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Editorial

Dear authors, reviewers, and readers

It has been a month since I was given the privilege to serve as the Chief Editor of the International Journal for Innovation Education and Research (IJIER). It is a great pleasure for me to shoulder this duty and to welcome you to **THE VOL-7, ISSUE-8 of IJIER** which is scheduled to be published on **31st August 2019**.

International Journal for Innovation Education and Research (IJIER) is an open access, peer-reviewed and refereed multidisciplinary journal which is published by the International Educative Research Foundation and Publisher (IERFP). IJIER aims to promote academic interchange and attempts to sustain a closer cooperation among academics, researchers, policy makers and practitioners from a wide range of disciplines, which contribute to state of the art in science, education, and humanities. It provides a forum for the exchange of information in the fields mentioned above by welcoming original research papers, survey papers, and work-in-progress reports on promising developments, case studies, and best practice papers. The journal will continue to publish high-quality papers and will also ensure that the published papers achieve broad international credibility.

The Chief Editor, appointed by the Associate Editors and the Editorial Board, is in charge for every task for publication and other editorial issues related to the Journal. All submitted manuscripts are first screened by the editorial board. Those papers judged by the editors to be of insufficient general interest or otherwise inappropriate are rejected promptly without external review. Those papers that seem most likely to meet our editorial criteria are sent to experts for formal review, typically to one reviewer, but sometimes more if special advice is needed. The chief editor and the editors then make a decision based on the reviewers' advice.

We wish to encourage more contributions from the scientific community to ensure a continued success of the journal. We also welcome comments and suggestions that could improve the quality of the journal.

I would like to express my gratitude to all members of the editorial board for their courageous attempt, to authors and readers who have supported the journal and to those who are going to be with us on our journey to the journal to the higher level.

Thanks,

Dr Eleni Griva

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Analysis Of The Physiotherapeutic Treatment For Cerebral Palsy Based On The Bobath Neurodevelopmental Treatment Through The Gmfm

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ABSTRACT

INTRODUCTION: Cerebral palsy (CP) is characterized by postural, functional and tonus dysfunctions due to lesions in the Central Nervous System in the maturation phase. Physiotherapy inserts itself in the treatment of CP aiming to normalize dysfunctions, providing higher quality of life and autonomy. One of the most used methods for the treatment of these patients is the Bobath Neurodevelopmental Treatment (NDT). The prognosis and efficacy of treatment can be measured through instruments such as GMFM.

OBJECTIVES: To evaluate the physiotherapeutic treatment based on NDT through the GMFM-88 scale in children with CP before and after intervention, quantitatively observing the evolution. METHODOLOGY: 8 patients were submitted to the GMFM scale before and after physiotherapeutic treatment. The treatment was carried out in the discipline of Pediatrics of a Community University. Quantitative data were tabulated and analyzed using simple descriptive statistics and GMAE-2 Software. RESULTS: A general evolution was observed in the neuropsychomotor development of patients or the maintenance of their condition.

CONCLUSION: The results demonstrate that the physiotherapeutic treatment based on the Bobath Neurodevelopmental Treatment is effective for the evolution or maintenance of the gross motor function of the patients and that the GMFM instrument is effective in showing these results quantitatively.

KEYWORDS: motor activity, cerebral palsy, proprioception, physiotherapy.

INTRODUCTION

Cerebral palsy, also known as chronic non-progressive encephalopathy (NPE), is characterized by a group of postural, functional and muscle tone dysfunctions and changes that result from permanent lesions of the Central Nervous System (CNS). In addition to functional dysfunctions, NPE usually involves sensory, behavioral and communicative dysfunction, as well as social interaction and integration, and cognitive dysfunction.¹

NPE is a new term used to replace the nomenclature of cerebral palsy (CP), since the later is not considered correct because it characterizes and gives the idea of a cerebral lesion whose clinical condition is characterized by the total loss of cerebral functions. However, cerebral palsy is still the term usually used.²

Considered one of the most incident and important neurological lesion, NPE occurs during the brain maturation phase and can be classified according to the period of incidence of the etiologic agent on the CNS: it may be prenatal, perinatal or postnatal, and may be caused endogenously or exogenously.^{3,4}

The clinical condition of the lesion is usually characterized by spasticity and hyperreflexia, having impact on the patient's musculoskeletal system in different ways. This spasticity can be observed through hemiplegia, quadriplegia and/or diplegia, the first being the most common. In addition to these conditions, NPE may also be characterized by dyskinesia, ataxia, hypotonia and mixed symptoms, which are more rare.^{5,6}

The alterations and functional deficiencies due to the NPE are aggravated by the lack of a professional treatment that seeks improving the patient's quality of life. The patients, as they grow and develop, suffer consequences from their limited routine of activities and muscle stimuli and lack of physical activities that act on the improvement of the musculoskeletal system.^{5,6}

NPE treatment requires a multiprofessional team formed by a neuropsychiatrist, orthopedist, physiotherapist, speech therapist, among other professionals, working on the most precocious stimulation so that the child can perform their activities of daily living, as well as performing stretching and strengthening exercises of the musculature, and adapting of means of communication and locomotion if necessary.⁶

Physiotherapy is inserted into the treatment aiming to improve mobility, give range of motion and strength in order to regulate the abnormal muscle tone that the patient presents. Therefore, the role of physiotherapy is to normalize the dysfunctions, providing the patient functional independence and greater autonomy whilst performing their daily activities.⁵

One of the most effective and most used methods by the physiotherapist in the treatment of this dysfunction in children is the Bobath Neurodevelopmental Treatment (NDT). This method, created by Berta and Karel Bobath in the 1940s, consists of encouraging the functionality of the child's movements from adjusting muscle tone, influenced by the manipulation of control key-points, facilitating the establishment of normal postural patterns, patient's motor coordination, and, thereby, reducing their functional limitations.^{7, 8}

The Bobath Neurodevelopmental Treatment is a method of physiotherapeutic treatment already known worldwide, developed initially around 1940 and used until today, that has undergone alterations in order to adapt to the present demands, being updated the face of new discoveries and advances of the physiotherapy.⁴ However, through such adaptations that this method suffered and suffers, recent scientific research with relevance that proves its effectiveness in a quantitative way is scarce, which raises controversial discussion about its use and effectiveness. Thus, the researchers' intention with the present study was to contribute to the bibliographic collection, discussing the competence of the physiotherapeutic treatment following the precepts of this method.

The prognosis of gross motor function in children with NPE is variable. Therefore, the assessment of the level of functionality has a predictive value to quantify gross motor skills. One way to assess a child with NPE's motor skills is by using Gross Motor Function Measure (GMFM). The GMFM scale was developed by a group of Canadian researchers and is a standardized instrument that measures the change in gross motor function over time on the quantitative aspect.⁹

This scale consists of 88 items of different motor activities grouped into 5 dimensions: lying and rolling; sitting; crawling and kneeling; standing; and walking, running and jumping. Each item is scored in a scale from 0 to 3, being 0 “does not initiate”, being 1 “initiates”, being 2 “partially completes” and 3 “completes”, according to the skills and age of the patient. The final result is obtained through the sum of the dimension scores divided by the total number of dimensions (5).⁹

Using the GMFM scale, the objective was to evaluate the results of the physiotherapeutic treatment, with duration of six months, based on NDT in 8 children diagnosed with chronic non-progressive encephalopathy. For that, it was verified if there was alteration of the scores of the GMFM scale between the application pretreatment and post-treatment.

METHODOLOGY

The present study has a quantitative character, since it measures the evolution of gross motor function by the score of the domains of the GMFM-88 scale, before and after physiotherapeutic treatment. It was done in a descriptive and cross sectional way. The research was carried out in the Teaching Clinic of a community university in the south of Brazil, with 8 children attended in the discipline of pediatric practice during the period from July to December 2017, under the authorization of parents or guardians through the Informed Consent Term. Still, patients agreed to study participation through a video stating their assent. In addition, ethical procedures were respected in accordance with Resolution nº466/12 of the National Health Council (CNS). The study was approved by the Research Ethics Committee (CEP) of the University of Vale do Itajaí through ordinance nº 2.247.140. The identity of the participants was kept confidential and the term “patient” with crescent numbers was used for each participant.

The sample was obtained obeying the inclusion and exclusion criteria. Included in the study were children with NPE diagnosis and children in the age group between 6 months and 16 years of age. Patients with diagnoses other than NPE were excluded from the study, as well as patients who did not have cognitive function preserved according to their diagnosis and who did not fit within the inclusion age range.

The data and the application of the scale were obtained under the supervision of the researchers involved during the physiotherapeutic care. For the purposes of data collection, the GMFM-88 scale was used due to the fact that this version of the scale is the most complete one. The application of the GMFM-88 scale aimed to evaluate the motor function and to what extent the child was able to perform a certain activity, in addition to being used to make a comparison of this motor function at the beginning and end of the physiotherapeutic care period, thus evaluating the proposed treatment. In order to carry out the activities proposed by the scale, it was necessary equipment such as carpet, toys, benches, chronometer, pole, steps, measuring tape, among others. The application of the scale lasted an average of 45 to 60 minutes, done in a spacious, warm, comfortable room with a firm and flat surface. The parents were able to accompany the

application of the scale, but without influencing it. The children who were part of the research were wearing as little clothing as possible and were barefoot.

From the first application of the scale the physiotherapeutic treatment was started. The treatment was based on the Bobath Neurodevelopmental Treatment method and carried out by the students of the discipline of pediatric practice. From the NDT integration into the physiotherapeutic treatment plan, a proposal was developed that involved the following therapeutic measures such as: stimulating the puppy position; lateral protection reaction stimuli; rolling; unilateral weight-training workout; proprioceptive training, including postural reorganization, gait training in instability and balance; trunk control and cervical control training; changing decubitus, from dorsal decubitus to lateral decubitus, from sitting to kneeling and semi-kneeling, progressing to orthostatic position and gait training. For these conducts, key points were used to facilitate the movement and perform them in a functional way. The conducts were performed individually according to the need of each patient and adapted according to the patient's GMFCS classification level, motor impairment and age range.

After the semester of physiotherapy intervention based on the aforementioned conducts, the GMFM-88 scale was reapplied to re-evaluate the patients, thus being able to have a comparison of the motor gains reached. From the two applications of the scale, the quantitative data were tabulated and analyzed through the Excel program, using simple descriptive statistics composed by frequency distribution and averages. Quantitative results were presented in the form of tables and graphs. The Gross Motor Ability Estimator Software (GMAE-2) was used to construct the graphs that demonstrate the patient's initial situation and his progress in neuropsychomotor development during the semester through age percentiles.

This software builds such charts using original data from the GMFM-88 scale, the GMFCS level of the patient, the patient's date of birth, and the type of the patient's impairment. In addition, the software analyzes the data obtained with the original GMFM-88 application and calculates a new score, equivalent to GMFM-66.

Due to the time of application of the scale of this research, the risk assumed was that the participating children would not tolerate the entire application of the scale in a single moment. However, there were no such situations with the participants of this research. Regarding the patient's risk of withdrawal and abandonment of treatment, there were no ways to minimize it, since the patient and / or caregiver was free to do so without any financial or moral implications under their decision .

The application of the GMFM scale has the benefit of being a low-cost tool that provides an overview of the patient's motor function, helping to enhance the goals of his treatment and to evaluate his prognosis. On the other hand, NDT brings benefits to the treatment of tonus normalization and movement facilitation, preventing deformities, bringing the patient the fastest daily activities of life, increasing the functionality, coordination and quality of life of the patient.

RESULTS AND DISCUSSION

In this study eight children with a diagnosis of NPE were evaluated, four of them female and four males, aged 1 year to 14 years, where two children are 0-2 years old, two 2-4 years old , one child aged 4-

6 years, two children aged 6-12 years and one in the group over 12 years, who underwent physiotherapeutic treatment based on NDT, from March to July 2017, once a week.

The GMFM scale was used, which is an instrument to evaluate the motor function of children with motor disorders. The choice is due to the fact that the scale fulfills the criteria of reliability and validity with regard to responsiveness to functional change over time. Patient evolution analysis was performed individually and according to the age group of the participants, their motor impairment and GMFCS classification.

All the evaluated patients received, after the initial evaluation, NDT-based physical therapy, in order to potentialize neuropsychomotor development. The 8 patients reevaluated after the half-year of treatment showed an improvement in the gross motor function, although for some patients the improvement was minimal, be it by the severe commitment of the patient or because it is a patient with well developed gross motor capacity. This improvement can be observed in table 1.

Table 1 - List of patients by age demonstrating results obtained in the application of GMFM in each dimension and in total, pre and post physiotherapeutic intervention

P A T I E N T	AGE - GMFCS	IMPAIRMENT	GMFM - 88	A	B	C	D	E	TOTAL
				%	%	%	%	%	%
1	1 - V	QUADRIPLEGIA	PRE	35,29	1,66	0	0	0	7,39
			POST	47,05	38,33	9,52	0	0	18,98
2	1 - V	QUADRIPLEGIA	PRE	27,45	28,33	0	0	0	11,15
			POST	43,13	30	0	0	0	14,62
3	2 - II	HEMIPLEGIA	PRE	68,62	90	78,57	25,64	9,72	54,51
			POST	96,07	100	88,09	71,79	31,94	77,58
4	3 - III	DIPLEGIA	PRE	100	96,66	100	51,28	50	79,58
			POST	100	100	100	56,41	50	81,28
5	4 - I	HEMIPLEGIA	PRE	100	100	90,47	89,74	76,38	91,32
			POST	100	100	97,61	94,87	87,5	95,99
6	6 - I	HEMIPLEGIA	PRE	100	100	95,23	100	98,61	98,76

P A T I E N T	AGE - GMFCS	IMPAIRMENT	GMFM - 88	A %	B %	C %	D %	E %	TOTAL %
			POST	100	100	97,61	100	100	99,52
7	10 - III	DIPLEGIA	PRE	100	93,33	100	92,3	95,83	96,29
			POST	100	100	100	94,87	97,22	98,41
8	14 - V	QUADRIPLEGIA	PRE	19,60	6,66	0	0	0	5,25
			POST	54,90	13,33	0	0	0	13,64

GMFM-88 dimensions, represented by A% = lying and rolling; B% = sitting; C% = crawling; D% = standing; E% = walking, running, jumping.

Participants aged 0-2 years, responded satisfactorily to the treatment, evolving from score 1 to score 2 in several items in the lying and rolling and sitting dimensions. Regarding the total earnings of this age group, it can be observed that the dimensions increased considerably during the semester, with dimension A going from a total of 31% to 45%; dimension B going from 15% to 34%; dimension C going from 0% to 4%. In general, a motor gain of about 7% was observed with these patients, since the mean GMFM percentage of this group increased from 9% to 16% (table 2).

Participants aged 2-4 years had gains in all dimensions. It evolved from score 1 to score 2 and 3 into many evaluated items. Dimension A went from 84% to about 98%, showing an almost complete gain of this scale dimension; the B-dimension went from 93% to 100%; C-dimension went from 89% to 94%; dimension D went from 38% to 64% and dimension E, 30% to 40%. In general, a total motor gain of about 12% was observed with these patients, since the mean GMFM-88 percentage of this group increased from 67% to 79% (table 2).

The 4-6 year-old age group had only one participant, in whom there was no improvement in the first dimensions, A and B, since the patient had already total motor function evaluated in them, and it should be noted that the complete percentage was maintained during the semester. It was observed an improvement in the C, D and E dimensions, with the gain in relation to the C dimension being 7%, from 90% to 97%; dimension D going from 90% to 95% and dimension E from 76% to 87%. In general, a total motor gain of about 5% was observed with these patients, since the average GMFM-88 percentage of this group went from 91% to 96% (table 2).

In relation to participants aged 6-12 years, these two patients had the lowest gain compared to the other groups. This is because the gross motor function of these patients was almost total. This group showed an

improvement in dimension B from 96.5% to 100%; in dimension C, went from 97.5% to 99%; in dimension D, went from 96% to 97.5% and in E it went from 97% to 98.5%. Dimension A remained at 100% and in total this group had a gain of about 2.5% (as shown in table 2).

In the group over 12 years old, with only one patient, a considerable gain was observed in A and B dimensions of the scale, but without alteration of the other dimensions due to the significant motor impairment of the patient tested. However, the motor gain resulting from the physiotherapy semester in these dimensions was about double the initial score, and a change from 20% to 55% in dimension A and from 6.5% to 13% in dimension B could be observed. Overall, a total motor gain of about 8% was observed with these patients, since the mean GMFM percentage of this group increased from 5.35% to 13.64% (Table 2).

Table 2 - Sample of the study divided by age group with their respective results in the test and retest

AGE GROUP (y.o)	PATIENTS	TEST %	RE-TEST %	EVOLUTION %
0 - > 12	8 (100%)	55,5	62,5	7
0 - 2	2 (25%)	9,3	16,8	7,5
2 - 4	2 (25%)	67,1	79,4	12,3
4 - 6	1 (12,5%)	91,3	96,0	4,7
6 - 12	2 (25%)	97,5	99,0	2,5
> 12	1 (12,5%)	5,3	13,6	8,3

Regarding the motor impairment of the participants, the group was divided according to its diagnosis of cerebral palsy in hemiplegic, diplegic and quadriplegic, in order to analyze if these characteristics can interfere in motor learning and neuropsychomotor development. Among the participants, three are part of the hemiplegic group, two of the diplegic and three of the quadriplegic.

The group of diplegics started the semester being the less compromised, reaching 87.94% on the GMFM-88 scale and its progress during the semester was the lowest compared to the other two groups. The initial GMFM score was 87.94% and the final score was 89.85%, with a gross motor function gain of 1.91% (Table 3).

Regarding the hemiplegics, they started the semester reaching 81.53% in the GMFM-88, taking into account the average among the three participants. Thus, this was the group that had the greatest gain in gross motor function, to 91.03% on the GMFM-88 scale average, totaling a gain of 9.5% (Table 3).

Concerning the group of quadriplegic patients, they started the semester with the most severe motor impairment, as expected, with an average of 7.93% in the GMFM group. At the end of the semester, there was an important gain in gross motor function, reaching 15.75% in the GMFM scale, totaling a gain of 7.82% (table 3).

MOTOR IMPAIRMENT	Test %	Retest %	Evolution %
DIPLEGIC (n=2)	87,94	89,85	1,91
HEMIPLEGIC (n=3)	81,53	91,03	9,5
QUADRIPLEGIC (n=3)	7,93	15,75	7,82

Table 3 - Sample of the study divided by type of impairment with its respective results in the test and retest.

Therefore, it is possible to observe a general evolution in the neuropsychomotor development of the patients, either in a grouped manner (by age, by motor involvement) or also when we analyze the progression of the patients separately.

Through the GMAE-2 software, the graphical arrangement of the advance in the neuropsychomotor development of each patient through the percentiles by age was made, thus, better illustrating the result of the research. The age percentiles are reports that indicate the patient's position on the curves of gross motor function according to their level of GMFCS¹⁰. In addition, the software analyzes the data obtained with the original application of GMFM-88 and calculates a new score, equivalent to GMFM-66, indicated above the curves and next to the age of the patient.

When analyzing the individual GMAE-2 graphs, all the patients showed an advance of gross motor function within their respective percentiles. Patient 2, however, did not obtain graphic improvement but physical therapy for this patient provided the maintenance of his condition.

It is important to put in perspective that the literature often shows that motor development and motor learning, translated into the way patients respond to physiotherapeutic treatment, goes according to the aforementioned characteristics (motor impairment, GMFCS and age group), that is, that some groups will have a better response to treatment than others. The results of this study show that there is some corroboration with this idea, however there are several factors and more characteristics that involve each patient and this, in its entirety, will develop differently from the others, regardless of the group in which fits.

This can be observed when comparing the results of patient 1 with patient 8 (table 1). Their age groups disagree with each other, yet both had significant gains from treatment. When comparing patients 1 and 8 with patient 3 (table 1), there is a large GMFCS level difference. However, there was a significant evolution of gross motor function for all three.

It is widely agreed by several authors that the earlier the physiotherapeutic intervention, be it NDT-based or not, the greater the gains in gross motor function and motor development in PNE patients.¹¹

Since important results have already been achieved with the intervention of this study, being only once a week, it is possible to correlate and emphasize that intensive or more frequent treatment would bring even more promising results.

The results of the research show that the lower the level of patient impairment and dependence, according to GMFCS, the higher the motor development provided by the physiotherapeutic performance. This can be observed when comparing the percentage of evolution of diplegic or hemiplegic patients in

relation to quadriplegics, or in a comparison between the evolution from the lower levels of GMFCS to the higher levels.

This observation is in accordance with studies that compared the impact of neuromotor gravity on the functional profile of children with NPE, where thirty-six children were classified by GMFCS according to levels of neuromotor impairment (mild, moderate or severe) . These three groups were evaluated by the PEDI test, which reports on the functional abilities and independence of the child in the areas of self-care, mobility and social function, in which they concluded that the greater the patient's neuromotor impairment, the greater the number of factors that will limit his functional capacity and independence. Thus, it can be considered that this is true for the physiotherapeutic treatment and its evolution: the greater the motor impairment, the greater the barriers to the success of the intervention and, thus, the lower the result.¹²

In contrast, our study shows that patients with high motor impairment (GMFCS V) had significant gains, as did patients with low motor impairment (GMFCS I and II). This is because there is a wider range of motor milestones to be achieved with more severe patients.

In addition, it is important to note that although the gains of patients with more severe neuromotor impairment are smaller and more difficult to achieve, physiotherapy and its NDT-based interventions are effective in treating these patients, since it provides them the evolution that keeps them within normal range of the neuropsychomotor development for their age group or, still, keeps them in the way to achieve evolution.

These small gains, as seen in relation to patient 2 of this study, corroborate with the literature that presents results of an intervention that combines different approaches, including NDT, with 4 children with NPE, and although the progress achieved is not statistically significant, there was improvement in motor development through GMFM and evolution sufficient to reach the goals proposed for each patient through the Goal Attainment Scale (GAS).¹³

CONCLUSION

We can conclude that the results found in our research were satisfactory, since the patients presented gains in the motor development and improvement of the gross motor function. According to results obtained, it is suggested that GMFM-88 is useful as a result measurement tool to detect changes in gross motor function in children with NPE undergoing physiotherapeutic interventions.

It should be emphasized that GMFM is an effective tool when used to assess the child's motor function in a quantitative way, not replacing a physical therapy evaluation and the association of other assessment instruments that evaluate smaller motor gains and make qualitative analysis of gross motor function . However, we can say that the GMFM evaluation instrument performs satisfactorily what it is meant to do.

The results of this study show the efficacy of the physiotherapeutic treatment, which used interventions based on the NDT to facilitate and encourage the neuropsychomotor development of the patient. Because it is a method that requires specialized training, it is possible to attest that even using only the principles of this method is possible to obtain satisfactory results, either for the evolution of the patient or the maintenance of his / her condition.

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Lean Practices Transfer in Developed Countries: A Practical Case in an Electrical Wires and Cables Company

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Abstract

Although Lean knowledge is widely spread worldwide bringing forth benefits to organizations, observable in the literature is that small-sized enterprises in developed countries do not usually apply this industrial management technique. Therefore, this article has sought to demonstrate that Lean Knowledge Transfer, through the university-enterprise cooperation, may reach expressive results in a wires and cables company. To achieve that, a product family largely impacting the production process has been selected in that company. Next, the tool Value Stream Mapping (VSM) has been used to visualize the current state and, in partnership with the company's managers, idealize a future state of the process. With that, wastes have been found in the production process and Lean tools have been pointed out to reach improvements proposed in the future state. The results have shown a significant reduction in wastes of: movement of operators (50 and 40% in distances traveled), inventories (44 and 22% of copper), lead time (60 and 53% of the time) and the number of operators (39% in total). Thus, the conclusion is that these results corroborate the literature, where one may apply Lean knowledge transfer in different-sized enterprises so as to seek the reduction of wastes and improve the production process efficiently with the cooperation of universities.

Keywords: Electrical wires and cables company; Value Stream Mapping; Lean knowledge transfer;

1. Introduction

Brazil has been experiencing an economic and financial crisis since the end of 2014 [16]. In fact, when analyzing the data of the Gross Domestic Product (GDP), it is possible to verify that in 2014 the value of the GDP was of 2.456 trillion dollars and the emergence of the crisis this figure fell to 1.802 US dollars in 2015 [48]. The implications of this recession had an impact in different sectors, mainly in the civil construction sector, which directly reflected in other industries that provided inputs to this sector, as is the case with the wire and cable industry. To overcome this situation, companies are looking for ways to reduce their processes and keep them competitive and survive. As an alternative to solving this problem,

companies have the Lean Manufacturing (LM) technique.

The LM, according to [31], is the most widely used term in the West to refer to the production model proposed by Toyota (Toyota Production System – TPS). This production model is also found in the literature synonymous to “Lean production”, “Lean thinking”, “Lean enterprises” and “Lean consumption” [46, 6, 52, 33].

In accordance with [52], a catalyst that has been important to increase the popularity of Lean was the development of the International Motor Vehicle Program (IMVP). Corroborating the aforementioned, as per [40], the word Lean entered Industrial Management through a researcher from the Massachusetts Institute of Technology (MIT), called John Krafcik. Furthermore, this term has been chosen to represent the essence of TPS, as mentioned by [52], which is far less thirsty of resources in comparison to other Western traditional productions systems [40].

The systematic review undertaken by the authors [40] spans 25 years of Lean literature that has covered from 1989, its emergence, until 2013. Therefore, the authors demonstrate the increasing number of publications through graphs, where you may perceive a steep evolution of correlated works.

By observing the panorama described by the authors [40], easily notice the considerable boost in the number of publications as regards this theme from 2000 to 2013. This boost is likely due to, chiefly, the benefits generated in the production processes of its application, as well as in the extrapolation of application outside the automobile sector limits.

The benefits brought forth by implanting this industrial management technique, according to [4], are reduction of production costs, of lead time and improvement of production flow. Additionally, [30] stress that this technique has been shown as a good example of innovation in enterprises and one of its supports is the continuous improvement. However, so as to explore Lean, firstly, a current Value Stream Mapping (VSM) must be carried out in the production process aiming to show the wastes inherent to the process and then point out improvement opportunities in the future state or expected state VSM [12].

Corroborating the above-mentioned authors, [47] ratify that the VSM tool is the starting point to be followed in the application of Lean concepts. In addition, they attest that the automobile industry of Toyota was the first to use VSM and some authors who have employed this tool in their studies may be found in the literature [45, 42, 11, 36, 49; 2, 35, 50; 3, 10, 34], as it visually outlines the information of the production process including value-added or non-value added activities to the good or service, besides clearly exposing the wastes and with that one may attain these cited benefits [5, 43, 27].

As per [29], the implementation of the Lean industrial management has occurred in a brilliant manner in the automobile sector and its principles and tools have been transferred to other companies of the manufacturing sector [7, 6, 41, 14] and one can observe that this knowledge has continuously been incorporated into the service sector [13, 1; 21, 23, 51; 39, 38, 19, 20, 32].

Despite this strong evidence, namely Lean enhances any production system by bringing forth benefits, the authors [17] report that knowledge transfer of this technique is a crucial point, albeit difficult, for enterprises. In accordance with these authors, this is related to multinationals in emerging countries. Regarding underdeveloped countries, note that in some of the major databases (Scopus, ScienceDirect, Emerald, Web of Science and SciELO) this transfer has a high correlation in multinationals and low in local enterprises. This problem, or gap in the literature, is higher in poorer regions, as in the case of the Brazilian

Northeast. Additionally, another gap found deals with scarcity of works published taking into account Lean knowledge transfer (LKT) in electrical wires and cables companies, which is the focus herein.

Another crucial factor with which this article is helping is to collaborate with researches referring to “Lean knowledge transfer”, which according to [14], the literature on adherence to transfer of this industrial management technique is still embryonic and very fragmented. Thus, this article aims to demonstrate that LKT, through university-enterprise cooperation, may reach expressive results in a wires and cables company. For such, this survey is structured into five sections, in addition to the Introduction, namely: Section 2 – deals with the contextual antecedents and bibliometrics; Section 3 – outlines the methodology used; Section 4 – approaches the results and discussions; Section 5 – Discussion; and Section 6 – exhibits conclusions of the case study.

2. Contextual antecedents and bibliometrics

The gaps shown in the introductory section have been evidenced with the use of the literature review methodology used for designing this survey, which for its part has been based upon the combination of six keywords, as outlined in Chart 1, on five international databases, whose bibliometrics result is in Table 1.

Chart 1 Combination of keywords and operator

Keywords	Operator	Keywords
Wire Company	AND	Lean
Cable Company		Knowledge transfer
Wire and Cable		Value Stream Mapping
Keywords	Operator	Keywords
Lean	AND	Knowledge transfer
Value Stream Mapping		

As observed in Chart 1, the keywords have been combined in pairs by using the Boolean operator “AND” and by verifying Table 1, note that in all these databases accessed, the final bibliometrics result summed up 27 works, of which five are reviews [17, 46, 9, 24] and 22 are researches. Seven of these have drawn attention, as the authors have analyzed multi-cases or multi-plants [8, 17, 14, 22, 26, 25, 28, 24] where they have grouped several cases of LKT and synthesized them in their respective works.

Another noteworthy factor as regards this bibliometrics result analysis refers to the absence of works carried out at electrical wires and cables companies and which have not taken into account the following: knowledge transfer, Lean and Value Stream Mapping. This fact was previously discussed in the Introduction section above and makes this survey original and, due to that, it will be the largest literary contribution.

The result outlined in Table 1 has been reached by criteria of exclusions, duplicates and by the elimination of articles whose abstracts read have been outside the scope of the application theme of LKT in companies. Next, the remainder articles have been read thoroughly and served to support the methodology and find the gaps of the Introduction section. As there have not been researches at wires and cables companies, the results have been discussed based upon articles which have shown similarity to the theme Value Stream Mapping and these have been surveyed on the aforementioned databases of the bibliometrics in addition to

Google Scholar.

The systematic review method used herein was Methodi Ordinatio proposed by [37]. With that, the nine stages of this method have been used in addition to the software Medley, JabRef and Microsoft Excel spreadsheets, student version, as recommended by the authors. Its use has aimed to order the major works found on the five databases of the Engineering literature: Web of Science, ScienceDirect, Emerald, Scopus and SciElo. Noteworthy is that the limitations of this study regard the following facts: the choice of works, which have been restricted to review articles and researches for analysis and discussion purposes; and the search of articles, which have been on these five databases.

Table 1. Bibliometrics result

Keywords		Data base					Total		
		Emerald	Scopus	Sciencedirect	Web of Science	SciElo	Found Papers	Check duplicates	Review of abstracts
wire company	Lean	0	0	0	0	0	0	0	0
	Knowledge transfer	0	0	0	0	0	0	0	0
	Value Stream Mapping	0	0	0	0	0	0	0	0
cable company	Lean	0	0	0	0	0	0	0	0
	Knowledge transfer	0	0	0	0	0	0	0	0
	Value Stream Mapping	0	0	0	0	0	0	0	0
wire and cable	Lean	0	1	0	0	0	1	1	0
	Knowledge transfer	0	0	0	0	0	0	0	0
	Value Stream Mapping	0	0	0	0	0	0	0	0
Lean	Knowledge transfer	7	41	10	20	1	79	52	27
Value Stream Mapping	Knowledge transfer	0	2	0	0	0	2	2	0
								Total	27

3. Methodology

3.1 Methodological procedures

The technical procedures employed herein consist of stages performed aiming to comply with the main objective of the survey. Importantly, in order to reach this objective, an LKT team has been created, made up of research professors, students from two university and the participants interested in absorbing this transfer on the part of the company studied. This transfer has occurred with the support of the stages outlined in Figure 1.

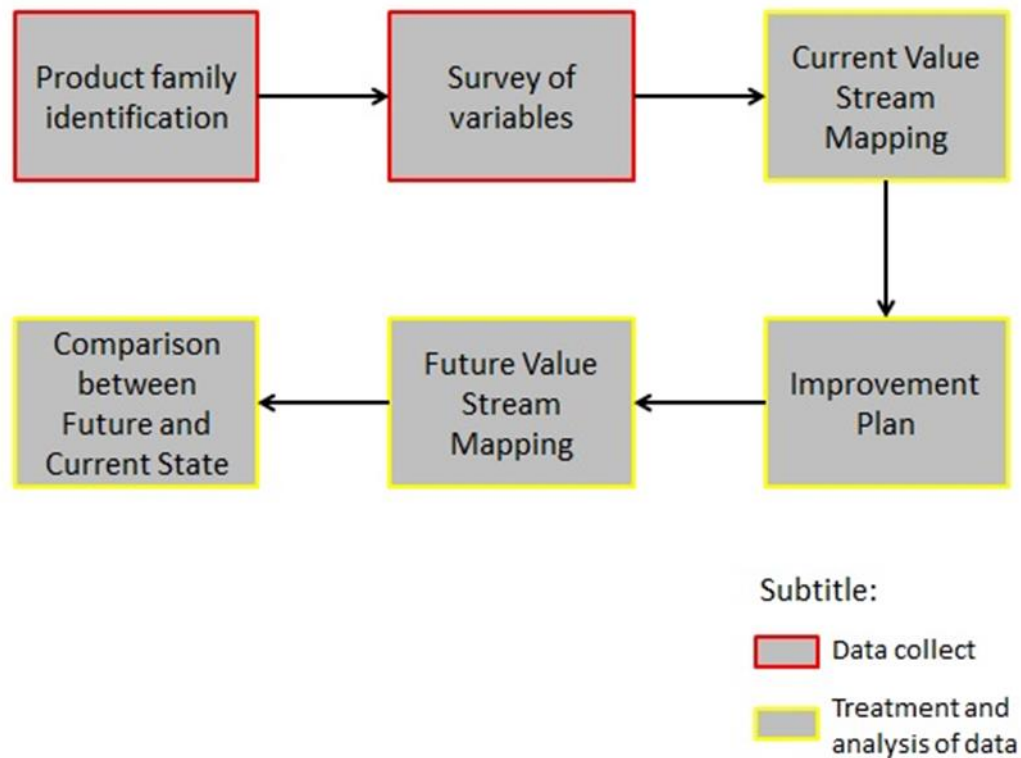


Figure 1. Stages of technical procedures.

Note that some of these stages of the research method employed herein (Figure 1) have been designed adapted as proposed by [15, 7]. Also note that, according to that Figure, the stages of technical procedures have been grouped into two macro stages: data collection; and data treatment and analysis. For such, the stages are explained in the following subsections of this Methodology.

3.2 Identification of the product families

The first stage has been based upon the works of [49], in which the author attests that one must choose the product family before executing the VSM. In this stage, the product family showing the highest production rate is identified in the company to serve as a base for the study. The data to elaborate and select the product family of this study have been collected by means of the company's Planning, Programming and Control of Production (PPCP) and Material Requirements Planning (MRP) regarding the actual demand of each product.

3.3 Raising the variables

After the identification of the product family, the variables of the production process referring to it have been collected. The stage of raising the variables is similar to the preparation phase presented by [15] seen that before raising them, the researcher has had to know which variables to collect and know the instruments to use for collecting the data. The variables presented in Figure 2 have been collected in a two-month period.

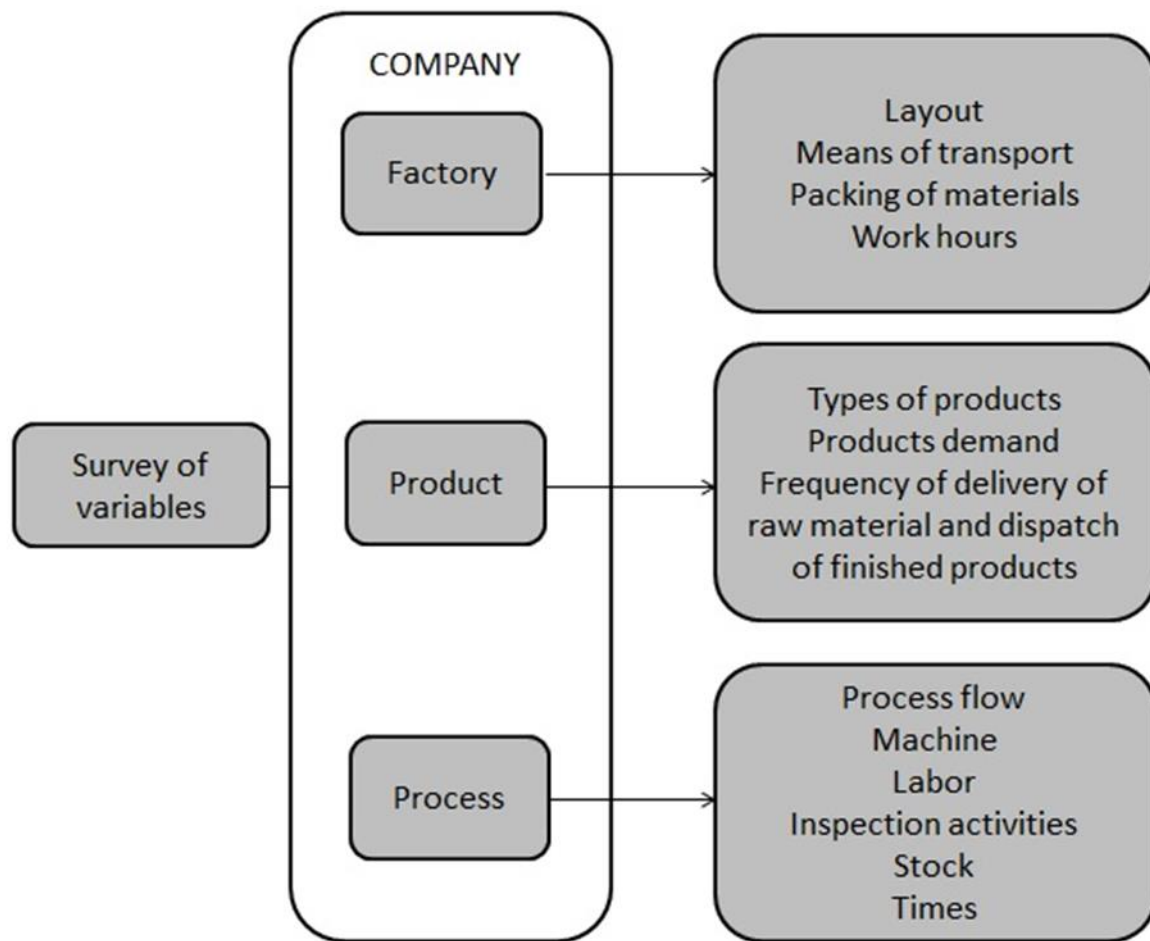


Figure 2. Sources of variables.

According to Figure 2, there are three Sources in the surveying of variables: the factory, the product and the process that generate the variables collected. The data collected regarding the factory have been layout of the floor (treated by means of AUTOCAD), the means of moving/transporting and storing the materials, as well as working shifts and hours. In regard to the product, data have been required on the types of products, the daily manufacturing demand, the frequency of the delivery of raw materials by the suppliers and dispatch frequency of finished goods to clients.

As for the production process of each product family, these have been collected: the process stream, the quantity of machinery and employees, inspection activities, WIP and inventories of finished goods, times (machine cycle time, time to load and unload the machine or manual time, setup time, inspection and waiting time). Finished the data collection, the data treatment and analysis have been started by the current physical modeling of the production process, explained in the following section.

3.4 Current value stream mapping

For carrying out this stage and that of subsection 3.1.5, some of the symbols have been used based upon the works of [18, 7]. These symbols have been developed by the Lean Enterprise Institute which, for mapping the production process, are extremely important.

For data treatment and analysis, as well as for accomplishing this stage, firstly, the takt time has been calculated and the structural part of the VSM elaborated via Microsoft Excel, based upon the works of [12]. For elaborating the current VSM, in each activity of the production process of the chosen family the averages of the following times have been calculated through statistical estimates: the machinery cycle, the manual work of operators, the setup, the inspection and the waiting times. Also, the following variables have been measured: the time in relation to the movement of the operator, inventory quantity, the production capacity of each machine, the quantity of operators in each activity. In the end, the lead time has been calculated (total time for producing the kg of copper) which served as a parameter for future comparisons amid scenarios.

Thus, the current VSM has guided the LKT team to identify the wastes present in the production processes of each product of the family, also helping them to identify which Lean tools should be proposed in the improvement plan, which is the following stage of the data treatment and analysis procedures.

3.5 Improvement plan

After the building of the current state VSM, this stage has been started, which demands skills and expertise about every Lean tool, requiring minute attention from the LKT team so as to identify the wastes and indicate which tool would help the company in reducing wastes and increasing production yield.

Observe that in this stage, the variables collected have also been treated through spreadsheets elaborated on Microsoft Excel serving as data treatment tools. Following the analyses and improvement suggestions, the future state VSM of the chosen production process has been performed.

3.6 Future State Value Stream Mapping

By finishing the improvement plan, the future state VSM has been built following the same steps used in elaborating the current VSM (section 3.1.3), though according to the improvement suggestions proposed by the LKT team when using the Lean tools. After elaborating the future state VSM, the results of the improvements have been compared with those of the current state of the production process.

3.7 Comparing the future and current states

In this stage, the results from the improved state have been compared with those of the current scenario, aiming to check the benefits brought forth with implanting Lean in the company's production process and to quantify the gains with these improvements.

4. Results

4.1 Identifying the product family

This company manufactures different types of electrical wires and cables, adding up 112 items in its product line. Therefore, defining the families in which the products may fit has been necessary. Thus, the product-process matrix has been elaborated, where products that have similar manufacturing stages have been observed and grouped, making up ten product families built, as shown in Table 2.

In Table 2, the acronyms TREF – wiredrawing, TOR – torsion, EXT – extrusion, MED – measurement and

EMBAL – packing indicate the stages of the manufacturing processes of all products, and note that in some families there are stages in their process that are not performed, that is, the stages with unchecked squares (no “X”). Also, the products have been fitted into ten families, from A to J, and for choosing the product family to be used as a research base, a manufacturing monthly summary has been elaborated, which has taken into account the measurement in kilometers (km) of manufactured cables per month, as demonstrated in Table 3.

After the analysis of Table 3, Family B has had the highest production rate within the company, corresponding to the flex mainstream cable, being one of the reasons for regarding this as the research base, as it has the highest production rate (84%), supposing that the majority of availability of the production process is intended for manufacturing this family. Due to this fact, the chosen family has the name “mainstream”, from English, meaning main current or flow of the company, corroborating the idea of highest frequency shown previously.

Table 2 Product-process matrix

Product Family	TREF 1	TREF 2	TOR 1	TOR 2	EXT 1	TOR 3	EXT 2	MED 1	MED 2	MED 3	EMBAL
Family A - 11 items	x	x	x	x	x			x			
Family B - 4 items	x	x	x		x				x		x
Family C - 46 items	x	x	x		x		x	x			
Family D - 6 items	x	x	x	x	x		x	x			
Family E - 12 items	x	x	x		x	x	x	x			
Family F - 8 items	x	x	x	x	x	x	x	x			
Family G - 8 items	x			x				x			
Family H - 6 items	x	x	x		x	x	x	x			
Family I - 6 items	x	x	x		x	x				x	
Family J - 5 items	x				x					x	

Table 3 Production volume for each family of product

Months	Family A	Family B	Family C	Family D	Family E	Family F	Family G	Family H	Family I	Family J	Total
jan	147,61	6011,11	38,83	64,82	524,14	33,50	0,00	98,50	33,18	116,32	7067,99
fev	195,24	6849,43	223,28	148,64	420,77	7,75	67,52	74,06	55,42	2,34	8044,43
mar	202,76	5299,11	70,71	88,52	531,59	9,99	66,01	69,02	39,30	0,00	6377,00
apr	194,21	7843,19	60,52	52,32	572,08	15,03	20,51	40,09	52,19	0,00	8850,13
may	133,69	6445,52	39,93	50,35	430,53	9,21	8,33	115,25	2,01	37,45	7272,25
june	251,71	3797,18	74,01	109,12	517,44	10,67	46,91	125,37	32,64	0,00	4965,04
july	132,63	6537,87	218,34	203,50	520,73	1,58	78,03	0,00	28,23	0,00	7720,91
aug	181,91	5514,87	48,42	80,33	438,17	8,55	64,73	93,85	31,22	0,00	6462,05
sept	201,73	5503,32	305,68	160,52	825,79	18,40	0,00	55,43	0,00	19,15	7090,02
oct	305,65	6318,21	82,08	139,86	459,12	17,53	36,80	94,31	51,70	0,09	7505,33
nov	205,01	6218,21	233,45	165,35	628,38	15,07	52,33	94,82	40,31	0,00	7652,93
dec	252,01	6907,46	170,86	197,36	713,40	7,28	16,65	76,95	59,61	0,00	8401,57
Total	2404,15	73245,47	1566,10	1460,68	6582,14	154,54	457,80	937,65	425,81	175,34	87409,66
%	3%	84%	2%	2%	8%	0%	1%	1%	0%	0%	

4.2 Current state value stream mapping

After choosing the focus family for this survey, the next stage has been the elaboration of the current state Value Stream Mapping taking into consideration the data on working hours, demand, WIP, machinery involved in the manufacturing process, frequency of raw material receipt and dispatch of finished goods,

stream of the products' process, machine cycle time, manual time of the operator, inspection and setup times, aiming to know in which current conditions is the production process of the family flex mainstream cable found, and thus identify other wastes inherent to processes 1 and 2. Figure 3 and 4 show the current mappings for these processes, respectively.

The Value Stream Mappings (Figure 3 and 4) exhibit the entire cycle for the production of the family "flex mainstream cable", representing the delivery of the raw material by the supplier as far as the dispatch of finished goods to the client.

Amid the stages of the production process are the quantities of intermediate inventories and in each machine are the times that have been raised in the data collection. By observing the VSM of Figure 3 and 4, the machinery involved in the production process of cables A and B are T2 (wiredrawer), B1 (buncher), E1 (extruder), M1 (measurer) and TE (shrink-tunnel); whereas, the ones used in producing cables C and D are T2 (wiredrawer), B2 (buncher), E1 (extruder), M2 (measurer) and TE (shrink-tunnel), as seen in Figure 3 e 4.

By means of the times collected, the individual takt time has been calculated for each machine taking into account their working shifts and the demand for products.

According to Figure 3, the lead time for process 1 registers approximately 28 days, and according to Figure 4, the lead time for process 2 is 19 days. Notable is that the lead times for the processes studied have been high, as the WIP has also been high amid the stages of the production process, and this ends up increasing the lead time of the finished good.

In the above-mentioned Figure, the wastes with intermediate inventories have been circled in blue, the total cycle times that do not comply with the takt time have been highlighted in red, and the lead time, in green. Observe, through these mappings, that the wastes are directly related to the high inventories amid operations and overproduction, once with these high intermediate inventories the company produces more than demanded daily, or more than the necessary, generating high inventories of finished goods.

Furthermore, note in the current mappings (Figure 3 and 4) that the cycle times of some machines are higher than the takt time, that is, machines (B1, E1 and M1) cannot fulfill the demand of flex mainstream cable programmed for the day. For fulfilling the takt time and reducing wastes found, some improvements have been suggested and are found in the next section.

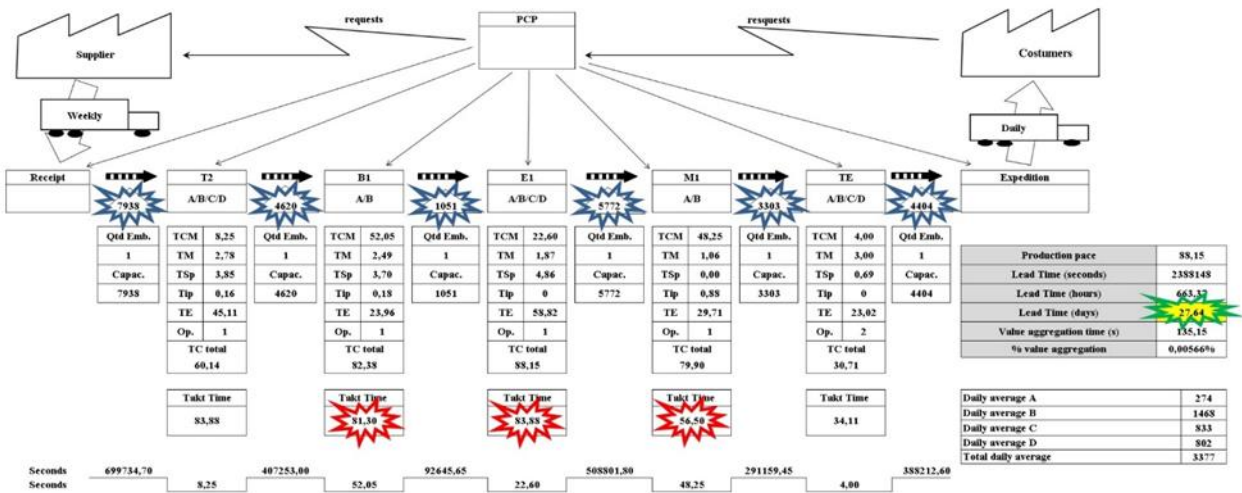


Figure 3. Current value stream mapping of process 1

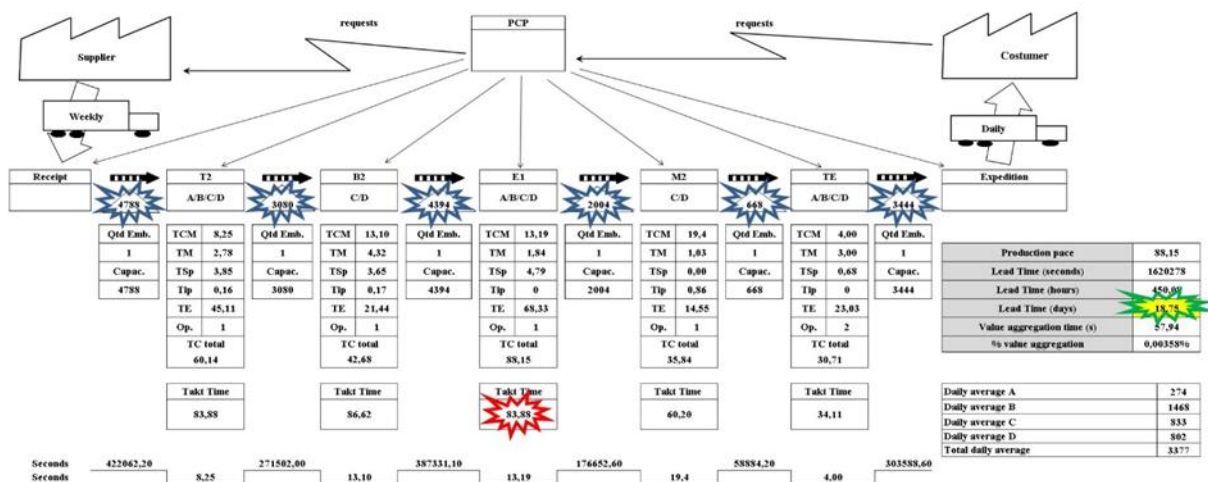


Figure 4. Current value stream mapping for process 2.

4.3 Improvement plan

After the analyses for identifying the wastes inherent to the production process of the family flex mainstream cable, improvements have been suggested so as to fulfill the objective of this research. Table 4 shows the problems found and the improvements proposed to solve them.

Table 4. Improvement plan

Problems identified	Improvements proposed
High inventories and overproduction	To produce as per the demand; to change the push to pull production flow; to implant supermarket inventories and the kanban system.
Cycle time B1	To transfer part of the demand to B2 or to reduce setup time through SMED.
Cycle time E1	To send to another extruder in the factory the production of cables C and D.
Cycle time M1	To transfer part of the demand for M2 and to implant the

	continuous flow between extrusion and measurement steps.
Unnecessary movements	To relocate machines B1 and B2 for the area of deactivated drawings.

As previously seen, the improvement opportunities in the Value Stream Mappings are reduction of inventories, amid operations, caused by overproduction, as well as some total cycle times higher than the takt time and unnecessary movements. As per Table 4, for reducing high inventories and overproduction a production according to daily demand is necessary, changing the production flow from the pushed to the pulled manner.

As for the cycle times higher than the takt time, by observing the current states shown by processes 1 and 2, a suggestion would be that a part of the demand intended for machine B1 be produced in machine B2, or reducing the setup time of B1 in 2s during the production of cable A, as well as the production of B through Single-Minute Exchange of Die (SMED), as shown in Chart 3.

As regards machine E1, it is intended for forwarding the demand to another extruder machine (E2), already existing in the factory, of the same standard of E1. Thus, E1 would be intended for cables of process 1 and E2 for cables of process 2. Thereby, a suggestion would be that two manufacturing cells be formed, one referring to process 1 and another to process 2.

M1, exhibited in Figure 3, does not comply with the takt time in 23.40s and M2, shown in Figure 4, has a lag time of 24.36s; then, by transferring a parcel of the demand from M1 to M2, ensures the requested demand to the machines to be fulfilled. Significant is that the measurement and the shrink-tunnel are within the limits of the takt time, in case there is any month in which the demand is higher than normal, M1, M2 and TE will not fulfill the demand, and improvement measures will be necessary in case this occurs.

So as to correct the deficit of measurement in high demands, and at the same time, reduce costs with collaborators, the continuous flow has been proposed between the extrusion and measurement stages, that is, E1+M1 and E2+M2, as extrusion already works three shifts and in each shift there is an operator; in this manner, with the continuous flow the work of measurement operators would not be necessary, and there would be a reduction of the existing 4 operators, as in the current measurement stage two machines are used and they work in two (2) shifts.

Additionally, grouping extrusion and measurement would bring changes for the factory floor layout by organizing it so as to fulfill the demand improving the production flow, also opening physical space to the factory.

Another matter worthy mentioning is to physically rearrange machine B2 closer to B1 and inserting a supermarket between them. This adjustment in addition to benefiting the process in itself would also reduce the non-value-added activity to the product, e.g. waste in unnecessary movement, intermediate transport and inventory. Reducing the quantity of operators to one (1) would be sufficient for handling the two machines, as these would be close to one another.

Hence, note that before the actual alterations in the factory layout, carrying out the study of operators' activities matching is important so that the working cells are sequenced the best manner possible; also, enlarging the Value Stream Mapping study is necessary for the remainder product families of the company.

4.4 Future state VSM

Based upon the proposed improvements and seeking to subsequently compare the future with the current state, the LKT team has designed future state mappings for processes 1 and 2, portrayed in Figure 5 and 6, respectively. Figure 5 exhibits the future state VSM for process 1 and Figure 6 exhibits the future state VSM for process 2.

Analyzing both future VSMs from Figure 5 and 6, observe the improvements of the new arrangement of the proposed layout with a continuous flow, and it is a Pull production based on the client's daily demand; additionally, there is the presence of supermarkets between the stages of the production process, and the order of production is pulled through kanban cards. Concisely, both production processes are Lean regarding the current state.

The lead time for process 1 is now 11 days (Figure 5) and for process 2 is now 9 days (Figure 6). After the compilation and explanation of results brought forth by the future state mappings, there has been a comparison between the current and future states both for process 1 and process 2.

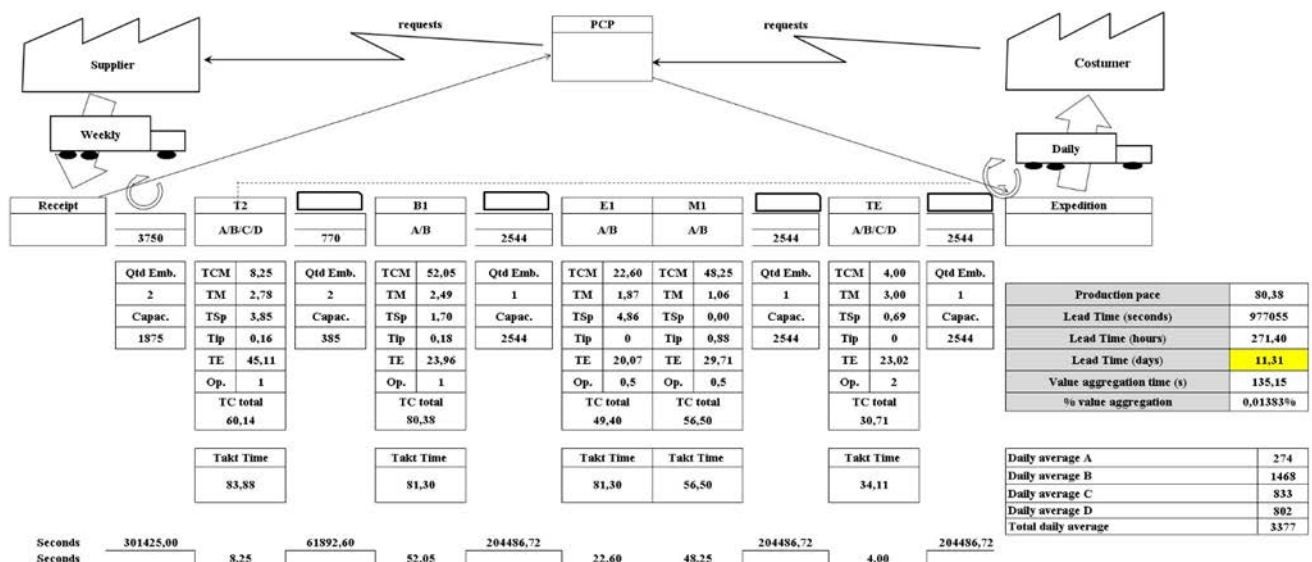


Figure 5. Future Value Stream Mapping for process 1.

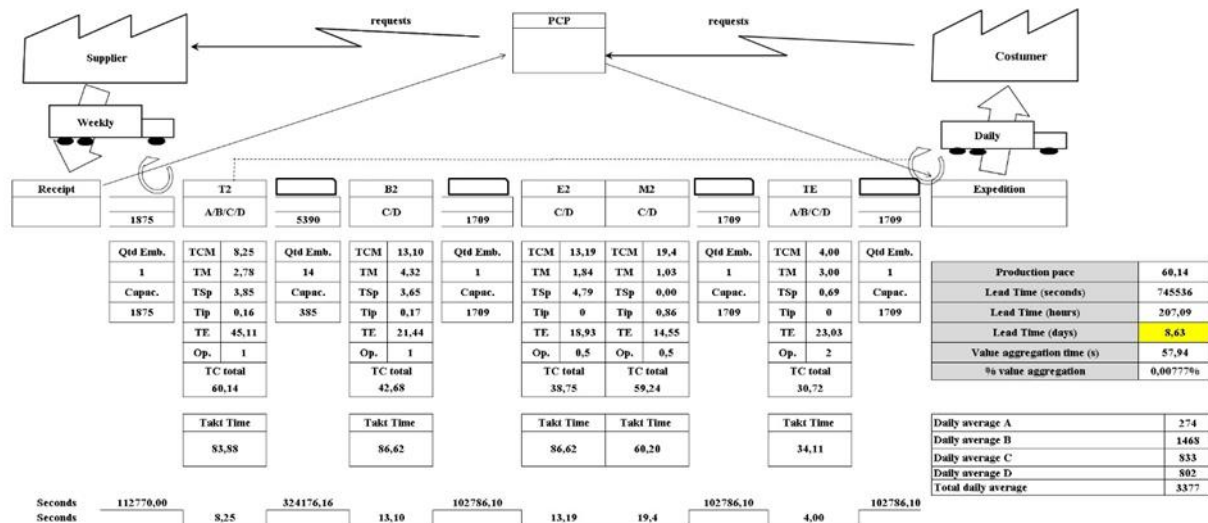


Figure 6. Future Value Stream Mapping for process 2.

5. Discussion

As mentioned by [30], the company has sought to innovate its production process by adopting the industrial management technique Lean Manufacturing. For such, this knowledge transfer has been efficiently established with the assistance of the LKT team, made up of collaborators from two Federal Higher Education Institutions and the company in this study.

In order to prove the efficiency reached by the LKT team, a comparison between the state in which the chosen process for analysis had been and the improved state has been carried out so as to explain the gains with this technique. Therefore, Table 5 exhibits the comparison of some productivity indicators of both states.

Table 5 Comparison between the current and future states

Indicators	Current state	Future state	Reduction
Distance traveled (process 1)	262. 4 m	131. 4 m	50%
Distance traveled (process 2)	225.14 m	129. 58 m	42%
Inventories (process 1)	27 tons	15 tons	44%
Inventories (process 2)	18 tons	14 tons	22%
Lead time (process 1)	28 days	11 days	60%
Lead time (process 2)	19 days	9 days	53%
Operators	18	11	39%

As shown in Table 5, various are the gains acquired with the improvements suggested. The changes in the factory floor layout enabled the distance traveled (unnecessary movement) by the product to decrease from 262.4m to 131.4m in process 1, which represents a reduction of 50% and from 225.14m to 129.58m in process 2, which is a reduction of 42%. The reductions in this indicator corroborate the results in the work of [44], where the company B.S. Spray Painting Works has reduced 44.18% and Kotla Auto Parts has attained a reduction of 50% in the distance traveled.

With the change of the production method from Push to Pull and working according to the daily demand,

the inventories between operations for process 1 has reduced in 44%, and for process 2 they have decreased 22%. Through the reduction of inventories, the processing lead time has also decreased 60% (process 1) and 53% (process 2), making the process Lean as regards the current one. The reduction of lead times has been higher than the planned in the work of [7] and that reached in the work of [49], which has been 50%. The consequence of reducing the lead time is that the percentage of value-added time to the product increases and that may be observed when comparing Figure 3 with 5 for process 1 and 4 with 6 for process 2. In view of that, the percentage of added value in process 1 has moved from 0.006% to 0.014% and from 0.0036% to 0.0077% in process 2, approximately. This result is in accordance with that of [3], where the increase was 0.006% to 0.074% of the value-added time to the product.

Another indicator from Chart 4 is the quantity of operators. In the company studied herein, the quantity of operators is designed according to the quantity of machines working per shift, but it is known that for each machine there is one operator, except for the shrink-tunnel, which runs with two. Therefore, three (3) operators are intended for T2, B1, B2 and E1, as these run in 3 shifts adding up 12 operators. For M1 and M2 there are 2 operators for each machine, as these run in 2 shifts adding up 4 operators, and for TE 2 operators are required, being one to stay within the Source and the other at the machine's outlet, which works in the morning shift only. Thus, in the production of the family flex mainstream cable, 18 collaborators operate daily.

After the continuous flow proposal between extrusion and measurement, the work of four (4) measurement operators would not be necessary. Additionally, for machines B1 and B2, previously, the work of six (6) operators was necessary, being three (3) for each machine, but, with the relocation and proximity of these machines the work of only three (3) operators would be required, as one (1) operator per shift is able to handle them both. Thus, the quantity of 18 operators would now be 11 showing a reduction of 39%. Note that the quantity of operators above does not add the operators of E2, as these are a part of the company's staff.

Therefore, all these reductions explained above are in accordance with [4], as he reports that implementing Lean Manufacturing brings forth various benefits to the company, of which he has pointed out the reduction of lead time, of WIP and consequently there will be a reduction of costs.

6. Conclusion

As seen in the Introduction section, Lean Knowledge Transfer (LKT) may bring forth benefits for enterprises that plan to "dry" their production processes. Thus, this work has sought to demonstrate that LKT, through university students, has been able to achieve expressive results in an electrical wires and cables company. In order to achieve that, the LKT team has broken ground in this company by teaching Lean Manufacturing tools, e.g. by elaborating a Value Stream Mapping, how to identify the improvement opportunities, how to use kanban, just-in-time production, manufacturing cells and supermarket inventories. The improvement opportunities identified by VSMs of the chosen processes for analysis have been inventory wastes amid processes, overproduction, unnecessary movements, as well as some machines which have not complied with the takt time. In view of these wastes, the LKT team has designed improvements so as to reduce their incidence in the processes herein.

Through the results attained from the improvements proposed, gains have been acquired from eliminating non-value-added activities to the processes studied. These are among them: the reduction in the distance traveled by the product along the production process, in the quantity of inventories amid operations, in the lead times of the production processes of electrical wires and cables and the reduction of the working labor. These reductions have a direct relationship with the decrease of production costs, and in times of crisis, it may be a competitive distinction in front of the competitors of this company.

With that, the contribution of this work has been both for the company and the literature, as the company has learned a new industrial management technique through the LKT team, in addition to having attained significant reductions explained in the previous section. In the case of the literature referring to this theme, this research has filled gaps found in the databases from the Introduction section, such gaps are: the scarcity of works referring to Lean knowledge transfer; the scarcity of such works in developing countries and more precisely at small and medium-sized enterprises; and the originality of working with this theme in electrical wires and cables companies.

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The Body Language of Culture

Filiz Akkiline

Abstract

Body language is an element of our lives that is inextricably incorporated into all spheres of human interactions and functioning. It may happen that the same gesture in diverse cultures may have a completely different meaning so researchers from all over the world are recommending to gain as much insight into the concept of nonverbal communication as possible so as not to miss out on certain critical elements that could expose a person to unwanted circumstances. The current article dwells on the importance of learning the essentials of body language and then switches to reviewing the key elements of nonverbal communication such as handshakes, hand gestures, eye contact, head movements, physical contact, and sitting position. After a thorough overview of the key elements of body language, the author discusses the most interesting ways of learning body language. The paper is closed by an in-depth conclusion reiterating the importance of nonverbal communication and its role for the development of human community.

Introduction

Body Language

When it comes down to bodily movements displayed by humans, it is rather interesting to see how different people are using a variety of gestures and facial expressions to convey their messages either together with or completely without the words. This also makes us wonder what are the essentials of nonverbal communication and how one could interpret other people's body language better even if the latter did not say a single word (Lewis, 2010). The most exciting part about body language is that one can easily learn this talent and solve the majority of its riddles. Knowing how to read body language gives you an advantage because you start reading between the lines and can witness both the image you are projecting and how other people are trying to project themselves. In this case, one may easily detect a lie or display confidence by means of resorting to body language while also gaining more insight into people's emotional states based solely on their physicality (Birdwhistell, 2010). It is vital to learn more about body language and know how one's body is communicating when the person is not actually saying anything verbally.

This does not necessarily mean that one, for example, would always use their body language knowledge to find out whether a person is stressed or lies to everyone in order to cover up something important. Research in the area still proves that the majority of communication that humans convey is based on body language. Imagine a person telling lies: more than half of their messages (approximately 57% and this value can slightly vary from one individual to another) are coming through their body and not words (Bonvillain, 2019). Another important instrument that liars tend to use is the tone of their voice – approximately 34% of the liar's messages are communicated with varied intonations so as to confuse the other person. Accordingly, there are only 9% left that are responsible for the actual words that the person

is saying. This is why it is more than important to pay attention to inconsistencies between the verbal and nonverbal communication and make sure that every postural component has been read correctly (Mehrabian, 2017). Even if the verbal messages are trying to convince you to believe that a person is not mad at you, their limited body language might expose their real attitude on the spot. Nonetheless, even more body language differences may be found in people coming from diverse cultures so there may be a big number of reasons for learning body language as the lack of such knowledge could lead to adverse consequences and additional issues that would have never arose if the person knew the unspoken rules of body language.

Why Is It Important to Learn Body Language?

The overall importance of learning body language consists in the fact that it may give individuals even more advantages than a mere ability to spot liars. From the perspective of interpersonal relationships, body language could be one of the most effective instruments allowing you to ‘stimulate’ someone’s interest in you: based on whether the person is crossing their arms in front of you or has dilated pupils and a spark in their eyes, you will be able to find out what a person truly thinks about you rather quickly (Kuhnke, 2012). On a daily basis, a strong knowledge of body language will help you to communicate better and become more honest with your close ones. Telling when someone is angry, confused, or happy to see you is important but the significance of body language extends even further as a lot of individuals are using it to push their business careers forward. When going through a generic business scenario such as sales or even a job interview, a person could display their most confident body language in order to persuade others (Lewis, 2012). Coherent body language brings not only persuasion but also trustworthiness, which is just as much important as knowing how to use body language. When a person is calm and confident, we see them as authoritative because they are practically presenting the best version of themselves. Most importantly, choosing the right posture could also help a person boost their confidence even if they are diffident (Matsumoto & Hwang, 2013). Therefore, body language is a vital instrument that we tend to use daily but seem not to realise the true power of this skill and how it could help us change our lives for the better.

Body Language in Different Cultures

From the very childhood, human instincts are helping people to send messages to other people around them. Nonetheless, not at all times people from different areas or cultures can understand each other’s gestures. For example, in one culture a gesture meaning “yes” can be perceived as a “no” in another one or a simple “come here” gesture could be translated as “goodbye” (Surkamp, 2014). These insights into body language are essential because the majority of differences stem from the cultural background and it may be interesting to see how the significance of body language contributes to the ability of people from all over the world to understand each other. Below, there will be several particular body language essentials reviewed in order to show how it contributes to diversity and, sometimes, potential misunderstanding among people.

Handshakes

The first important element of human body language are handshakes – it is safe to say that even the simplest variations of it can be perceived differently across the world. Even though a handshake is a social norm, the firmness of a handshake has to be regulated based on the geographic location of where you are shaking hands with other people (Thomas & McDonagh, 2013). In Western culture, a strong handshake is synonymous with confidence and an ability to convince while the majority of Far Eastern people tend to see a firm handshake as an iteration of aggression. This is why the people from Far East bow to each other and do not shake hands. All across Europe, a handshake is also a norm but handshakes are different in a variety of regions: Northern Europe handshakes are quick and steady while Southern Europe handshakes are much longer and warmer, with both individuals having their left hand touching the other person's elbow or clasped hands. The same is also true for South and Central America but one should beware of the fact that in Turkey, a firm handshake is a direct sign of aggressiveness (Dingemanse & Floyd, 2014). This is why in Turkey and a lot of African countries a handshake should be as limp as possible. When speaking of the majority of Islamic countries, men never shake hands with those women who do not come from their family.

Hand Gestures

Another important part of body language agenda is how people are using their hand gestures all over the world in order to illustrate their words and put emphasis on certain elements of their communication. It may be truly surprising how the 'OK' sign that is freely used across the United States, for example, is taken for 'a**hole' in such countries as Brazil, Spain, and Greece (Ruthrof, 2015). If we move even further, Turkish people may use the 'OK' sign to insult homosexual people. Another perfect example of how hand gestures can significantly contribute to misunderstanding among people is the use of the 'thumbs up' sign which generally means "great job" in the United States and the majority of European cultures but in the Middle East and Greece, people see it as the 'up yours' sign (Martin & Nakayama, 2013). One more controversial gesture is the 'come here' – where you have the palm facing up and curl your index finger: in parts of Europe and across the United States, people use this gesture to signal someone to come closer but for Chinese, Malaysian, Singaporean, and Philippine people this is an outright rude gesture that should never be used with people – this is why in the majority of East Asian countries (and Asian countries in general), this gesture is used to beckon dogs (Knapp, Hall, & Horgan, 2013). Once you use this gesture in the Philippines, you may get arrested. There was also a case in 2005 when George W. Bush (during the Inauguration Day) raised his fist with the little and index fingers being extended up (Argyle, 2013). While this was a clear reference to the logo of the Texas Longhorn, a football team, mass media from all over the world immediately reacted to the gesture because numerous Latin and Mediterranean countries (Cuba, Italy, Argentina, Spain, Portugal, Colombia, and Brazil) got used to the fact that such gesture means that someone's spouse is cheating on them.

Eye Contact

For the Western cultures, it is rather typical to believe that the presence of eye contact between people means concentration and self-assurance. Therefore, Western people often assume that when a

person is looking away during a discussion it means that they are not interested in either what is being discussed or the person that they are talking to (Berger, 2016). When it comes to the Middle Eastern region countries, eye contact is much more sustained and forceful compared to the Western countries, especially when it comes to same-gender contacts. More to say, some of the countries in the Middle East believe that an eye contact between sexes that goes beyond a quick peek is an inappropriate gesture that may even be punished. Many African and Asian cultures see an unbreakable eye contact as a confrontational gesture that manifests aggressiveness and unfriendliness (Segerstrale & Molnar, 2018). These cultures are overly concerned with the concept of hierarchy and respect – when a person is trying to avoid eye contact with those who are higher on the hierarchy ladder, it basically means that they have respect for their elders or bosses. Therefore, it is quite normal for African or Asian children or employees not to look at their parents or bosses respectively when the latter are talking to them. If we outline the differences among the cultures in terms of the intensity of eye contact, there will be the following results:

- Middle Eastern, European, Mediterranean, and Latin American regions are using eye contact a lot;
- Across the Northern Europe and North American regions, eye contact is used not as much;
- People have to use eye contact carefully when they are in Africa or countries such as Thailand and Korea;
- Most careful use of eye contact should be exerted in the Far Eastern regions.

Head Movements

When it comes to the head movements, it is interesting how in several regions of India, locals are merely tilting their head in order to either display their active participation in communication or confirm something that is being discussed. This gesture originated owing to the British occupation that had Indian people tilting their heads from side to side when British soldiers were talking to the locals and the latter were too afraid to display a gesture that could be perceived by the occupants as a 'no' (Ting-Toomey & Dorjee, 2018). Today, Indian head movements from side to side are generally perceived as a direct sign of the fact that the person tilting their head understands what they hear but there may be even more meanings assigned to the given gesture.

Physical Contact

The 'touch – do not touch' part of the body language agenda also requires specific attention because there are critical differences between cultures across the world that have to be taken into consideration if the person wants to evade any issues with the locals. For example, the Far East and Northern Europe countries are known as the cultures where the presence of contact should be minimized to an extent where people would not touch each other in general (Huff, Song, & Gresch, 2014). In other words, if you do not know the person you are talking to well enough, you are not touching them. If you are walking down the street and accidentally touch someone, you will have to apologize for the inconvenience. One of the most famous stories involving the cultural differences in terms of physical touch emerged in 2009, when the royal protocol has been broken and Michelle Obama hugged the Queen (Bond, 2012). This story practically became viral overnight because of the cultural clash and an ability to see how an innocent hug could lead to a controversy (even if there were no repercussions for both the Queen and Michelle Obama).

On the other hand, there are cultures where people are socializing through physical contact and are freely touching each other to communicate messages and build an emotional connection. Some of these cultures can be found in the southern parts of Europe and all across Latin America and Middle East (Ambady & Weisbuch, 2010). Throughout the majority of Arab cultures, men are kissing each other and holding hands when they greet each other, but they are not allowed to do the same with a female. On the other hand, there are much stricter physical contact “laws” in countries such as Laos and Thailand, where you are never allowed to touch anyone’s head. In South Korea, when elderly people are getting through the crowd, they are allowed to use their force but younger people are never allowed to do that (Fiske, 2010). Again, when it comes to physical contact, the rules are overly sophisticated and the majority of those rules depend on the status, gender, profession, and ethnicity of the individual. Below, there is a concise generalization of the types of contact and what cultures tend to use each of them:

- High concentration of physical contact: Latin America, Middle Eastern countries, Southern Europe. People in these countries tend to stand closer to each other when communicating and make physical contact habitually;
- Medium concentration of physical contact: North America, Northern Europe. These people only touch each other on certain occasions and tend to stand close to each other when communicating;
- Low concentration of physical contact: Far East. Physical contact is being avoided by any means and the distance between people during communication is much greater than in the first two cases.

Sitting Position

Another part of body language that has to be carefully addressed by people from all over the world is their sitting position because the latter can seriously affect one’s well-being. For example, in Japan, if you are sitting cross-legged, you will be instantly labelled as disrespectful, especially when an older or more respected person is present near you (Ang & Van Dyne, 2015). In the Middle East and India, it is not recommended to show the soles of your feet or shoes because it is outright disrespectful and offends people. When visiting Iraq in 2008, George W. Bush found out that when a shoe is being thrown at someone it means a form of a direct protest intended to insult the person at whom the shoe is thrown (Gordon & Trainor, 2012; Jacobson, 2010). From one country to another, cultural differences are huge so it is critical to learn more about sitting positions as well if one does want to get themselves into an unapproachable situation.

Best Ways to Learn Body Language

One of the best ways to find out more about the value of body language and its correct use may be to observe how individuals behave during TV shows and other on-screen activities. While the essential value of watching a movie in a different language consists in picking up the vocabulary and correct pronunciation, it may be easy to learn the body language as well and see how one culture differs from another (Burgoon, Guerrero, & Floyd, 2016). For example, one may compare a Russian movie to an American movie and see that body movements, hand gestures and facial expressions are essentially different. There are similar behaviours and gestures, of course, but the differences will be evident at the first sight. Nonetheless, a real-life interaction with a representative of a different culture will be much more

useful because of the authentic experience of talking to a person who comes from a different background (Penbek, Sahin, & Cerit, 2012). Native speakers may be a valuable source of information regarding body language and reactions to different gestures and words. Learning what and how to say is important because it gives people an opportunity to put emphasis on certain emotions and set up generic “scenarios” in order to help the interlocutor understand the real meaning behind what is being said (Schenker, 2012; Stacks & Salwen, 2014). Such knowledge could significantly benefit a person that is going to a different country and save them from embarrassment and misunderstanding: imagine a tourist showing the ‘OK’ sign to a Greek male or a male tourist trying to hug an Arab woman. This is why it is critical to pay attention to cultural differences and never miss out on what other cultures have to say to us if we want to remain respectful and full of appreciation.

The Bottom Line

The importance of nonverbal communication cannot be undermined or overlooked because the image that we project to the ones around us can only be mitigated with the help of body language. Also, the latter can be used to decipher what others have to say even when they keep silent. As an essential part of human communication, body language is surprisingly ignored by a lot of people who believe that verbal communication is much more important and contributes to an effective information transmission. As long as we only judge by the words that are being said, we tend to limit ourselves in terms of what we can understand. There are numerous reasons to believe that body language is overly important and should be perceived together with the actual verbal message if a person is willing to understand the real message behind the words. Some of the generic gestures that are perceived identically in all cultures are shrugged shoulders (meaning that we do not know the answer to the question) and raised eyebrows (signalling surprise and admiration). Evidently, it is also important to pay attention to body language if we are looking forward to finding out if someone is not telling the truth – when there is no congruence between the words and gestures, it may be concluded that the person is lying.

And yet, people are often missing out on the idea that body language is different for a variety of cultures for a reason. This may be one of the most important ideas why one would like to learn more about nonverbal communication. Not only this could save a person from unnecessary trouble but also give them an opportunity to gain insight into other cultures and find out something new and useful. Being able to distinguish between location-specific meanings of different gestures should be seen as an advantage that will always protect the person from the locals’ aggression. Cultural differences contribute to the diversity of the world that we live in, but it should be understood that it may not be enough to realise that someone is, for example, lying to you when you cannot see the whole picture and have no idea regarding what the other person’s gestures mean if they are coming from a different culture. This article provided the readers with the insights on the use of body language in different countries and outlined the most important instances of gestures that have diametrically opposite meanings across diverse cultures from all over the world.

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A Quintessential Tool in Teaching: A Case Study on Teachers Using YouTube Videos

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Abstract

This multiple case study explored the views and insights of Teachers who use Youtube videos in their class. The researcher formulated questions to collect data which was followed by the analysis of results. This research can be an avenue to discover the emerging revelations of teachers in their use of Youtube videos. The study employed the qualitative analysis using the multiple case study method. The participants were identified through purposive sampling. There were 3 participants which served as the primary source of data. The researcher interviewed the participants and the data gathered was generated through a semi-structured interview using validated interview questions as instruments. Transcripts of interviews were analyzed through thematic analysis. The result revealed that participants embraced the differences of their perspective to cope with their experiences. The themes that were generated are the following themes: Improvement, Easy access, Abundance of resource, Supplement, Appropriate, Interest, Time Frame and Familiarity, Motivation and Active learning.

1. Introduction

Founded in 2005, YouTube has quickly become a leader in online media. YouTube is an Internet application in which people can upload, share, and watch videos. There are millions of messages being uploaded each day onto this forum. Empirical evidence shows that Youtube is contribute to the wholistic learning of students. Thus, this research is an avenue to discover the emerging ideas that stem from the perspective of teachers. Teachers are the frontliners of education and it is their task to facilitate the learning of their respective students. This study will be a significant endeavor in the lens of teachers on expressing their insights on the use of Youtube videos in the classroom. In addition, this will be valuable to the stakeholders of the institution who will be enlightened by the output that will be brought about by the research. Finally, it will be helpful to future researchers who wish to explore further a similar scope to this study.

2. Literature Review

Creative teaching strategies that incorporate innovative technology motivate and engage learners who are technology savvy and are accustomed to the online environment. Using a variety of instructional methods and learning activities in the classroom creates an enriched learning environment for the student (Beldarrain, 2006). Using videos is a creative strategy. It was explored by Pappas (2016) that videos found

in YouTube can also be an indispensable learning tool that eLearning professionals can use to make their eLearning courses more enjoyable. In a separate study of Dowse (2009) discovered that YouTube videos provide a wide variety of content suitable for English teaching. There have been other explorations of how YouTube can be used in the classroom setting. It can be used to develop writing skills (Barbeau, 2010), and it is used to make teaching engaging and interactive to students (Brandejs, 2016).

3. Methodology

This work adopted a qualitative study employing a case study because it seeks to explore the similarities and differences of teachers using Youtube videos in the classroom setting. This investigation is multiple case study which permitted the researcher to uncover the comparative cases and what are distinct (Yin, 2013). Furthermore, a multiple case study empowers the researcher to break down each setting and across settings (Baxter & Jack, 2008). It is also a variation that presents at least two or more interpretations and findings of a similar phenomenon (Santos & Eisenhardt, 2005).

The investigation involved 3 participants, whose backgrounds were based on their age, experiences and number of years in service. It was emphasized that this design would look into the multiple perspectives of the situation and make generalizations of what something is like. This depends primarily on the data gathered from the interviews with carefully participants (Raagas, 2010). Moreover, the researcher's concern was on the participant's experience and how it varies from the others. (Denzin & Lincoln, 2011).

This study focused on the participants experience in the use of Youtube videos in the classroom setting. I noted down the participants' comments and behavior during the course of the study and to further add to the data. Further readings from other researches were used to enrich the analysis drawn from the data gathered.

4. Results and Discussion

Teachers are the heroes of the educational system. These teachers propel their students to different heights; protect the students from mediocrity and save the students from stagnancy. These characteristics are both manifested by heroes and teachers which bridges the common ground that teachers and super heroes are the same. The three superheroes are all members of one super hero team the Justice league like the three participants who belong to one institution.

4.1 Case 1 - Superman. Superman is a college professor handling English subjects. He has been teaching in college for 10 years. Superman was given such a pseudonym because among the three participants, he is the one who has attained success in his teaching career. He has also earned his doctorate degree and, just like Superman who is above all things in Justice League.

Superman's experiences in the use of Youtube videos in the classroom can be summed up into; Improvement and Easy Access. He believes that using YouTube videos in the classroom helps his students improve in the learning outcomes of the subjects he is handling. He has observed the difference of the knowledge of his students from before and after the course. He believes that one of factors that caused this change is by integrating Youtube videos in the classroom setting. Furthermore, He did not encounter many

difficulties in using Youtube videos because the videos are readily available and provides Easy Access. He mentions that the website can be accessed by anyone who has internet connection.

Superman's considers the following criteria in selecting Youtube videos; Appropriateness and Interest. Superman carefully selects the videos he uses in the classroom setting so that it is appropriate to the level of competency of his students. He also adds that aside from the appropriateness, Interest is another consideration when he selects videos for classroom use. He believes if the video is interesting then it allows the students to participate better in the classroom discussion.

Superman's main insight in using videos is Motivation. He mentions that "Youtube videos can be used to motivate students in the classroom. If done exceptionally well, students will surely perform better."

Case 2 – Batman – Batman is a college professor handling English subjects. He has been teaching in college for 5 years. Batman was given the pseudonym because among the three participants, he is the one who technologically literate. The participant himself even expressed that he is up to date with technology. He is likened to Batman who is most technologically literate of three superheroes; Superman, Batman and Wonderwoman.

Batman's experiences in using Youtube videos can be encapsulated into; Improvement, Abundance and Supplement. Batman believes that using Youtube videos can help improve the student's competencies if used effectively. Batman also mentioned that Youtube videos offer an abundant resource that range from educational videos, movies and more. Finally, Batman also asserts that Youtube videos can serve as a supplemental to help better understand topics that are abstract.

Batman believes that careful consideration to Appropriateness, Interest, Timeframe and Familiarity are the essentials for the use of Youtube videos in the classroom. Appropriate videos that are suited to the topics would help the students better understand the topic discussed. Interest is also an integral factor because this would capture the attention of the student. Furthermore, Timeframe becomes a contributing factor to the student's success rate in learning because the length of the video can be a determinant of the student's attention in class. Batman also observes familiarity. Students who are familiar with the Youtube videos find it easier to connect the ideas with the subject matter.

The main insights that Batman shared are Motivation and Active learning. Batman strongly supports that if Youtube videos are highly motivating it would have lasting effects on the students. In addition, Youtube videos can induce the learners to be actively participate in class.

Case 3 – WonderWoman – Wonderwoman is college professor who teaches English. She has been teaching in college for 3 years. Wonderwoman was given the pseudonym because, she is the only woman from the three participants.

Wonderwoman's experience with the use of Youtube videos is mainly characterized into Improvement and Abundance. Wonder woman has observed the improvement of her students when she integrated the use of Youtube videos in her class. She noticed that students in her class have improved scores. She also observed that Youtube has abundant resources. The resources are vast and there are also videos devoted to expanding topics that are discussed in the classroom setting.

Wonderwoman considers the Appropriateness and the Time frame when she selects Youtube videos.

She carefully considers if the Youtube videos she uses in her classes fit her students. She has experience in the past that if the videos utilized are not fitted to the students there was a negative effect on the students. Timeframe is another criterion that she also carefully considers. She carefully analyzes the length of the video whether it can be integrated in her lesson design. She mentions that Careful attention to time should be taken so that videos can be used properly in class.

Wonderman's main insight is the Active learning of the students. If Youtube videos are used effectively this enables the students to be active in class. Wonderman observed that students participate more and perform better in class. In the words of Wonderwoman, Students are active in learning.

Table 1. Themes and Core Ideas on the experiences of teachers using Youtube Videos

Emerging Themes	Core Ideas
Improvement	• Students improve in the learning outcomes. • Improve the student's competencies if used effectively. • Improvement of her students when she integrated the use of Youtube videos
Easy Access	• The website can be accessed by anyone who has internet connection
Abundance of Resource	• Youtube videos offer an abundant resource that range from educational videos, movies and more • The resources are vast and there are also videos devoted to expanding topic
Supplement	• Youtube videos can serve as a supplemental to help better understand topics that are abstract.

Presented in table 1, each teacher had different ideas to share in their experience of using Youtube Videos. The participants of this study revealed key points in their experience. There were some distinctions but also similarities.

In this study, I have observed that these teachers are firm believers that using Youtube videos in classroom improves the students. Similar results were drawn from a study that went through the method of using songs in YouTube to improve vocabulary competence. (Abidin et. al, 2011). Another study drew similar results through anchoring instruction on videos (Barron 1989) A study conducted by Kasper (1997) illustrated that teaching English using multimedia increased the reading and writing examinations of students.

Considering the unique case of Superman, who was the only participant to assert the Easy Access of Youtube. He did not encounter many difficulties in using Youtube videos because the videos are readily available. YouTube has offered a new way of accessing to a rank of information and video resources in a simple way, which does not require any special skills and is free (Snelson& Perkins,2009). Another Unique

case was drawn from the statement of Batman. He mentioned that Youtube videos can Supplement learning. Such statements were confirmed that vidoes can clarify comprehension,consolidate concepts and reinforce learning (Singer,1997).

Two of the participants made mention of Youtubes having Abundance of resource. This was confirmed in a study that showed YouTube as an infinite resource for language learning because it provides learners with various language sources such as songs, music videos, movie trailers, talk shows, lectures, debates, and parodies (Balcikanli, 2011)

Table 2. Themes and Core Ideas on the factors Teachers consider in selecting Youtube Videos

Emerging Themes	Core Ideas
Appropriate	• Appropriate to the level of competency of his students. • Appropriate videos that are suited to the topics would help the students better understand the topic discussed. • If the videos utilized are not fitted to the students there was a negative effect on the students.
Interesting	• If the video is interesting then it allows the students to participate better in the classroom discussion. • Interest is also an integral factor because this would capture the attention of the student.
Time Frame	• The length of the video can be a determinant of the student's attention in class. • The length of the video can be analyzed whether it can be integrated in her lesson design.
Familiarity	• Students who are familiar with the Youtube videos find it easier to connect the ideas with the subject matter..

Reflected in table 2, choosing which YouTube videos to use in the classroom setting is not by random. The Participants have a set of criteria that are considered whether the YouTube video is applicable to the class. This shows that even if the criteria may vary there is a systematic set of norms that teachers abide before deciding to use a YouTube video in the classroom

In this study, I was able to discover 4 themes; Appropriate, Interest, Time Frame and Familiarity. All the Participants share the same ideology of using YouTube videos that are appropriate.

This was confirmed by a study which revealed that Content should be age- and skill-appropriate, as “the content one watches may be a truer determinant of future academic success (CPB,2008) Furthermore, choosing what is appropriate for the students plays a pivotal role in teaching because it dictates the ways in which individuals take in information (Marshall ,2002).

However, in terms of Interest, only Superman and Batman share the idea. A study highlights the great advantage of the digital video technology as it matches in the best way with the students’ interests (Shrosbree,2008). On the other hand, only Batman and Wonderman hold that Time Frame should be taken into consideration. Language teachers should also consider the time frame of utilizing videos. A study suggested that video should be shown in short periods as opposed to showing a full feature-length movie without intermediate comprehension activities. With a 15-minute time limit(Canning,2000).

From the three participants, only Batman had an isolated case of Familiarity as an item to consider in selecting videos. He believed that a degree of familiarity helps students bridge the gap towards abstracts ideas. An idea which was explored in the study of Fleck et al., (2013), the research suggested that the more familiar students are with online learning tools, the more willing they are to use them in the class.

5. Conclusion

On the ideas that were shared by the participants, it can be implied that in teaching YouTube videos play a pivotal role. These videos breath some refreshing light onto the stale teaching methods that are employed by teachers. Regardless if the subject matter maybe different, Using YouTube videos helps students. The results of these experience of the teachers would show that Videos belong in the academe. It is a matter of choosing the right videos for the right subject matter.

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INSECTICIDE ACTIVITY OF PLANT EXTRACTS OF THE NORTHEASTERN BRAZILIAN FLORA FOR THE CONTROL OF *Sitophilus zeamais* [Mots, 1885] AND *Sitotroga cerealela* [Olivier, 1819]

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Abstract

*One of the typical crops of the semiarid tropic is the maize *Zea mays* L., a rustic plant cultivated in the Brazilian northeastern semiarid region mainly by small farmers. It is one of the sources of protein and carbohydrates and an economic alternative for job creation, especially for rural populations. Among the factors limiting its cultivation are pests, among which weevil and Angoumois grain moth. This work aims to evaluate the insecticide activity of plant extracts obtained from medicinal plants of the Brazilian northeastern flora for the control of Angoumois grain moth and weevil under laboratory conditions. The methodology consisted in the production of plant powders, which were mixed with 99.8% alcohol, and then macerated and filtered. Using a rotary evaporator and applying a water bath, it was possible to separate the alcohol from the filtered solution, resulting in a creamy paste, which is the extract itself, later used in tests with insects. Preliminary tests were applied at the concentrations of 0% [control] to 100% ml of extracts. Extracts with a mortality rate $\geq 50\%$ were analyzed by bioassays and four replicates, each consisting of a lot of five insects. The experimental design was completely randomized.*

Keywords: Corn weevil, Angoumois grain moth, Stored grains, Semiochemicals, Bioinsecticides.

1 Introduction

The Brazilian Northeast region, with an area of 1.56 million km² [18.2% of the national territory], contains most of the Brazilian semiarid region, which is the most populated semiarid climate area in the world [1]. In this region, the Caatinga is a complex of vegetal formations with several plant physiognomies [2].

According to [3], the Caatinga vegetation is extremely diverse. The number of phanerogamous species surpasses 5,000 species; 1,512 are present in the Caatinga *stricto sensu*, with at least 318 endemic species. Such biodiversity, associated with knowledge, makes this biome one of the most privileged ones as a source of resources with a bio-prospective potential.

Plants are complex living beings and, as such, have an excellent metabolism, which leads to the production of a wide variety of chemicals. Some of these substances, such as proteins, lipids, carbohydrates and nucleic acids, are common to all living beings and are used in plant growth, reproduction and maintenance [4]. However, a large number of chemical compounds produced by plants serve other purposes, for example as food deterrents and protecting plants against predators and pathogens [5].

Botanical insecticides produced using plant extracts have arisen due to the need for alternatives to the chemical control of insects that harm agricultural crops, reducing or eliminating problems of environmental contamination, food residues, harmful effects on beneficial organisms, and resistant insects [4].

Extracts are concentrated preparations of various possible consistencies obtained from dried vegetable raw materials, pre-treated or not, and prepared by a process involving a solvent. This involves two steps in the manufacturing process: the separation of specific compounds from a complex medium and the drug or part of the plant used [6].

The use of plant extracts gains momentum in agronomic science as a promising and differentiated option for integrated plant protection management. Combined with other practices, it can contribute to the reduction of doses and applications of synthetic chemical insecticides, which, among other problems, affect pollinating insect groups and the environment [7] and [8].

In Brazil, maize is one of the main agricultural crops, with extensive cultivated areas and wide use in human and animal food [9]. The importance of maize to human food varies from region to region because, in certain regions, the highest consumption of this grain and its derivatives is by low-income families. It is also traditional in the culinary of some cultures, such as in the Northeast. Worldwide, for Mexicans, for example, the use of this cereal and its derivatives in their cooking is a rich source of energy for the population [10].

Brazil ranks third in the world ranking of harvested area of corn grains, producing an average of 12 million hectares in each harvest, surpassed only by the United States and China [11].

Because it is a crop with a good adaptation to different ecosystems, Brazil is a country that has a high potential in the production of this grain. The 2011/2012 harvest was estimated at 165.92 million tons, 3.12 million tons above the previous year's crop [12]. These data confirm the importance of this culture in Brazil.

In 2012, 50.81 million hectares were planted, increasing the planted area by 1.9% over the year before, generating revenues and jobs for the country [12].

Along with the effort to increase productivity, the harvesting process and grain storage conditions must be improved. A positive feature of grains is that they can be stored for a long time without significant quality losses. However, a prolonged storage can only last when correct practices of harvesting, cleaning, drying, insect control and fungal prevention are adopted [13].

The conservation of the quality of this cereal is greatly influenced by the presence of insects, especially in tropical climates, which have ideal characteristics for development of grain mass [14]. Insects feed on maize grains, but weevil, *Sitophilus zeamais*, and Angoumois grain moth, *Sitotroga cerealella*, account for most losses [13].

Dozens of insect species are associated with maize, but relatively few have characteristics of a key pest, such as regularity of occurrence, geographic coverage and potential to cause economically significant damage [15].

Pests cause losses from the early stage of development by reducing sowing density, causing direct and indirect damage during the vegetative and reproductive phase and attacking grains and their derivatives during storage, which is an essential step in the production of high quality seeds. Otherwise, the development effort in production will be affected [16].

Dozens of insect species are associated with maize crops [6], among them corn weevil, *Sitophilus zeamais* [Coleoptera, Curculionidae], and Angoumois grain moth, *Sitotroga cerealella* [Lepidoptera, Gelechiidae], stand out. These insects may be responsible for the deterioration of stored corn quality, thus resulting in a high rate of grain loss [17].

Sitophilus zeamais [corn weevil] is a primary pest. The adults measure 2.0 to 3.5 mm, and are dark brown with light spots on the ellipses [anterior wings]. This species has a cross-infestation, which is the ability to infest grains both in the field and stored, with a high multiplication potential. It has many hosts such as wheat, rice, corn, barley, and triticale [LORINI, 2008].

The species *Sitotroga cerealella*, known as Angoumois grain moth, belongs to the order Lepidoptera, comprising the family Gelechiidae [18]. According to [19], it is a primary pest. The adults are butterflies measuring 10 to 15 mm. However, there is a certain polymorphism in this species: not all individuals have the same color, size and pattern. This pest attacks whole grains, which affects the surface of the grain mass. They may infest developing or maturing grains in the field, but infestations may be related to the proximity to the storage location of seeds.

The objective of this work is to analyze, by performing ethnobotanical and chemosystematics studies, medicinal plant species used by human populations in the São Francisco Valley region as possible sources for obtaining plant extracts that can be used to control insect populations attacking corn crops.

2 Material and Methods

The work was developed at the Animal Sciences Laboratory of the Department of Technology and Social Sciences [DTCS], campus III, of the State University of Bahia [UNEB], Juazeiro, Bahia, and at the

Chemical Laboratory of the Federal Institute of Sciences and Technology of the Sertão Pernambucano, campus Zona Rural, Petrolina, Pernambuco, Brazil.

2.1 Selection and drying of plants

The plants were selected by ethnobotanical studies in two relevant databases in the scientific-academic field: *Scielo* and *Lilacs*. For the search in the databases, the descriptors "botanical extracts," "natural insecticides" and "agroecology in the northeastern semiarid" were used. Eight species of plants, listed in Table 01, were used.

COMMON NAME	SCIENTIFIC NAME	FAMILY
Brazilian orchid tree	<i>Bauhinia variegata</i> L.	<i>Fabaceae</i>
Klip dagga	<i>Leonotis nepetifolia</i> R. Br.	<i>Lamiaceae</i>
Bitter melon	<i>Momordica charantia</i> L.	<i>Cucurbitaceae</i>
Brazilian peppertree	<i>Schinus terebinthifolius</i> Raddi.	<i>Anacardiaceae</i>
Black jurema	<i>Mimosa tenuiflora</i> Willd. Poir.	<i>Fabaceae</i>
Wormseed	<i>Chenopodium ambrosioides</i> L.	<i>Amaranthaceae</i>
Lemongrass	<i>Melissa officinalis</i> L.	<i>Lamiaceae</i>
Passion fruit	<i>Passiflora cincinnata</i> Mast.	<i>Passifloraceae</i>

Table 01: Medicinal plant species selected from ethnobotanical studies

The plant material was collected at the UNEB/DTCS experimental area [09°24'50" S, 40°30'10" W; altitude: 368 m]. Leaves of the selected species were used because they are the most abundant plant material available. At the time of collection, phytosanitary aspects of the leaves were observed, giving preference to leaves with a good conservation status.

The collections were made using pruning pliers and scissors, trays, newspapers, leather gloves, and plastic bags.

After collection of plant species, they were taken to the laboratory, where the leaves were separated from branches, identified and put to dry at room temperature [Figure 01 A and B]. At each leaf collection, a fertile branch was collected from each plant used in the experiment. These branches were pressed, dried and identified for directing them to the UNEB/DTCS *Herbarium*.

Figure 01: A and B: Leaves put to dry at room temperature. UNEB/DTCS Animal Science Laboratory.



Source: Authors' collection [2018]

After about 20 days of collection of each completely dried plant material, they passed through a forage chopper with 5-mm blades [Figure 02]. The material was reduced to dust [Figure 03] and packed in previously sterilized containers in autoclave [Figure 04], then hermetically sealed and identified.

Figure 02: Electric forage mincer.



Source: Authors' collection [2018]

Figure 03: Vegetable powder from minced leaves



Source: Authors' collection [2018]

Figure 04: Wrapped vegetable powders awaiting the production of extracts



Source: Authors' collection [2018]

Thereafter, the extracts were prepared and the biological activity tests were conducted using the insect species of this study.

2.2 Production of plant extracts

At the first stage, the powder was macerated. Two-liter pots and ten-liter gallons were used. The powders were placed therein; the empty space of the container was filled with 99.8% alcohol solution, and then mixed.

After 72 hours in maceration, the powders were ready for the second stage: filtration. The decanted powder was separated from the liquid above the surface. The contents remaining in the container underwent further maceration to use most of the metabolite residues present in the plant material. The filtrate was sent to the production of ethanolic extracts. There were five macerations and five filtrations of each plant species. This stage was performed at the IF Sertão de Pernambuco Chemistry Laboratory, campus Zona Rural.

Using a rotary evaporator and a water bath, it was possible to separate the alcohol from the filtered solution, resulting in a creamy paste, which is the extract itself, later used in tests with insects.

Solubility tests were performed with different reagents for each species. For this, rods and test tubes were used together with each reagent individually. The entire procedure was performed in a flow chamber, as it may be toxic to humans.

The reagents tested were methyl alcohol and chloroform. Thus, we identified the most suitable reagent [Table 2], i.e., the one that best solubilized the extract of each species, leaving only the extract in its purest form ready to be diluted at different concentrations.

Table 02: Reagents used in the solubilization of plant extracts, indicating the best solubilization.

	Methyl alcohol	Chloroform
Brazilian peppertree [<i>Schinus terebinthifolius</i> Raddi]	X	
Klip dagga [<i>Leonotis nepaetefolia</i> R. Br.]		X
Lemongrass [<i>Melissa officinalis</i> L.]	X	
Black jurema [<i>Mimosa tenuiflora</i> Willd. Poir.]		X
Passion fruit [<i>Passiflora cincinnata</i> Mast]		X
Wormseed [<i>Chenopodium ambrosioides</i> L.]		X
Bitter melon [<i>Momordica charantia</i> L.]		X
Brazilian orchid tree [<i>Bauhinia variegata</i> L.]		X

2.3 Insect Selection and Breeding

The adult insects of *Sitophilus zeamais* were obtained from the corn storage shed of the Animal Science Laboratory of the Federal University of São Francisco Valley [UNIVASF] from stored corn bags. The insects were placed in 250-ml glass jars and in nylon and plastic bags kept at the DTCS III/UNEB Animal Science Laboratory Insectary inside glass jars with corn available, so that insects were multiplying at a mass breeding level.

The adult insects of *Sitotroga cerealella* were obtained from pest-infested sheds at the Animal Science Laboratory of the Federal University of Vale do São Francisco [UNIVASF]. The insects were placed into nylon plastic bags. There was no multiplication and mass breeding of insects.

2.4 Laboratory Bioassays

The extracts were diluted to provide 200 ml of solution. Immediately after dilution, solutions were prepared at 0% [control], 25%, 50%, 75% and 100% for insect application. The extracts that presented a mortality rate $\geq 50\%$ were considered as having a great lethal capacity [LC]

2.4.1 *Sitophilus zeamais*

In the laboratory, Petri dishes were prepared by autoclaving. Corn and ten insects were deposited per plate. Each experimental treatment received five different concentrations of extracts from each plant. The plates were sprayed with the solutions, and sealed with PVC film paper. They were then placed in a completely randomized BOD [biochemical oxygen demand] chambers at $25 \pm 2^\circ\text{C}$ and relative humidity of $40 \pm 5\%$.

2.4.2 *Sitotroga cerealella*

The preliminary bioassays were separated into plots consisting of five Petri dishes per plant species containing five adult insects. The plates were sprayed with the test solutions, capped, labeled and transferred to an incubator oven under controlled temperature and humidity, and observed for 48 hours. The experimental design was completely randomized.

3 Results

3.1 Control of *Sitophilus Zeamais*

The results show that all medicinal plants tested showed insecticidal activity, with a mortality higher than 80% [Table 03], with the exception of Brazilian orchid tree, whose lethality did not reach 50%.

Table 03: Mortality/Insecticide activity of medicinal plant extracts against *Sitophilus Zeamais*

MEDICINAL PLANTS	MORTALITY RATE [%]				
	0%	25%	50%	75%	100%
Brazilian peppertree [<i>Schinus terebinthifolius</i> Raddi]	0%	30%	60%	90%	90%
Klip dagga [<i>Leonotis nepaetefolia</i> R. Br.]	0%	60%	60%	20%	100%
Lemongrass [<i>Melissa officinalis</i> L.]	0%	40%	40%	80%	70%
Black jurema [<i>Mimosa tenuiflora</i> Willd. Poir.]	0%	20%	100%	90%	90%
Passion fruit [<i>Passiflora cincinnata</i> Mast]	0%	10%	40%	50%	100%
Wormseed [<i>Chenopodium ambrosioides</i> L.]	0%	40%	70%	50%	70%
Bitter melon [<i>Momordica charantia</i> L.]	0%	10%	70%	90%	100%
Brazilian orchid tree [<i>Bauhinia variegata</i> L.]	0%	20%	30%	30%	40%

At the concentration 25%, the klip dagga extract [Figure 05 A] was the only one that had a lethality higher than 50%. For the concentration 50%, the best result was presented by black jurema extract [100% lethality, Figure 05 B], followed by wormseed [Figure 06] and bitter melon, which reached a 70% lethality, and klip dagga and Brazilian peppertree, both with a 60% lethality.

Figure 05 A, and 05 B: Results for efficiency of klip dagga and black jurema in laboratory bioassays for the control of *Sitophilus Zeamais*.

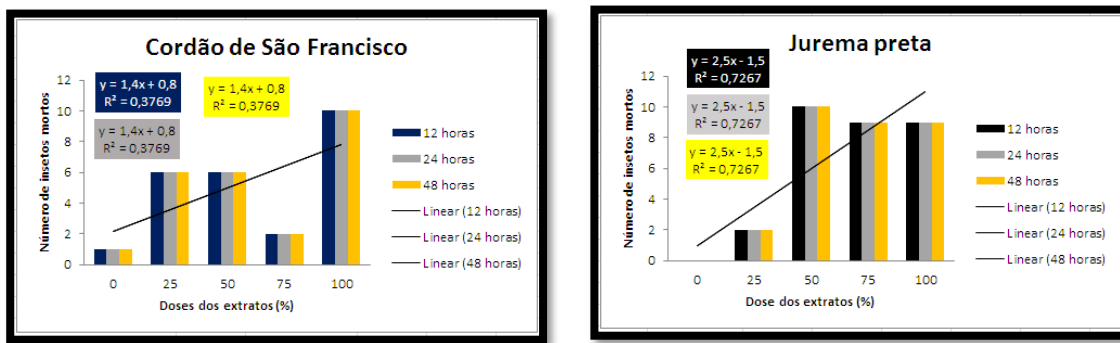
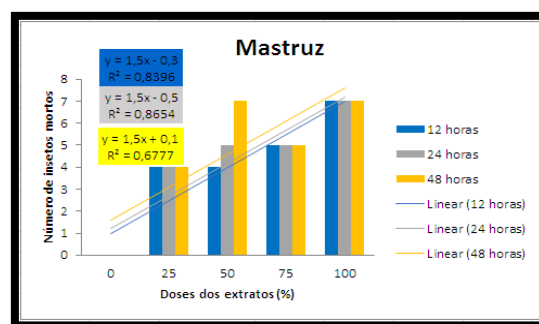
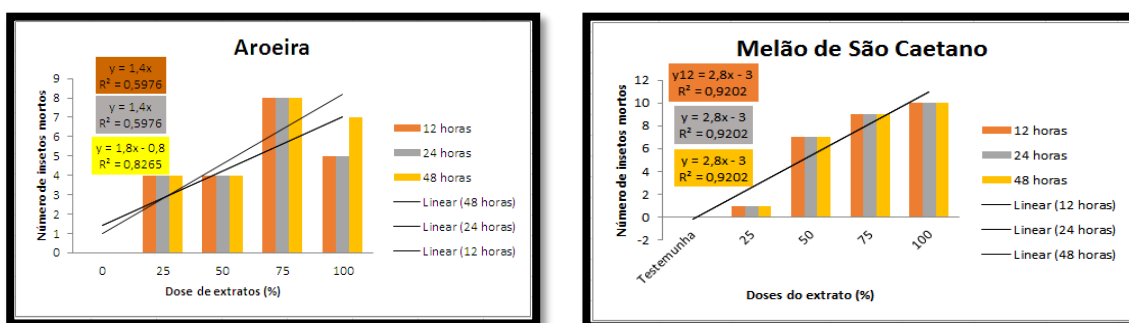


Figure 06: Results for efficiency of wormseed in laboratory bioassays for the control of *Sitophilus Zeamais*.



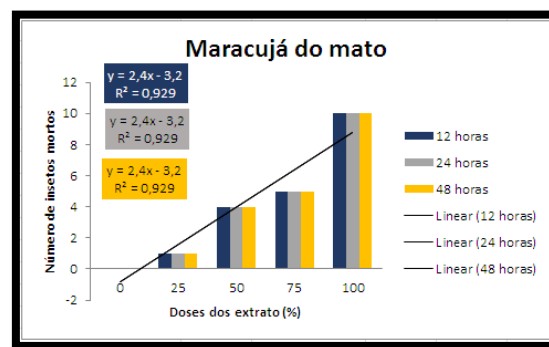
For the concentration 75%, Brazilian peppertree [Figure 07 A], black jurema [Figure 05 B] and bitter melon [Figure 07 B] obtained a 90% efficiency in the control of *S. zeamays*.

Figure 07 A, and 07 B: Results for efficiency of Brazilian peppertree and bitter melon in laboratory bioassays for the control of *Sitophilus Zeamais*.



At the concentration 100%, with the exception of Brazilian orchid tree [40%], all other extracts had their lethal capacity above 50%, especially the klip dagga [Figure 05 A], passion fruit [Figure 08] and bitter melon [Figure 07 B], which had 100% of efficiency. However, we do not recommend the use of extracts at high concentrations if it, at a lower concentration, obtains satisfactory results, such as klip dagga [Figure 05 A], which has a lethality at 25% and 50%. We emphasize that, in the experimental field of DTCS III/UNEB, the cultivation of this species, which presented a low local population, is recommended.

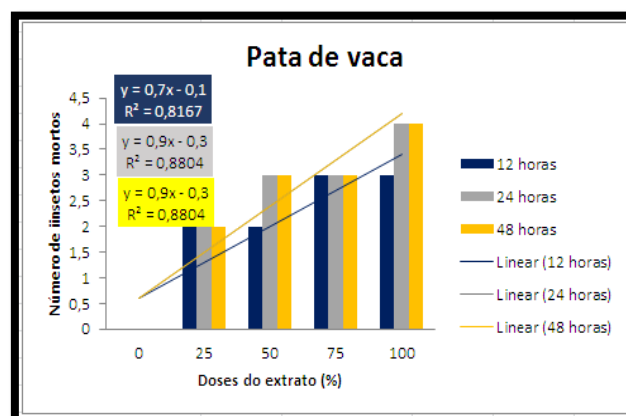
Figure 08: Results for efficiency of passion fruit in laboratory bioassays for the control of *Sitophilus Zeamais*.



The bitter melon [Figure 07 B] showed a great efficacy at the concentration 50% [with a 70% mortality] and at the concentration 75% [90% lethality], making its use more economical at these concentrations.

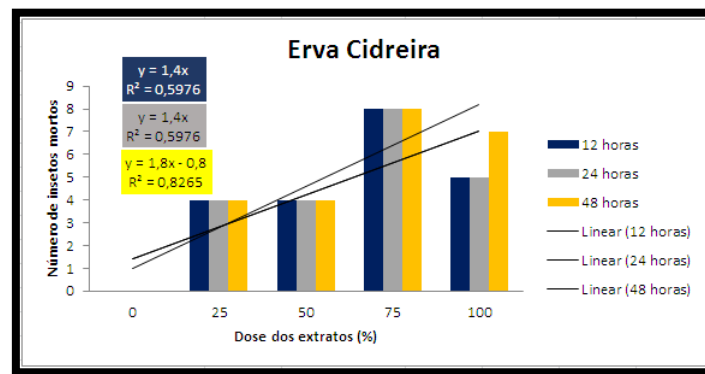
The lowest mortality rate was presented by Brazilian orchid tree [Figure 09] at the tested concentrations.

Figure 09: Results for efficiency of Brazilian orchid tree in laboratory bioassays for the control of *Sitophilus Zeamais*.



In general, the efficiency of insecticide activity increases as the concentration increases, as observed for lemongrass [Figure 10], passion fruit [Figure 08], Brazilian peppertree and bitter melon [Figures 07 A and B, respectively]. However, some species decrease their efficiency at the concentration 100%, such as black jurema [Figure 05 B], which obtained a better efficiency at the concentration 50% [100% lethality]. It is considered in this experiment as the most suitable species for the control of *S. zeamays* since it had a higher mortality rate at lower concentrations.

Figure 10: Results for efficiency of lemongrass in laboratory bioassays for the control of *Sitophilus Zeamais*.



Importantly, the usefulness of plants for insect control is not limited to the use of the substances obtained from them or their extracts. These active substances can usually be used for the synthesis of new active ingredients. This knowledge has aided in the development of insect control methods less aggressive to the environment.

3.2 Control of *Sitotroga cerealella*

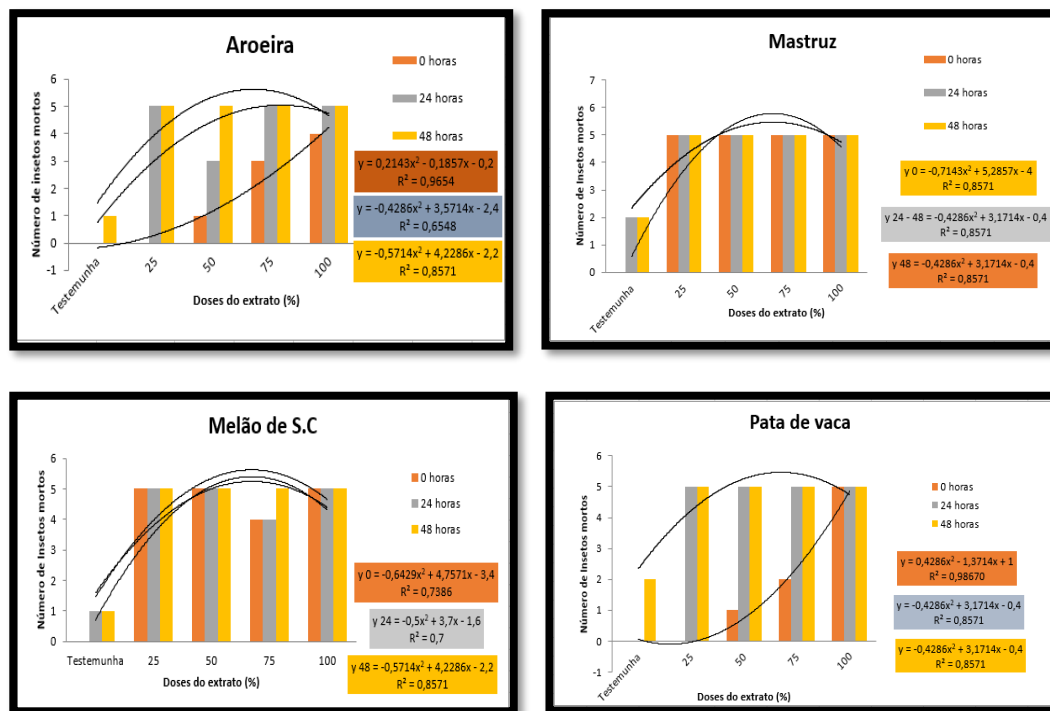
The results show that all medicinal plants tested showed insecticidal activity, with a mortality higher than 60% [Table 04].

Table 04: Mortality/Insecticide activity of medicinal plant extracts against *Sitotroga cerealella*

MEDICINAL PLANTS	MORTALITY RATE [%]				
	0%	25%	50%	75%	100%
Brazilian peppertree [<i>Schinus terebinthifolius</i> Raddi]	0%	100%	100%	100%	100%
Klip dagga [<i>Leonotis nepaetefolia</i> R. Br.]	0%	100%	60%	80%	100%
Lemongrass [<i>Melissa officinalis</i> L.]	0%	60%	100%	100%	100%
Black jurema [<i>Mimosa tenuiflora</i> Willd. Poir.]	0%	60%	100%	100%	100%
Passion fruit [<i>Passiflora cincinnata</i> Mast]	0%	80%	80%	100%	80%
Wormseed [<i>Chenopodium ambrosioides</i> L.]	0%	100%	100%	100%	100%
Bitter melon [<i>Momordica charantia</i> L.]	0%	100%	100%	100%	100%
Brazilian orchid tree [<i>Bauhinia variegata</i> L.]	0%	100%	100%	100%	100%

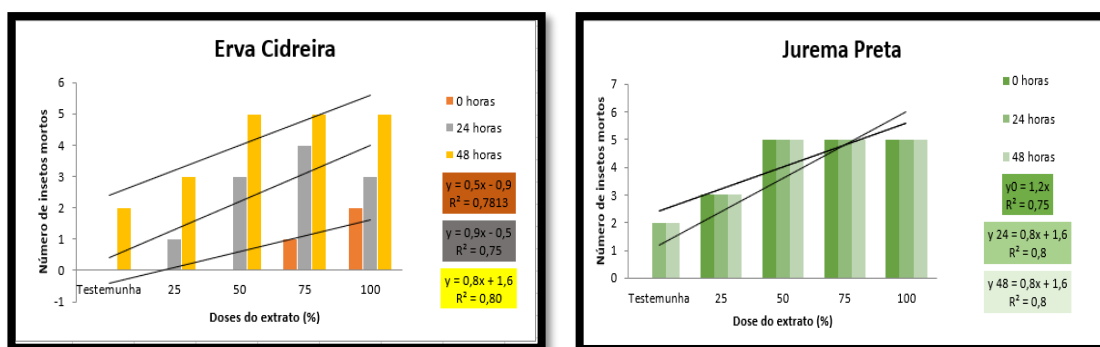
Brazilian peppertree, wormseed, bitter melon and Brazilian orchid tree [Figures 11 A, B, C and D] had a better performance at 25%, 50%, 75% and 100% concentrations for the control of *S. cerealella*. For these species, we recommend the use of extracts at the concentration 25% because they have maximum lethality and low cost.

Figure 11 A, B, C and D: Efficiency results of Brazilian peppertree, wormseed, bitter melon and Brazilian orchid tree in laboratory bioassays for the control of *S. cerealella*.

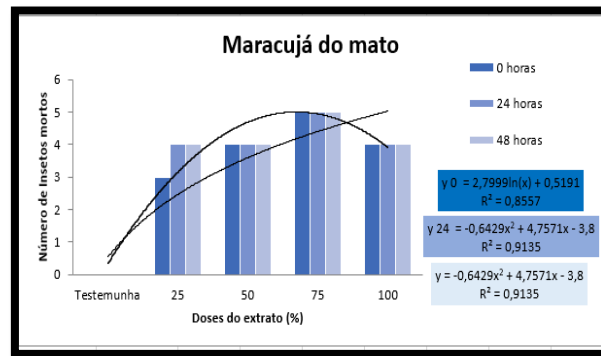


The lowest mortality rate recorded was 60%, presented by lemongrass and black jurema [Figure 12 A and B] at the concentration 25%.

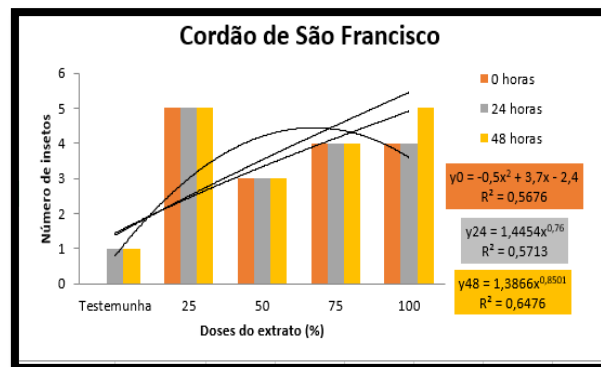
Figure 12: Efficiency Results of **A:** Lemongrass and **B:** black jurema in laboratory bioassays for control of *S. cerealella*.



In general, the efficiency of insecticide activity increases as the concentration increases, as observed for Brazilian peppertree [Figure 11 A], lemongrass and black jurema [Figure 12 A and B]. However, some species decrease their efficiency at high concentrations, such as passion fruit [Figure 13], which obtained only 80% effectiveness [pure extract = 100%] and 100% lethality [at a concentration of 75% of extract].

Figure 13: Results for efficiency of passion fruit in laboratory bioassays for the control of *S. cerealella*.

The klip dagga [Figure 14] is 100% effective at the concentration 25%, and it is an economically viable and effective species for controlling *S. cerealella*.

Figure 14: Results for efficiency of passion fruit in laboratory bioassays for the control of *S. cerealella*.

The use of plants for insect control is not limited to the use of the substances obtained from them or their extracts. These substances can and should be used for the synthesis of new active principles, helping to control insect populations aggressive to various agricultural crops.

Our results prove the effectiveness of plant extracts that have been researched and largely with already proven effects for pest control [20]. The insecticide activity of plant extracts can be manifested through direct mortality, repellency, sterility, interference in development, and modification of arthropod behavior [21].

4 Conclusions

The continuous growth of the world population increases the demand for food. As a result, it is urgent to reduce losses in the different stages of food production, especially losses resulting from the action of insects at either the production and/or storage [22] and [23]. Insect control techniques still largely use agrochemicals, which are quick solutions to increase production, but without taking into account the harmful effects of these substances on living organisms and the environment. However, currently, when designing an integrated pest management, a set of control methods and strategies are used to reduce losses due to the biological action of insects [24].

One of such strategies is the identification of plants that can be used as bioinsecticides. They can control the growth of insect populations in addition to causing less side effects and being economically viable.

Medicinal plants, as they are an abundant and easily accessible natural resource, can and should be used to obtain natural insecticides as an alternative to synthetic insecticides. The advantages are a low production cost, which makes them more affordable for small producers, and the non-cumulative effects on food and the environment, promoting the isolation of active ingredients that allow the synthesis of new phytosanitary products.

Thus, studies highlighting the use of plant species that have metabolites capable of mitigating impacts caused by pests on grains are important because they allow obtaining better bioinsecticides [25]. Thus, the production of extracts in this study aimed to find new ways to control *Sitophilus Zeamais* and *Sitotroga cerealella* in order to increasingly mitigate losses resulting from the action of this pest, reducing pest control costs and consequently increasing the profit margin for the producer by providing a bioinsecticide as a tool more environmentally friendly and more efficient in insect control.

Plants with a high potential can also be used for the production of different compounds, such as vegetable oils. According to studies on other plant species, they have a high potential for the control of various insects, producing natural products that, after field and laboratory testing, can be marketed at competitive prices [26] and [27]. This work aims a continuity of studies and the use of the same species studied for the production of extracts for the control of fungi and pathogenic bacteria. It also aims the production of vegetable oils following the same line of research.

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RESEARCH ON GEOGRAPHICAL INDUSTRIES AND EDGE CRAFTS ASSOCIATIONS IN NORTHEAST BRAZIL AND NORTH PORTUGAL

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Abstract

This paper presents partial results of a survey on the profile of Geographical Indication Lace Embroidery Associations in northeastern Brazil and Portugal. Geographical Indications value and protect traditional products linked to a particular locality, while making positive contributions to the local economy. Handicraft production associations in Brazil, which have obtained the geographical indication seal, add many artisans who derive their families' livelihoods almost exclusively by selling the products. In Portugal the process is different and the certification is individual for the artisan and the pieces. This study aimed to characterize the profile of the members of the Renda Irlandesa, Renda Renascença e Bordado Filpe associations in northeastern Brazil with Geographical Indication seal and the lace of Tibaldinho, Bilro and Lenço dos Namorados in Portugal. The work started with bibliographic research that preceded the field research and Doctoral Sandwich in Portugal. In the bibliographic research were used articles, theses, dissertations available in the online bases of CAPES periods. The Sandwich Doctorate was conducted between November 2018 and March 2019 and the field research in Brazil was conducted from May to June 2019, and data were collected through a semi-structured questionnaire.

Keywords: Geographical Indication; Crafts; Income Generation.

1. INTRODUCTION

Geographical Indication and Intellectual Property

Geographical indications (GIs) are elements of intellectual property applicable to goods and services that

are characterized by the place from which they originate, involving environmental, historical and socio-cultural issues. According to Brazilian norms, they can be of two types: indications of origin (IO) or designations of origin (DO) (BRAZIL, 1996).

Valente et al. (2012) point out that the definitions of designation of origin and indication of origin defined by Brazilian legislation are similar to the designation of origin and geographical indication contained in European Union regulations. In both cases the differences are clear: in the appellation of origin, the geographical, meteorological and human characteristics that characterize the entire production process are determinant in the characterization and differentiation of the product; In the indication of origin (Brazil) or geographical indication (European Union), it is not necessary that the quality of the product is closely linked to the peculiar natural characteristics of the region, it is enough that the good produced in this area has reputation and notoriety with the consumer market. The authors also point out that not only does the culture that involves production guarantee its typicality, but its quality is less associated with the territory, and that the definition of GI present in the Brazilian legislation, differs from the one adopted by the EU and also covers of products of any kind, also the rendering of services as subject to protection by this intellectual property.

Consumers understand that geographical indications are references of origin and quality of products, so counterfeiting of certified products is punishable as it harms not only legitimate producers but especially consumers who buy a product in the face of valuable reputation. Penalties for counterfeiting a certified product range from prohibiting unauthorized use of certification to compensation for damages and in some serious cases to arrest of those involved (JUNGSMANN, 2010).

As the authors discuss Belletti et al., (2017) the support for GI products as suppliers of local public goods requires the right mix of public and private initiatives, leaving room for collective management. GI protected products can play a relevant role in activating and supporting local sustainable development processes in rural areas. But for the author this does not happen automatically. Links between the public and private sector are slow to come and may involve a number of potential negative effects that must be carefully assessed and managed. A GI product can contribute to sustainable development, but it probably requires proper regulation of its production and consumption, and the removal or treatment of aspects that hinder or block GI enhancement initiatives. It points out that due to the multidimensional nature of a GI different areas are appropriate to exploit the potential associated with the products.

For the Instituto Nacional da Propriedade Industrial do Brasil – INPI, an organization that grants the seal of Geographical Indication, handicraft fits in the Indication of Origin modality, as corroborated by Russo et al (2011, p. 80) the Indication of Origin (IO) is related to the geographical name known for the production, extraction or manufacture of a particular product, or the provision of a given service.

Geographic Indication Lace and Embroidery Craft Associations

Craft Associations were selected for the survey from the Geographical Indication grant list provided by INPI. The associations located in the Northeast region of Brazil were chosen, as follows: Associação para o Desenvolvimento da Renda Irlandesa de Divina Pastora - ASDEREN - SE Renda de agulha em Lacê- Indication of Origin; Conselho Associação das Cooperativas, Empresas e Entidades vinculadas à Renda Renascença - CONARENDA. Cariri Paraibano - PB Renda renascença - Indication of Origin; and Instituto

Bordado Filé das Lagoas de Mundaú-Manguaba - INBORDAL, Região das Lagoas Mundaú-Manguaba - AL Bordado Filé - Indication of Origin (INPI, 2016).

A survey was also carried out with three lace and embroidery organizations certified in Portugal - PT from November 2018 to April 2019. In Portugal, unlike Brazil, the renders and embroiderers are not organized in Associations, being the responsibility of the Chambers. municipal authorities the whole process of recognition and safeguarding of the stamps, be they Geographical Indication or the research took place during the completion of Doctoral Sandwich with support from CAPES.

The Associação para o Desenvolvimento da Renda Irlandesa de Divina Pastora – ASDEREN is headquartered in the municipality of Divina Pastora, located in the central region of the state of Sergipe. The city now known as “Irish Lace Land” holds the traditional lore of handmade lace. The way of making Irish income was recognized as a Brazilian Cultural Heritage in 2008 by the National Historical and Artistic Heritage Institute (IPHAN, 2014). The seal of Geographical Indication was granted by the National Institute of Industrial Property in 2013 (SEBRAE, 2014).

At the beginning the Associação had about 200 members, but currently has about 60 members, but offers support to a larger number of women, who are not members, but who seek help to produce lace, in sewing workshops, in collective buying. inputs and in the dissemination of products in Brazil and abroad (FIELD RESEARCH, 2019 and SEBRAE, 2014).

INPI granted the registration of geographical indication to the Council of Associations, Cooperatives, Companies and Entities linked to Renda Renascença do Cariri Paraibano – CONARENDA, which brings together several associations in the geographical region of influence of IG on September 24, 2013 in the category of Indication of Origin for the Renaissance Income production of the region known as “Cariri Paraibano” corresponds to the political limits of the municipalities of Monteiro, Camalaú, São João do Tigre, São Sebastião do Umbuzeiro, Zabelê, Prata, Sumé and Congo. The number of associates is about 400 artisans, but the number of women who work with income in the region is much larger, reaching up to three thousand people. The region's income differs from others and production has inserted women into the labor market, becoming the sole source of income for many families (SEBRAE, 2013).

The registration of Geographical Indication, in the indication of origin mode, was granted by INPI o for the embroidery fillet of the Lagoas Mundaú-Manguaba region on December 9, 2014. The coverage area is 252 km² in the state of Alagoas, covering part of the municipalities of Marechal Deodoro, Pilar, Santa Luzia do Norte, Coqueiro Seco, Satuba and Maceió. The GI was granted on behalf of the Instituto Bordado Filé das Lagoas de Mundaú-Manguaba, which started its activities with about 200 artisans, but currently has about 35 members (IPHAN, 2014, Field Research, 2019).

In Portugal, the Rendas de Bilro de Peniche, a Renda Tibaldinho de Mangualde e a Renda do Lenço dos Namorados do Minho were surveyed. Twelve lace makers and embroiderers certified by the City Councils and official Certification Entities were interviewed for their work and pieces in three different municipalities. In the three cases were also interviewed the Secretaries of Culture of the Municipalities. The lace and certified embroidery of Portugal follow the provisions of Decree-Law No. 121/2015 of 30 June 2015 and are governed by the rules of the Sistema Nacional de Qualificação e Certificação de Produções Artesanais Tradicionais - SNQCPAT (PORTUGAL, 2015).

2. Methodology

This article is organized as follows: initially are covered concepts about Intellectual Property, Geographical Indication, their relationships, different possibilities and characteristics of a GI and also identifies the researched craft associations. In the second part we discuss about the methodology used in the research. The third part is the result of surveys with the profile of members, their work and level of satisfaction with the associations. The fourth part is considerations followed by references.

The surveyed associations were selected from the information provided in the database of the Instituto Nacional da Propriedade Industrial do Brasil, through the Institute's website, the reports and journals available there. Among the seven handicraft associations with Geographical Indication were selected 3 associations of lace and embroidery, ASDEREN - Renda Irlandesa em Divina Pastora - SE, CONARRENDA - Renda Renascença em São João do Tigre - PB and INBORDAL Bordado Filé em Maceió - AL.

The research can be considered exploratory, because the recognition of the object of study was performed. It was quantitative with surveys and relationships between variables, with some qualitative elements. This study aimed to characterize the profile of the Rendas Irlandesa e Renascença and the Bordado Filé and to relate their level of strategic alignment with their markets. The research had an intentional non-probabilistic sampling and used the methodology called snowball.

The work consisted of bibliographic research followed by field research. The descriptive and documentary bibliographic research was carried out based on online journals available by the Comissão de Aperfeiçoamento de Pessoal do Nível Superior – CAPES, in contents published in theses, dissertations and scientific articles, books and articles of scientific journals.

The data collection instrument was through interviews with semi-structured questionnaires applied to the defined sample. After the application of the questionnaires during the months of May and June 2019, the data were tabulated and analyzed.

3. SEARCH RESULTS

Profile of the interviewees

The research was carried out with 125 people, all female belonging to the Associações de Rendas e Bordados with Geographical Indication in the Northeast, in the cities of Divina Pastora - SE, São João do Tigre - PB and Maceió - AL. No male associates were identified in any of the Associations surveyed. It is possible that lacework and embroidery work in the regions is also carried out by men, but they did not seek to associate in the researched institutions, nor were they found during field research.

Regarding the age of the associates, a greater number of women between 36 and 55 years old can be seen, according to table 01, showing a lower interest of the young public in the lace and embroidery craft.

Table 1: Age of Associates

MEMBERSHIP / AGE OF MEMBERS	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	41 - 45	46 - 50	51 - 55	56 - 60	61 - 65	66 - 70	71 - 75	76 - 80	TOTAL
ASDEREN	2	4	2	3	8	9	6	2	4	3	4	2	1	50
CONARRENDIA	0	4	5	8	8	2	8	8	1	4	2	0	0	50
INBORDAL	0	3	1	3	5	2	3	6	1	0	1	0	0	25
TOTAL	2	11	8	14	21	13	17	16	6	7	7	2	1	125

Source: Field Survey Data (2019)

Regarding the level of education there is a greater number associated with Incomplete Elementary School, and Complete High School, with a very diverse age range, ranging from 19 to 78 years, characterizing a diversity in the sample.

Table 2: Education level of the researched population

	CONARRENDIA		INBORDAL		ASDEREN		Grand Total	
	Frequenc y	%	Frequenc y	%	Frequenc y	%	Frequenc y	%
Complete Elementary education	1	2,00%	2	8,00%	3	6,00%	6	4,80%
Incomplete Elementary School	21	42,00%	5	20,00%	13	26,00%	39	31,20%
Complete High school	12	24,00%	11	44,00%	13	26,00%	36	28,80%
Incomplete High school	1	2,00%	2	8,00%	9	18,00%	12	9,60%
Did Not Study	10	20,00%	-	-	2	4,00%	12	9,60%
Higher Level Complete	3	6,00%	2	8,00%	6	12,00%	11	8,80%
Incomplete Higher Level	-	-	3	12,00%	3	6,00%	6	4,80%
Postgraduate Studies	2	4,00%	-	-	1	2,00%	3	2,40%
Grand Total	50	100,00 %	25	100,00 %	50	100,00 %	125	100,00 %

Source: Field Survey Data (2019)

About the marital status of the respondents 68% are married and 20% are single, 6.4% divorced and 5.6% are widows.

It is observed that the family income of the members of INBORDAL is much higher than the family income of the members of CONARRENDIA and ASDEREN, reaching almost double the amount received.

Table 3: Family income of the surveyed population

	ASDEREN		CONARRENDA		INBORDAL		Grand Total	
	Frequenc y	%	Frequenc y	%	Frequenc y	%	Frequenc y	%
Up to 1 minimum wage	34	68,00%	43	86,00%	8	32,00%	85	68,00%
2-4 minimum wages	15	30,00%	6	12,00%	16	64,00%	37	29,60%
From 5 to 7 minimum wages	1	2,00%	-	-	-	-	1	0,80%
From 8 to 10 minimum wages	-	-	-	-	1	4,00%	1	0,80%
Did not answer	-	-	1	2,00%	0	0,00%	1	0,80%
Grand Total	50	100,00 %	50	100,00 %	25	100,00 %	125	100,00 %

Source: Field Survey Data (2019)

About 47.20% of the members are home providers, so the majority and others 20.80 contribute 50%.

Table 4: If you are a home provider

	ASDEREN		CONARRENDA		INBORDAL		Grand Total	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
0.5	11	22,00%	13	26,00%	2	8,00%	26	20,80%
No	17	34,00%	11	22,00%	12	48,00%	40	32,00%
Yes	22	44,00%	26	52,00%	11	44,00%	59	47,20%
Grand Total	50	100,00%	50	100,00%	25	100,00%	125	100,00%

Source: Field Survey Data (2019)

Work, Production and Quality

INBORDAL is the association with the largest number of members that depend exclusively on the craft work of embroidery, being it the main economic activity, with CONARRENDA in second place and ASDEREN in third.

Table 5: Income / embroidery as the main economic activity of the members

	ASDEREN		CONARRENDA		INBORDAL		Grand Total	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
No	25	50,00%	11	22,00%	3	12,00%	39	31,20%
Yes	25	50,00%	39	78,00%	22	88,00%	86	68,80%
Grand Total	50	100,00%	50	100,00%	25	100,00%	125	100,00%

Source: Field Survey Data (2019)

73.60% of the members dedicate themselves practically every day of the week to the production of lace

and embroidery, with predominance of the members of INBORDAL, followed by CONARRENDA and ASDEREN in third place in number of days of the week dedicated to production, as shown by Table 6. Associates who have another source of income or develop other economic activities are retired and teachers with 16.67% each, civil servants with 11.11% and caregivers of elderly and day laborer with 8.33% each.

Table 6: How many days per week do members devote to income / embroidery production?

	ASDEREN		CONARRENDA		INBORDAL		Grand Total	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
1	2	4,00%	-	-	-	-	2	1,60%
2	5	10,00%	5	10,00%	0	0,00%	10	8,00%
3	2	4,00%	1	2,00%	2	8,00%	5	4,00%
4	2	4,00%	1	2,00%	-	-	3	2,40%
5	11	22,00%	2	4,00%	-	-	13	10,40%
7	28	56,00%	41	82,00%	23	92,00%	92	73,60%
Grand Total	50	100,00%	50	100,00%	25	100,00%	125	100,00%

Source: Field Survey Data (2019)

Regarding the number of daily hours devoted to lace production and embroidery, there is a predominance of between six and eight hours of daily dedication, as shown in Table 7.

Table 7: How many hours a day do members spend in lace / embroidery production?

Hours	ASDEREN		CONARRENDA		INBORDAL		Grand Total	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
1	1	2,00%	-	-	-	-	1	0,81%
2	3	6,00%	6	12,00%	-	-	9	7,26%
3	10	20,00%	4	8,00%	1	4,00%	15	12,10%
4	8	16,00%	6	12,00%	4	16,00%	18	14,52%
5	5	10,00%	1	2,00%	1	4,00%	7	5,75%
6	18	36,00%	6	12,00%	3	12,00%	26	20,97%
7	2	4,00%	-	-	-	-	2	1,61%
8	3	6,00%	27	54,40%	13	52,00%	43	34,68%
10	-	-	-	-	3	12,00%	3	2,42%
Grand Total	50	100,00%	50	100,00%	25	100,00%	124	100,00%

Source: Field Survey Data (2019)

The vast majority of associates sell their parts through associations, whether they have the GI seal or the seal, as shown in Table 8.

Table 8: What is the destination of the parts produced by the associates

	ASDEREN		CONARRENDA		INBORDAL		Grand Total	
	Frequenc y	%	Frequenc y	%	Frequenc y	%	Frequenc y	%
Selling at home to the consumer.	1	2,00%	2	4,00%	-	-	3	2,40%
Selling at home to the consumer. Sale to the association	12	24,00%	9	18,00%	-	-	21	16,80%
Selling at home to the consumer. Sell to the association, Sell to others.	6	12,00%	1	2,00%	1	4,00%	8	6,40%
Sell at home the consumer. Sell to others.	2	4,00%	1	2,00%	-	-	3	2,40%
Sale to the association	25	50,00%	26	52,00%	20	80,00%	71	56,80%
Sale to the association. Sale to other associations.	4	8,00%	4	8,00%	4	16,00%	12	9,60%
Sell to others.	-	-	7	14,00%	-	-	7	5,60%
Grand Total	50	100,00%	50	100,00%	25	100,00%	125	100,00%

Source: Field Survey Data (2019)

Certified Lacemakers and Embroiderers from Portugal

In Portugal it was found that 100% of the lace makers are female. In the three municipalities surveyed, no male artisans were found. The selection of interviews followed by the list of certified lacemakers and embroiderers provided by the City Councils and official Certification Institutions. In total, 10 artisans from a total of eighteen certified women were interviewed. Of this total, two declined to interview, one was not located and five were removed due to health problems.

In Concelho de Mangualde, in the most central region of the country, the lacemakers of the Bordado Tibaldinho were surveyed, with four certified artisans. Two lacemakers agreed to give an interview, one did not agree, and one was on sick leave. In the city of Peniche, further south of Portugal, Bilro's lacemakers were surveyed and five certified artisans were found, three of whom agreed to interview and two were on sick leave. The last embroidery to be researched was the Lenço dos Namorados do Minho, the northernmost region of the country, with a larger number of certified embroiderers. Were interviewed five artisans out of a total of nine, one was not located, one declined to give interviews, two were away for health problems.

The certification and registration system for Handcrafted Products in Portugal is different from Brazil. The artisans are not organized in associations, they are independent. All respondents are certified, 80% are married and 20% are widowed. About schooling 90% have completed high school and 10% have a postgraduate degree. About 30% are home providers and 70% contribute 50% of expenses.

100% of respondents know what certification is and how it works, have already done training on the subject and the points. Who has given all training and certification is ADERE together with the city councils of each city. ADERE is the Instituição oficial de certificação de artesanato of the Portuguese Government, accredited by the Instituto Português de Acreditação - IPAC (PORTUGAL, 2015).

In reference to income being the main economic activity of the respondents 60% answered the income or embroidery is the main and 40% answered that it is not, but 100% of the respondents develop economic activities. Other economic activities developed by the artisans include: 20% are artisan and craft store owner, 10% are decoration store owner, 20% are craft store employee, 10% are teacher, 10% are lace teacher, 10% do crafts in general, 10% are retired and 10% owns a craft store and teacher of lace.

About the number of days worked per week 50% work seven days, 20% work five days, another 20% work three days and 10% work two days a week. 50 of the interviewees also work 08 hours a day with lace and embroidery activities, 30% work 2 hours a day, 10% work 3 hours and another 10% 4 hours a day.

About the place of sale of certified parts 50% answered that they deliver in a specialized store in Lace and Embroidery, 20% sell their products directly at home to customers and also deliver in specialized stores and 30% sell at home and also in the City Hall store.

Regarding the increase in sales after certification of handicrafts, 60% believe did not notice increase in sales and 40% realized increase in sales. When asked about product changes after certification, 40% identified no change and 60% identified increased product quality with certification.

4. CONSIDERATIONS

The field research identified that in Brazil there are few women under 25 interested in learning and working with lace and embroidery. There is a predominance in the level of education in elementary school followed by high school. In Portugal the age of lacemakers is between 48 and 72 years old, just as in Brazil, it does not matter to younger women in the craft, but the education is higher, most of them having completed high school.

Household income around one minimum wage is present at 68%, but INBORDAL members receive double, about two minimum wages. Most of them, 47.20% are home providers, but in CONARRENDA this percentage increases to 52%. Among the lacemakers and embroiderers in Brazil and Portugal, most are married and most are also house providers or share expenses. It is also considered significant the percentage of associates that contribute 50% in family income, demonstrating the importance of activity in the domestic economy for both Brazil and Portugal.

Income and embroidery are the main economic activities of the associates in both countries and the number of days and hours they spend in production demonstrates this. In Brazil, the dependence of the associates in relation to the association is great, despite the possibility of the sale occurring in homes or elsewhere, it is clear that there is a predominance of sales through the associations. In Portugal, no certified lace and

embroidery handicraft associations were identified, and artisans sell their products in specialized stores, at home or, where they exist, in the City Hall stores.

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MODELING OF OVERFLOW CURVE IN URBAN MANAUS RIVERS

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ABSTRACT

The monitoring of water bodies is of great importance in urban areas, and also in the economic and social context of the large Brazilian metropolises. Urbanization alters the flow of rivers and streams that cut through large urban areas. At the same time, river monitoring can be performed using the mathematical methods present in the literature. This work will show the overflow curve of streams that cross the central areas of the city of Manaus, being possible to visualize through satellite images. For the characterization of the basins, besides satellite images, precipitation time series are used around the studied areas. With the data obtained from the study, it is expected to generate a program that warns the riverine population, for possible floods before they occur. It is also possible to develop a program that calculates a new gutter profile, which includes the design flow, for the studied streams.

Keyword: Overflow curve, urban floods, monitoring risk areas.

1. INTRODUCTION

Population increase in large Brazilian cities has been significantly over the last decades. In Brazil, according to data from the Brazilian Institute of Geography and Statistics (IBGE), in the 1940s, the population living in urban areas was smaller. The urbanization process became notorious since the 1960s, especially in the northern states, Acre, Amapá, Amazonas, Pará, Rondônia and Roraima as (BROWDER and GODFREY, 1990, 1997; BROWN et. Al., 1994). In the state of Amazonas, the implementation of the Manaus Free Zone was fundamental for the exponential increase of urbanization (OLIVEIRA and SCHOR, 2009).

The growth of cities causes a serious of environmental impacts such as deforestation, landslides and extreme weather events (OJIMA, 2011; OWEN, 2009; TUCCI, 2007). One of the main problems affecting urban areas is the large volumes of water generated by rainfall and the effect of soil sealing. Urban spaces that do not have adequate rainwater disposal components suffer from frequent flooding, causing environmental, social and economic problems.

According to PHILIPPI (2005), urban floods are caused mainly by the excess runoff, caused by the high impermeability factor that prevents the infiltration of these waters in the soil, thus, when the runoff volume exceeds the design runoff competence, the floods occur. (JONOV et. Al., 2013).

According to the Manaus City PDUA, uncovered and permeable areas are defined so that these same areas do not present any constructive alteration. Population expansion has spread horizontally in the peripheral regions, more precisely to the North and East Zones of the city of Manaus.

The monitoring of water bodies is of paramount importance in urban areas, this applies in the economic and social context of the city, as urbanization in a way alters the flow of rivers and streams that cut through the large metropolises. In addition, urban areas are susceptible to extreme precipitation events, which associated with soil sealing in these areas can lead to increased level of streams causing damage to surrounding areas (BARROS and CONDE, 2017; SILVA et al., 2018). The stream 40, Bindá, and Mindu, are located in the urban area and most susceptible to flooding in the city of Manaus, and for this reason, monitoring these can help the population and public agencies of the city.

One way to monitor urban rivers and streams is through hydrological models. The more robust the model is, the more viable its implementation can become (ZHANG & PAN, 2014; MONTE et al., 2016). Hydrological models can estimate impermeable areas and, at the same time, relate to urban areas (TUCCI, 2000). In addition, it is possible to simulate the effects of precipitation on river flow, infiltration and surplus through runoff (TUCCI, 2000; 2007). Thus, this article will try to obtain an overflow curve through precipitation information for three urban streams in Manaus / AM.

2. METHODOLOGY

To obtain the flooding area in the Manaus Igarapés Urban basins, it will be necessary to obtain the total area of the basins. This area will be measured by drawing contour lines (water dividers) using the ArcGIS Maps program, student version, as a tool. On-site visits will be made to the selected igarapés basins, with collections of the physical characteristics of the watercourses in 20m by 20m stakes, where the images describing the region were cataloged, as well as information obtained from the residents,

location geographic and satellite quotas. To obtain the flow calculation of the Basin, the mapping data from the Manaus City Hall database, available on a digital platform, will be used. The data of dimension, extension, tributaries and area will be obtained using the software ArcGIS Maps, student version. Once the in situ information is collected, it will be tabulated for applying the basin calculation methodology.

For the characterization of the rainfall regime will be made annual precipitation averages, from information will be taken from the database of the National Institute of Meteorology - INMET, the stations closest to the areas of the basins under study, formulating the rain equation (IDF curve). In the study region.

From the rainfall data will be constructed the series of probable annual maximum heights and respective Recurrence Time (T_r) and associated probability, which will result in the probable maximum heights for return periods of 10 to 100 years.

Also, it will be possible to obtain the maximum probable heights (h) for durations (t), which can also be obtained the maximum probable intensities (i) for periods (t) of 5, 10, 15, 20, 25. and 30 minutes and 1, 6, 8, 10, 12 and 24 hours. Finally, with the obtained results, it will be possible to find the IDF curve for the study region, given by Equation 1.0:

$$i = \frac{18,12691 \cdot T_r^{0,105789}}{(t + 9,788612)^{0,724313}} \quad (1.0)$$

Drainage structures, ie places where flow rates will be determined by the rational method, rainfall duration is also the concentration time, valid for basins with drainage areas up to 100 hectares, with t_c in minutes (equation 2.0). Subsequently, it will be possible to obtain flow calculations, where for a drainage basin in the less than 50 ha (0.5 km²), with a short concentration time, the Rational Method (equation 3.0) will be used directly.

$$t_c = 57 \left(\frac{L^3}{H} \right)^{0,385} \quad (2.0)$$

$$Q = \frac{C \cdot i \cdot A}{6} \quad (3.0)$$

Where: “C” is the surface runoff coefficient obtained from field information (NETTO and FERNÁNDEZ, 2018). Also, the surface runoff values in areas with surface coverage and divergent characteristics, as shown by NETTO and FERNÁNDEZ (2018). Also, for the project flow rates, and for verifying the existing talveg crossings, a value of 0.70 was initially found for the surface runoff coefficient, which was corrected for Macrodrainage through Equation 4.0.:

$$C_{Tr} = 0,8 \cdot T_r^{0,1} \cdot C_{10} \quad (4.0)$$

Where: C_{10} , the value of 0.70 is used, which was determined from the average between the coefficients “ C_{10} ” and “ C_{50} ”. To determine the degree of soil impermeability, it is necessary to know its use, where it can be classified as low, medium and high. This knowledge of land use is obtained through the degree of urbanization, vegetation cover and soil type, which are the same used in NETTO and FERNÁNDEZ (2018). In this study, the value of $n = 0$ was used. Finally, the flood flow is determined and added to the value obtained from the base flow. The latter was admitted to be in the order of 10%, from which the maximum project flow rate is obtained.

Thus, the flood curves were drawn, and the cross-sections of the studied water bodies were chosen and for the on-site collection points every 20m. To draw the flood curves, a maximum rainfall intensity is

chosen for the region, so it will be possible to simulate an atypical rainfall and predict the area of flooding. Once the maximum flow rate of the basin is available, and knowing from the field data collected on site, the cross section of the existing watercourses, it will be possible to obtain the maximum water level quota for the cross section (equation 5.0).

$$A.R^{\frac{2}{3}} = \frac{Q}{K.J^{1/2}} \quad (5.0)$$

Finally, it was possible to predict the maximum water depth, so that it was possible to integrate all the 20m points into 20m and to draw the flooding (possibly) overflow in the basins. With this curve is possível visualizar, através satellite images, the locations that will be affected by the intensity of the rain.

3. RESULTS

3.1 Basin Characteristics

For the characterization of this study, two large fully urban watersheds of the city of Manaus were chosen for their relevance and easily accessible areas.

- Water Course do Binda - Sub Basin 1;
- Water Course do Mindu - Sub Basin 2;

The Igarapé do Bindá Basin (Figure 1a) is located in the São Raimundo Basin, with an area of 9.26 km² and a perimeter of 23.02 km, where its longest stretch has 8,327.48 m. The source of Bindá is located in the Cidade Nova neighborhood, with the following geographical coordinates 3o 02 '10.25 "S / 59o 59' 51.83" W, elevation elevation of 83.779 m and its exutory 28.526 m. Flowing down into the French stream, its mouth is located at 3o 02 '10.25 "S / 59o 59' 51.83" W, having a height of 28.526 m, showing a variation of 2 m to 7.5 m in its cross section.

Also inserted in the São Raimundo Basin, the Igarapé do Mindú Basin (Figure 1b) has an area of 59,212,116.53 m² with a perimeter of 43,856.25 m, where its longest stretch has 18,101.53m. Its source with elevation elevation 64,689m 30 01'07.31 "S / 590 55'29.84" W is in the Cidade de Deus neighborhood, while its 24,069 m exutory at Igarapé do São Raimundo, which later flows into the Rio Negro (30 07'44.74 "S / 600 02'05.04" W) (IPAAM, 2008). The Mindú Stream has, to its extent, an average width ranging from 3.0m to 20.0m. It represents just over 53.45% of the drainage area of the São Raimundo basin.

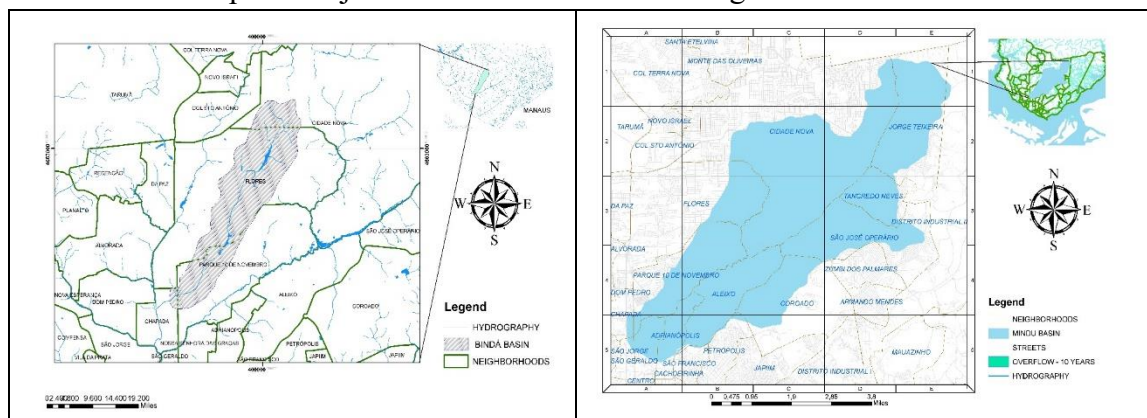


Figura 1: Physical delimitation of the basins: a) Igarapé do Bindá; b) Igarapé do Mindú, in the blue section.

After obtaining the other analysis parameters. With the application of the equations proposed in this study, it was possible to obtain the physical coefficients arranged in Tables 1 and 2, referring to the studied basins.

Table 1 – Study Area Water Course Information of Bindá Water cuorse

Physical Characteristics	Bindá Water cuorse
Drainage área	9,26Km ²
Perimeter	23,02Km
Total Length of Watercourses *	17,052Km
Length of Main Watercourse	8,33Km
Quota Difference between Headboard and Mouth of the Main Waterway	51,68m
Form Factor (Kf)	0,13
Coefficient of Compactness (Kc)	2,12
Drainage Density	1,84Km/Km ²
Mean Surface Runoff Length	136m
Main Alve declivity	0,0062m/m
Concentration Time	2,4h

* Only the perennial water courses

Table 2 – Study Area Water Course Information of Water Course do Mindú

Physical characteristics	Water Course do Mindú
Drainage Area	59,212Km ²
Perimeter	43,86Km
Total Length of Watercourses *	103,155Km
Length of Main Watercourse	18,51Km
Quota Difference between Headboard and Mouth of the Main Waterway	40,62m
Form Factor (Kf)	0,17
Coefficient of Compactness (Kc)	0,41
Drainage Density	1,74Km/Km ²
Mean Surface Runoff Length	143,50m
Main Alve declivity	2,19m/m
Concentration Time	1,77

* Only the perennial watercourses

The research will be considered as macrodrainage, so the return period of 10 and 50 years will be adopted.

Applying Equation 4.0, with $T_r = 10$ and 50 years and $C_{10} = 0.70$, the coefficients “ C_{10} ” and “ C_{50} ” were determined as an average of 0.77.

For the degree of soil sealing, it is usually adopted $n = 0.9$. Thus, the maximum design flow is obtained, and with the aid of equation 3.0, of the design flows of the Basins under study. The results obtained are expressed in Tables 3 and 4.

Table 3 – Flow Forecast for the Bindá Basin

Month	Rain (mm)	m ³ /s	m ³ /h
jan	260	0,49	1772,261111
feb	288	0,55	1963,12
mar	313	0,59	2133,529722
apr	300	0,57	2044,916667
may	256	0,48	1744,995556
jun	114	0,22	777,0683333
jul	87	0,16	593,0258333
aug	58	0,11	395,3505556
sep	83	0,16	565,7602778
oct	126	0,24	858,865
nov	183	0,35	1247,399167
dec	217	0,41	1479,156389
Average Flow (m ³ /s)		0,36	1.297,95

Table 4 – Flow Forecast for the Mindú Basin

Month	Rain (mm)	m ³ /s	m ³ /h
jan	260	3,150	11340,93479
Feb	288	3,490	12562,26623
mar	313	3,792	13652,74073
Apr	300	3,635	13085,69399
May	256	3,102	11166,45887
Jun	114	1,381	4972,563716
Jul	87	1,054	3794,851257
Aug	58	0,703	2529,900838
Sep	83	1,006	3620,375337
Oct	126	1,527	5495,991475
Nov	183	2,217	7982,273333
Dec	217	2,629	9465,318652
Average Flow (m ³ /s)		2,31	8.305,78

For the months of highest rainfall, the Bindá Basin has the average flow rate in its outflow of 0.59 m³ / s and for those with the lowest rainfall 0.11 m³ / s, as shown in Figure 2. The average flow rate of this

Water Course is of $0.36 \text{ m}^3/\text{s}$. In the Mindú Basin, for the most precipitation months, the average flow in its exsutory is $2.31 \text{ m}^3/\text{s}$. As shown in Figure 3.

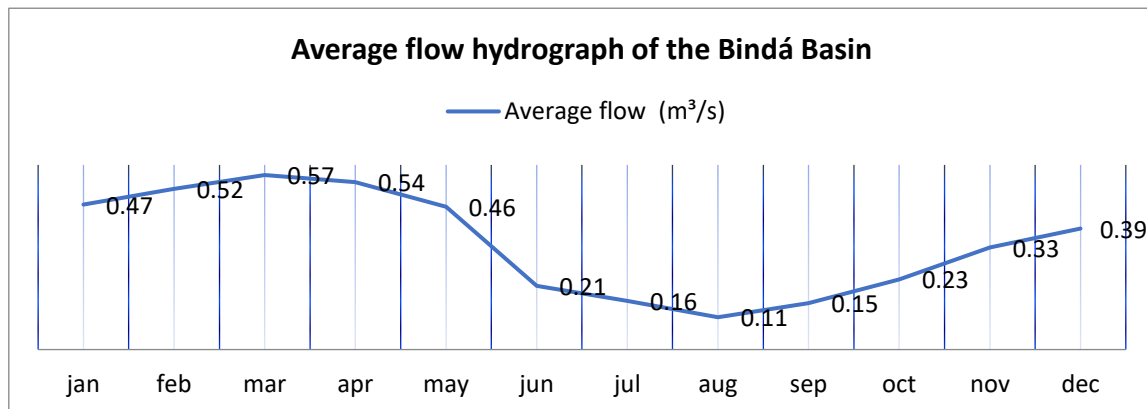


Figure 2 – Average flow hydrograph of the Bindá Basin. Source: own author.

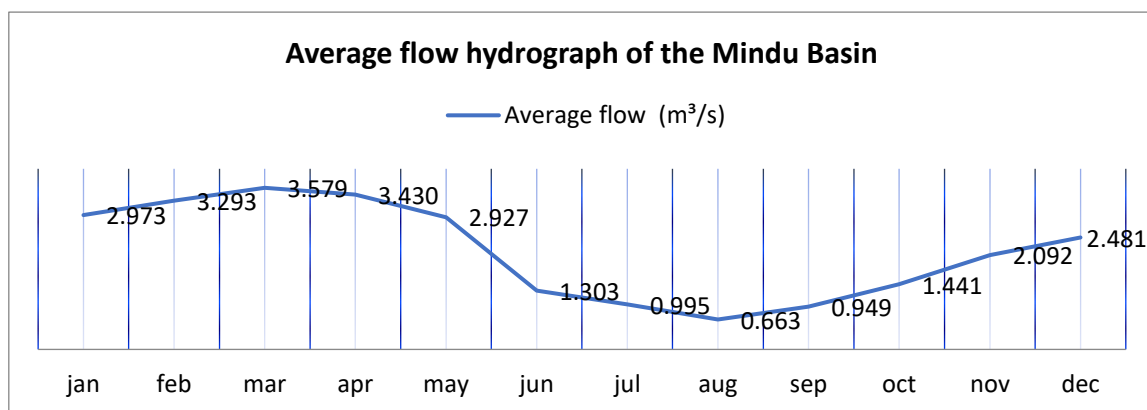


Figure 3 – Mean Flow Hydrograph of the Mindu Basin. Source: own author.

3.2 Field survey

Because they are large basins, sections of each densely urbanized Water Course were chosen, inserted in urban areas, for each field survey.

For Igarapé do Bindá, a field visit was made on January 16, 2019 to characterize the body of water in a small stretch of the Water Course, which characterizes a concentration urban area Approximately 1.0 km from the Bindá Water Course, between Rua 13A and near the F, in the November 10th Park neighborhood, as shown in Figure 4a. Information was collected at 10 points downstream of the Water Course at points P-1 through P-10, as shown in Figure 4a.

For the Igarapé do Mindú, a tributary, called São Sebastião Water Course, was chosen in the Parque 10 Neighborhood. Figure 4b illustrates the Water Course sub-basin. On May 15 and 16, a field visit was carried out to characterize the existing body of water in the project area. It was characterized approximately 2.1Km of the São Sebastião Water Course, between the streets Luís Otávio, closest to its source Rua Cel Ferreira de Araújo, called Project, where information was collected in 14 points, upstream of the Water Course, at points P-1 through P-14, as shown in figure 4b.

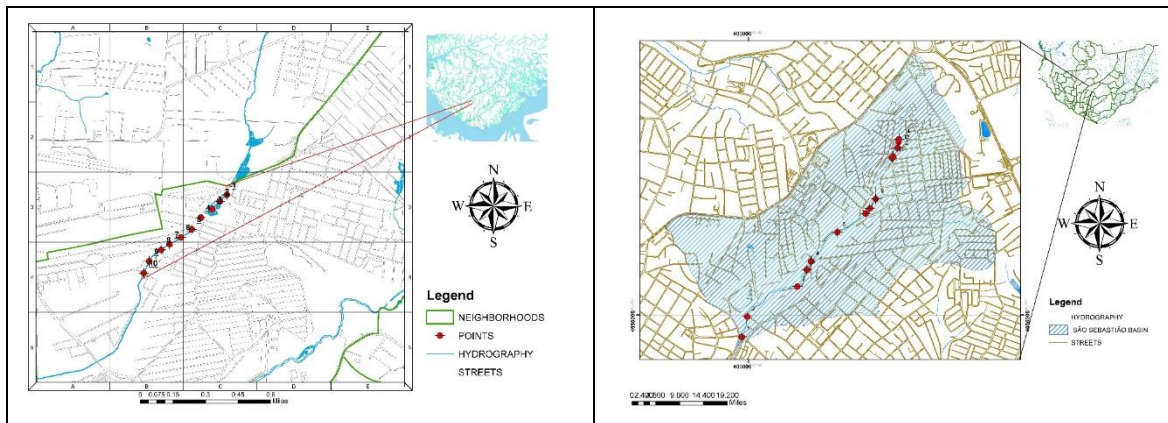


Figure 4: Delimitation of Points: a) Bindá Igarapé Sub Basin; b) Mindú Igarapé Sub Basin.

3.3 Flood curves

To generate the rain calculation parameters, the MANAUS rainfall station, which is part of the INMET (National Institute of Meteorology) network, operated since 01/01/1961, was selected. Data were obtained for the period from 1978 to 2018, data used to trace the flood curves of the two basins under study, which are shown in Table 5.

Table 5 – Data of the Maximum Maximum Precipitation Year, in mm, of the Rain Station Manaus, INMET.

Year	Máximo [mm]	Year	Minimum [mm]
1978	150,0	1996	155,0
1979	135,2	1997	105,0
1980	82,7	1998	69,2
1981	114,0	1999	133,2
1982	93,0	2000	154,4
1983	161,8	2001	96,9
1984	87,4	2002	90,8
1985	87,2	2003	138,8
1986	131,8	2004	116,5
1987	80,6	2005	71,2
1988	145,6	2006	97,4
1989	107,2	2007	76,1
1990	71,0	2008	84,2
1991	104,5	2009	72,0
1992	106,5	2010	132,5
1993	105,2	2011	116,2
1994	106,7	2012	85,2
1995	96,2	-	-

Source: HidroWeb, National Water Agency.

Using the data from Table 5, the series of probable annual maximum heights and respective Recurrence Time (Tr) and associated probability was constructed, which is shown in Table 6.

Table 6 – Series of Maximum Annual Heights, Tr and Probability.

Height [mm]	Tr [yerar]	Probability
161,8	35,00	0,029
155,0	17,50	0,057
154,4	11,67	0,086
150,0	8,75	0,114
145,6	7,00	0,143
138,8	5,83	0,171
135,2	5,00	0,200
133,2	4,38	0,229
132,5	3,89	0,257
131,8	3,50	0,286
116,5	3,18	0,314
116,2	2,92	0,343
114,0	2,69	0,371
107,2	2,50	0,400
106,7	2,33	0,429
106,5	2,19	0,457
105,2	2,06	0,486
105,0	1,94	0,514
104,5	1,84	0,543
97,4	1,75	0,571
96,9	1,67	0,600
96,2	1,59	0,629
93,0	1,52	0,657
90,8	1,46	0,686
87,4	1,40	0,714
87,2	1,35	0,743
85,2	1,30	0,771
84,2	1,25	0,800
82,7	1,21	0,829
80,6	1,17	0,857
76,1	1,13	0,886
72,0	1,09	0,914
71,2	1,06	0,943

71,0	1,03	0,971
69,2	1,00	1,000

Applying the Normal distribution, the probable maximum heights of 1 day (h) were obtained for the return periods (Tr) of 2, 5, 10, 20, 50 and 100 years. The probable maximum heights (h) were estimated for the durations (t) of 5, 10, 15, 20, 25 and 30 minutes and for 1, 6, 8, 10, 12 and 24 hours. Table 7 shows the Maximum Probable Heights as a function of Duration and Return Period.

Table 7 - Probable Maximum Height

Duration (min)	Tr (years)					
	2	5	10	20	50	100
5	12,946	15,689	17,123	18,307	19,640	20,529
10	20,561	24,918	27,196	29,077	31,194	32,605
15	26,653	32,301	35,254	37,692	40,436	42,266
20	30,841	37,377	40,793	43,615	46,790	48,907
25	34,649	41,991	45,830	48,999	52,567	54,945
30	38,075	46,144	50,362	53,845	57,766	60,379
60	51,453	62,357	68,057	72,764	78,062	81,594
360	88,206	106,898	116,669	124,739	133,820	139,875
480	95,556	115,807	126,392	135,133	144,972	151,531
600	100,456	121,745	132,873	142,063	152,406	159,302
720	104,132	126,199	137,735	147,261	157,982	165,130
1440	122,508	148,470	162,041	173,248	185,862	194,271

With the probable maximum heights (h) for durations (t) of 5, 10, 15, 20, 25 and 30 minutes and 1, 6, 8, 10, 12 and 24 hours, the probable maximum intensities (i) were calculated. , for the same durations (t) of 5, 10, 15, 20, 25 and 30 minutes and 1, 6, 8, 10, 12 and 24 hours, shown in Table 8, given by the ratio of heights to duration times.

Tabela 8 - Probable Maximum Intensity

Duration (min)	Return Period (years)					
	2	5	10	20	50	100
5	2,5891258	3,137823	3,424636	3,661492	3,928072	4,105793
10	2,0560705	2,491800	2,719564	2,907655	3,119351	3,260483
15	1,7768511	2,153408	2,350241	2,512788	2,695736	2,817701
20	1,5420529	1,868850	2,039673	2,180741	2,339513	2,445362
25	1,3859438	1,679658	1,833188	1,959975	2,102674	2,197807
30	1,2691793	1,538148	1,678743	1,794849	1,925525	2,012644

60	0,8575536	1,039289	1,134286	1,212736	1,301031	1,359894
360	0,2450153	0,296940	0,324082	0,346496	0,371723	0,388541
480	0,1990749	0,241264	0,263316	0,281528	0,302025	0,315690
600	0,1674271	0,202909	0,221456	0,236772	0,254011	0,265503
720	0,1446271	0,175277	0,191298	0,204529	0,219420	0,229347
1440	0,0850748	0,103104	0,112528	0,120311	0,129071	0,134910

With the obtained results, the IDF curve was formulated for the study regions. For the basins under study, these values are different because they are sub-basins delimited along every 20 m in the study area, where the average t_c of 70.04 min is determined for their similar characteristics. The 25-year payback period was adopted because it is macrodrainage. The design precipitation intensity for $T_r = 25$ is given by Equation 3, where $T_r = 10$ and 50 and $t = t_c = 70,04$ for both basins.

Table 9 and 10 present the summary of the project flow calculation for the Bindá and Mundú project areas, respectively.

Table 9 – Project Flows (Q) of Bindá Water Course

EST	Point	Bi	H	H lâmina (10 year rain)	H lâmina (50 year rain)	Q PROJ (10 year)	Q PROJ (50 years)
0	1,00	7,93	2,26	6,64	7,61	118,94	136,4299
0+5	2,00	8,30	2,80	5,27	6,05	122,51	140,516
0+10	3,00	9,20	2,73	4,95	5,68	124,29	142,5591
0+15	4,00	9,00	2,73	5,13	5,89	126,07	144,6021
0+20	5,00	9,00	2,60	5,46	6,27	127,85	146,6452
0+25	6,00	13,22	2,95	3,32	3,81	129,63	148,6883
0+30	7,00	8,34	3,00	5,25	6,02	131,41	150,7313
0+35	8,00	8,83	2,90	5,20	5,97	133,19	152,7744
0+40	9,00	9,00	3,00	5,00	5,73	134,98	154,8174
0+45	10,00	9,00	2,42	6,28	7,20	136,76	156,8605

Table 10 – Project Flows of the Mindu Basin, Subbasin São Sebastião Water Course.

EST	Score	Bi (m)	H (m)	H lâmina- (m) - (rain 10 years)	H lâmina- (m) - (rain 50 years)	Q PROJ- (m³/s) - (10 years)	Q PROJ - (m³/s) - (50 years)
0	(0-1)	1,00	0,80	0,96	1,26	5,62	7,88
0+100	(1-2)	1,00	0,80	1,31	1,76	8,26	11,58
0+200	(2-3)	1,00	0,80	1,72	2,32	11,31	15,86

0+300	(3-4)	1,00	0,80	2,05	2,78	13,82	19,39
0+400	(4-5)	1,00	0,80	2,50	3,41	17,26	24,21
0+500	(5-6)	1,00	0,80	3,01	4,11	21,13	29,64
0+600	(6-7)	1,00	0,80	3,51	4,82	25,03	35,11
0+700	(7-8)	1,00	0,80	4,25	5,85	30,73	43,10
0+800	(8-9)	1,00	0,80	4,85	6,68	35,35	49,59
0+900	(9-10)	1,00	0,80	5,66	7,81	41,63	58,39
1+00	(10-11)	1,35	1,50	4,04	5,52	46,81	65,66
1+100	(11-12)	1,03	1,20	6,77	9,37	52,74	73,97
1+200	(12-13)	1,35	0,99	4,91	6,74	57,90	81,21
1+300	(13-14)	1,40	0,85	4,86	6,66	60,61	85,01
1+400	(14-15)	1,70	0,85	3,89	5,28	64,31	90,19
1+500	(15-16)	6,00	1,58	1,08	1,36	68,46	96,02
1+600	(16-17)	10,00	1,78	0,76	0,95	71,58	100,40
1+700	(17-18)	8,00	2,20	0,93	1,16	76,04	106,65
1+800	(18-19)	4,00	1,70	1,71	2,20	79,95	112,13
1+900	(19-20)	4,00	1,50	1,75	2,26	82,70	116,00
2+00	(20-21)	2,50	1,20	3,24	4,33	93,57	131,25
2+100	(21-22)	4,00	1,20	1,99	2,57	98,16	137,68
2+200	(22-23)	10,00	2,21	0,93	1,21	104,86	147,08
2+217	(23-24)	10,00	2,21	2,03	2,41	96,31	135,08

Figures 5 and 6 show the overflow of the Bindá and Mindú Water Course gutters, in the sections studied for a 10 and 50 year project rain.

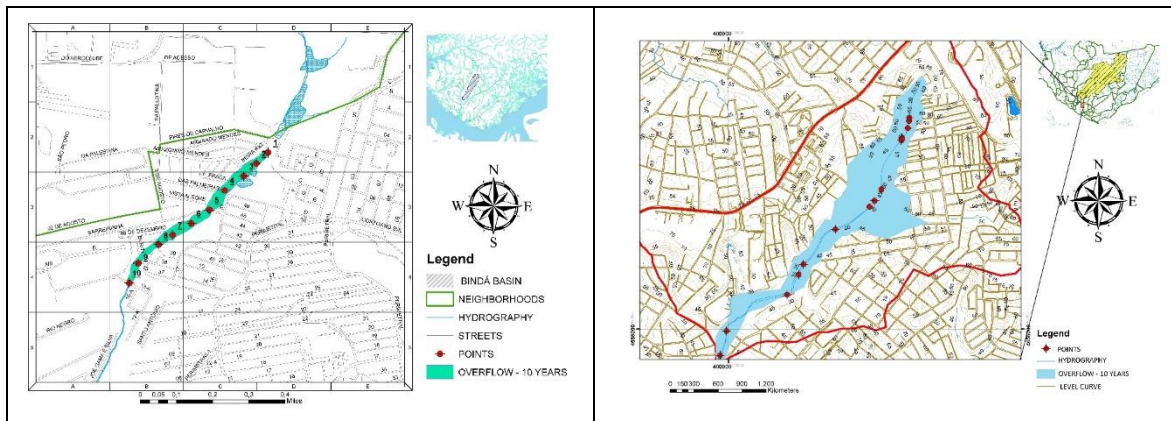


Figure 5: Delimitation of Points: a) Bindá Igarapé Sub Basin for 10-year rain; b) Mindú Igarapé Basin for 10-year rain.

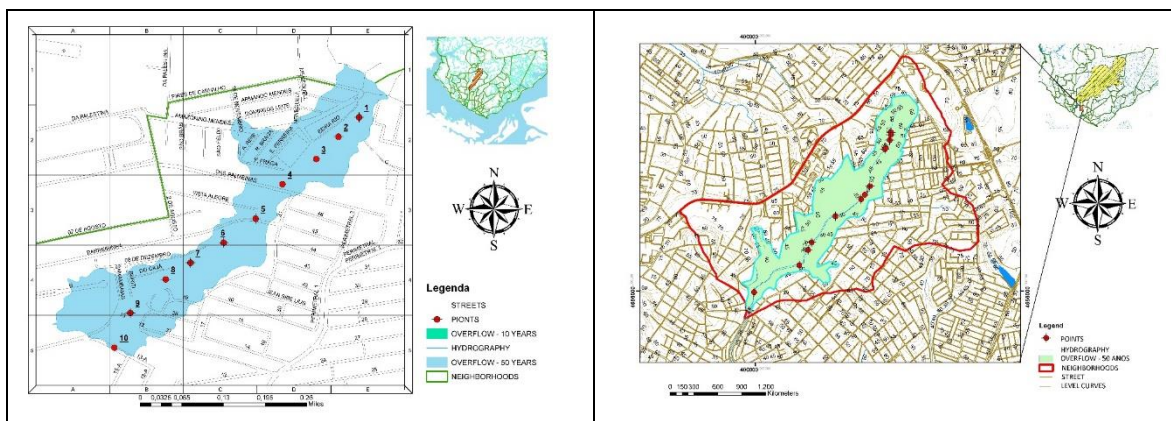


Figure 6: Delimitation of Points: a) 50-year-old Bindá Igarapé Sub-Basin for Rain; b) 50-year-old Rainwater Igarapé Sub Basin.

4. DISCUSSION

The physical coefficients of the studied basins indicate a good drainage capacity, but subject to peak flow due to intense precipitation due to its low concentration time.

The regions of the project are inserted in the same urban ecosystem of the city of Manaus has the same climatic characteristics of the rest of the city. However, the flood and ebb regime has no influence on the water levels of the Water Courses under study that are subject to the flow regime due specifically to the rainfall regime, as studied and shown in tables 3 and 4.

Overflowing of the gutters, caused by excessive soil sealing, generate high coefficients of return of water flow to the streams of the streams, which do not support the flow. A possible solution would be the widening and deepening of these channels, generating flow areas for the peak flow.

Figures 5 and 6 show a significant increase in the flooding area only with the change in rainfall recurrence time, also observed in field visits. It is observed that for a normal rainfall, with $Tr = 10$, the stream does not overflow, as opposed to $Tr = 50$, impacting a larger number of dwellings.

With the data obtained from the study, it is expected to generate a program that warns the riverine population, for possible floods before they occur. It is also possible to develop a program that calculates a new gutter profile, which includes the design flow, for the studied streams.

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Enhancing the Teaching and Learning of College Algebra with ColAlgMap

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Abstract

Teaching and learning lower level mathematics courses on the college level can be challenging and overwhelming. This paper will demonstrate how to design and develop a maplet package to aid in the teaching and learning of mathematics, to serve as a private tutor with infinite patience for college algebra students, and as a useful pedagogical tool for instructors. By using interactive worksheets and animated graphics in maplets, students will find the opportunity for numerous experiments that will foster their development of mathematical conceptual understanding and of computational skills.

Keywords: College algebra; teaching mathematics; learning mathematics; Maple; maplet;

1. Introduction

The Maple software is a computer algebraic system, a program that is able to manipulate information in a symbolic or algebraic manner. The symbolic capacity system makes Maple able to calculate exact analytical solutions of many mathematical problems. This makes Maple a powerful software program that can be used to solve general-purpose mathematical problems. While Maple math libraries are powerful, they do not explain the procedures and steps of solving the problems, and students need to learn the new and unfamiliar Maple language which may take away their precious studying time.

Maple has a package called maplet (see e.g. in Monagan M. B., et al., 2009, ErnieKamerich, 2011, Monagan M.B., 1998, Robert J. Lopez, 2012), which offers an ergonomic tool in the application. This package allows the possibility of creating windows, buttons, dialogues and other visual interfaces which interact with the

users. The maplet package is one of the effective ways to develop Graphical User Interface (GUI) applications. In short, a maplet allows a Maple software user to combine Maple math libraries and user procedures with interactive windows and dialogs. The authors use Maple as a support for the creation of a maplet package, namely ColAlgMap, which is an effective didactic tool to assist students and instructors in learning and studying College Algebra.

ColAlgMap creates both algorithmically-generated and user-entered problems while students are guided through the solution process. Students can find hints, receive immediate feedback with detailed explanations, and step-by-step checking of their responses with infinite patience. It is as effective as a private tutor. Instructors can also use ColAlgMap as an effective demonstration making use of the 2D/3D graphics and animations, and the ability to launch a maplet with a specific example or use it to create exam problems.

In short, ColAlgMap (i) allows students to find their own errors, to correct themselves, and to understand the question topic better; (ii) proves to be a powerful motivating force for encouraging students to take their homework seriously; (iii) provides collaboration among students in the completion of their assignments and projects. Therefore, ColAlgMap can balance the development of understanding and technical skills.

2. Material and Methods

Design and develop maplets to solve problems in a College Algebra course.

A complete maplet should be able to do the followings:

1. Allow students to enter or automatically generate new problems.
2. Describe problems graphically.
3. Allow students to check whether an answer is correct or not.
4. Allow students to solve problems step-by-step with instructions for each step.
5. Allow students to view solutions step-by-step or all steps at once.
6. Display meaningful messages together with colorful status bars to interact with the students' actions.
7. Provide hints.

Design a GUI which contains the following sections and buttons:

1. The "Problem" section describes a problem or a set of problems. Students can enter a new problem or generate a random problem by using the "Similar Problem" button.
2. The "Answer" section lets students input the final answer. Students can then use the "Check Answer" button to check for correctness.
3. The "Solution Window" section displays students' answers in correct mathematical symbols and detailed solutions step-by-step. Students can click on the "Solution" button to start the solutions. They will then use the "Next Step" or "Undo" button to navigate to the next step or to the previous one. The "All Steps" button is used to show all steps at once.

4. The “Interaction Window” section displays meaningful messages to tell students if their answers are correct or not, or detailed instructions for each step when the students try to solve the problems step-by-step. At each step, students will read the instructions in the “Interaction Window” and input their answers in the boxes below the “Check Step #” button. These boxes are dynamic fields which will display differently depending on each different step. Students will use the “Check Step #” button to check for the correctness of each step and corresponding messages will be displayed in the “Interaction Window”. The maplet only goes to the next step if the current step is correctly evaluated and the correct step is appended to the “Solution Window”. At each step other than the final one, students can also use the “Next Step” button to view the correct answer in the “Solution Window”.
5. The “Plot Window” section describes the problem graphically. Students will check the box “Show Graph” to view the pictures. This check box will only be activated when the “Solution” button is activated.
6. The “Help” button will provide the necessary material and techniques for solving the problem.
7. Two status bars at the bottom use many different colors to give additional response to the students’ answers such as green for a correct answer, red for a wrong answer, orange for a wrong input, or yellow for choosing “Next Step” and letting the maplet finish the step automatically. The number of short bars on the right is the number of steps students are expected to go through to finish the solutions of the problem. The black color of the short bars indicate the remaining steps. Each short bar will change color to green, red, or yellow corresponding to the response to the students’ answers for each step.

All the sections above can be implemented using Maple components and packages such as Label, TextField, TextBox, Button, RadioButon, DropDownBox, CheckBox, Plotter, MathML and MathMLViewer. Moreover, since the “Solution Window” contains both English and symbolic expressions, MathML encoding has to be rendered manually in order to display correct indentations and spacing.

For example,

“The following expression is 10 pixels below:

$a^2 + b^2$ ” can be represented semantically by the Presentation MathML as

```

<math>
  <mtext>The following expression is 10 pixels below:</mtext>
  <mspace linebreak='new line' /> <mspace height = "10px" />
  <mrow>
    <mrow>
      <msup>
        <mi>a</mi>
        <mn>2</mn>
      </msup>
    </mrow>
    <mo>+</mo>
    <mrow>
      <msup>
        <mi>b</mi>
        <mn>2</mn>
      </msup>
    </mrow>
  </mrow>
</math>

```

3. Result

To be able to demonstrate the usefulness of ColAlgMap, the following maplet had been used to solve a class of circle problems during a College Algebra course at the University of North Georgia. The maplet in figure 1 contains five problems and the first problem is currently selected.

College Algebra - Equation of a Circle

Problem

Find an equation of the circle that satisfies the given conditions

☒ Center(,) and radius

☐ Center(,); passes through P(,)

☐ End points of a diameter are P(,) and Q(,)

☐ Center(,); tangent to the -axis

☐ Lies in quadrant , tangent to both x- and y-axes; radius

Answer

Equation of the circle:

Solution Window

Plot Window

Interaction Window

Figure 1. Find an equation of the circle that satisfies the given conditions: Center (-1, 1) and radius 2.

Figures 2 through 12 demonstrate how to use the maplet to solve the problem: “Find an equation of the circle that satisfies the given conditions: End points of a diameter are $P(3, 0)$ and $Q(3, 7)$ ”.

Figures 2 and 3 demonstrate how students check an answer. The maplet in figure 2 displays the student’s answer in a readable form in the “Solution Window”, instructive feedback in the “Interaction Window”, and changes the status bar at the bottom right to red to indicate the answer is incorrect. The maplet responses to the correct student’s answer in the “Interaction Window” of figure 3. Notice that the bottom right status bar changes from red to green.

College Algebra - Equation of a Circle

Problem

Find an equation of the circle that satisfies the given conditions

☐ Center(,) and radius

☐ Center(,); passes through P(,)

☒ End points of a diameter are P(,) and Q(,)

☐ Center(,); tangent to the -axis

☐ Lies in quadrant , tangent to both x- and y-axes; radius

Answer

Equation of the circle

Solution Window

Your answer is $(x-3)^2 + \left(y - \frac{7}{2}\right)^2 = \frac{7}{2}$

Plot Window

Interaction Window

Good effort, but your answer is not correct. Please try again.

Figure 2. “Check Answer” is clicked for incorrect answer.

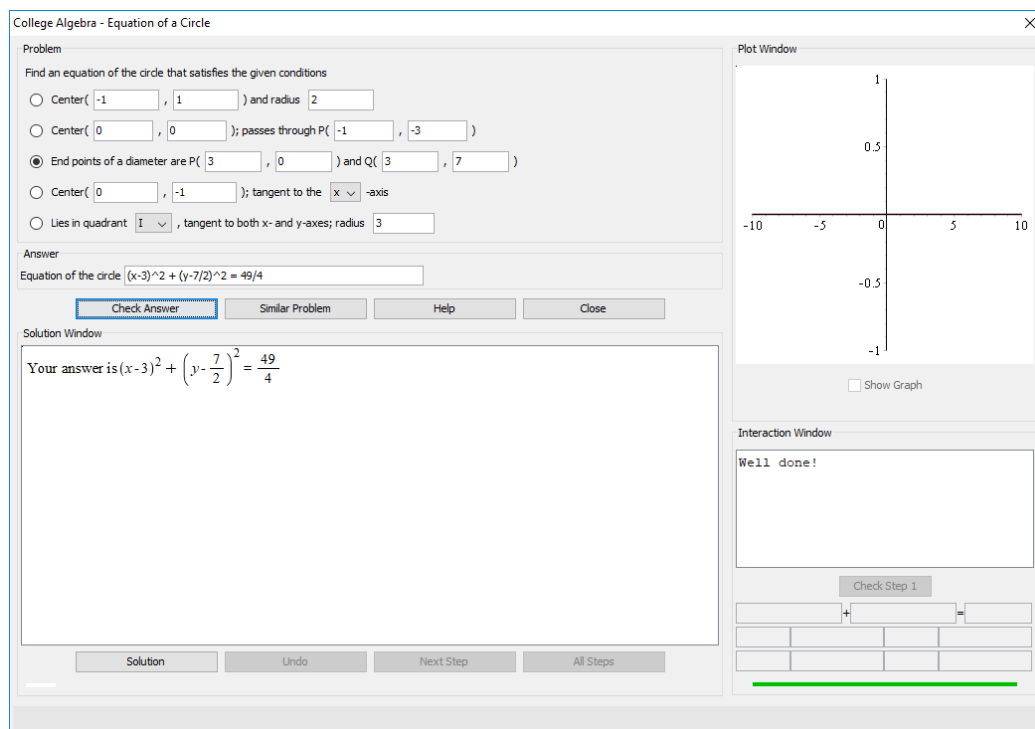


Figure 3. “Check Answer” is clicked for correct answer.

Figure 4 demonstrates when the student would like to see all steps of the solution at once by clicking on “Solution” and then “All Steps”. The detailed solution is shown in the “Solution Window”. The status bars changes to yellow to indicate the problem is solved automatically. Moreover, the five short status bars at the bottom right imply there are five steps to the solution.

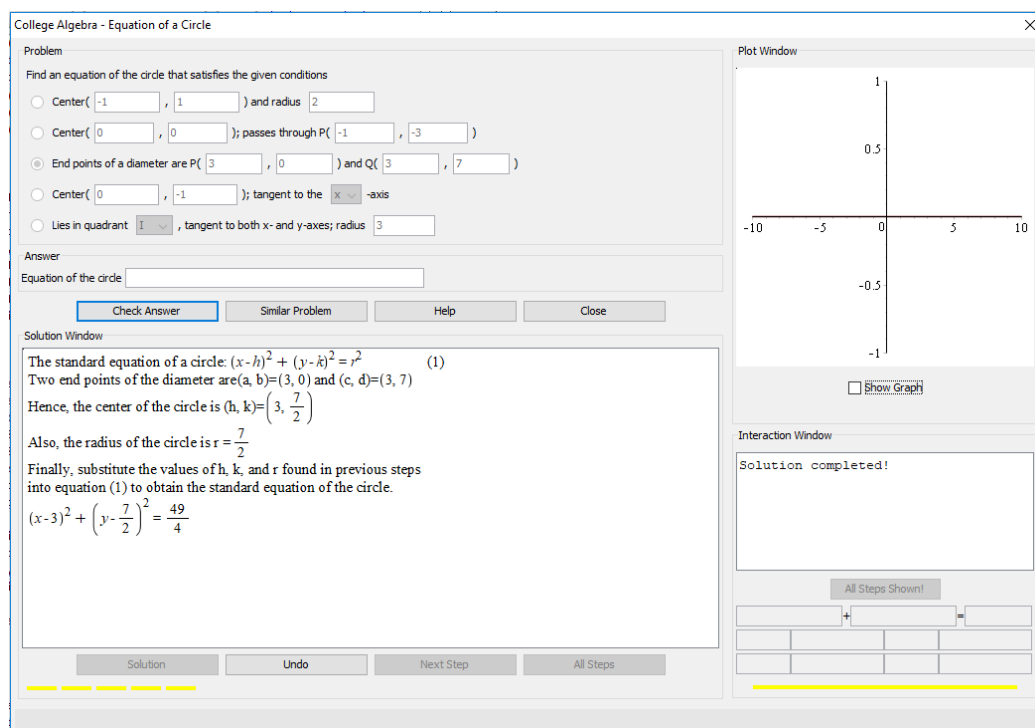


Figure 4. “All Steps” is clicked and the completed solution is shown.

Figures 5 through 10 demonstrate when the student would like to do the problem step-by-step by first clicking on the “Solution” button. The instructions for each step are shown in the “Interaction Window”. The student can do the current step by entering the input in the boxes below the “Check Step #” button and then clicking on this button. Figure 6 shows that “Check Step 1” gives an incorrect answer. A message is displayed in the “Interaction Window”, the first status bar on the bottom left, and the one on the bottom right, change to red to indicate the first step is incorrect. If an answer is correct, a congratulating message is received, and the instructions for the next step are displayed in the “Interaction Window” as seen in figure 7. Also, the status bars change to green and the correct answer for step 1 is appended to the “Solution Window”. If the student would like to see the step without doing it, he or she can click on the “Next Step” button. Figure 8 shows that step 2 is skipped. The answer to this step is appended in the “Solution Window” and the status bars change to yellow. Figures 9 through 11 demonstrate the rest of the solution step-by-step. In any step, the student can check the box “Show Graph” to see the graphical description of the problem as shown in figure 12.

Figure 5. “Solution” is clicked and Step 1’s instruction is shown.

College Algebra - Equation of a Circle

Problem

Find an equation of the circle that satisfies the given conditions

☐ Center(,) and radius

☐ Center(,); passes through P(,)

☒ End points of a diameter are P(,) and Q(,)

☐ Center(,); tangent to the -axis

☐ Lies in quadrant , tangent to both x- and y-axes; radius

Answer

Equation of the circle

Solution Window

Plot Window

☐ Show Graph

Interaction Window

Good effort, but your answer is not correct. Please try again. Step 1. Enter the standard equation of a circle using variables x and y for the horizontal and vertical axes,

$(x-h)^2 + (y-k)^2 = r^2$

Figure 6. "Check Step 1" is clicked for incorrect answer.

College Algebra - Equation of a Circle

Problem

Find an equation of the circle that satisfies the given conditions

☐ Center(,) and radius

☐ Center(,); passes through P(,)

☒ End points of a diameter are P(,) and Q(,)

☐ Center(,); tangent to the -axis

☐ Lies in quadrant , tangent to both x- and y-axes; radius

Answer

Equation of the circle

Solution Window

The standard equation of a circle: $(x-h)^2 + (y-k)^2 = r^2$ (1)

Plot Window

☐ Show Graph

Interaction Window

Excellent! Step 2. The center (h,k) of the circle is the midpoint of a diameter. Enter the end points (a,b) and (c,d) of the diameter in the boxes below.

$(x-h)^2 + (y-k)^2 = r^2$

a= b=
 c= d=

Figure 7. "Check Step 1" is correct and move to step 2.

College Algebra - Equation of a Circle

Problem

Find an equation of the circle that satisfies the given conditions

☐ Center(,) and radius

☐ Center(,); passes through P(,)

☒ End points of a diameter are P(,) and Q(,)

☐ Center(,); tangent to the -axis

☐ Lies in quadrant , tangent to both x- and y-axes; radius

Answer

Equation of the circle

Solution Window

The standard equation of a circle: $(x-h)^2 + (y-k)^2 = r^2$ (1)

Two end points of the diameter are $(a, b) = (3, 0)$ and $(c, d) = (3, 7)$

Plot Window

☐ Show Graph

Interaction Window

Step 3. Enter the center (h, k) of the circle, which is the midpoint of (a, b) and (c, d) , in the boxes below.

$(x-h)^2 + (y-k)^2 = r^2$
 $h =$ $k =$

Figure 8. "Next Step" is clicked and move to step 3.

College Algebra - Equation of a Circle

Problem

Find an equation of the circle that satisfies the given conditions

☐ Center(,) and radius

☐ Center(,); passes through P(,)

☒ End points of a diameter are P(,) and Q(,)

☐ Center(,); tangent to the -axis

☐ Lies in quadrant , tangent to both x- and y-axes; radius

Answer

Equation of the circle

Solution Window

The standard equation of a circle: $(x-h)^2 + (y-k)^2 = r^2$ (1)

Two end points of the diameter are $(a, b) = (3, 0)$ and $(c, d) = (3, 7)$

Hence, the center of the circle is $(h, k) = \left(3, \frac{7}{2}\right)$

Plot Window

☐ Show Graph

Interaction Window

Good job!

Step 4. The radius of the circle is half of its diameter. Enter the exact value of the radius by computing the distance between (a, b) and (c, d) in the box below.

$(x-h)^2 + (y-k)^2 = r^2$
 $r =$

Figure 9. "Check Step 3" is correct and move to step 4.

College Algebra - Equation of a Circle

Problem

Find an equation of the circle that satisfies the given conditions

☐ Center(-1 , 1) and radius 2
☐ Center(0 , 0); passes through P(-1 , -3)
☒ End points of a diameter are P(3 , 0) and Q(3 , 7)
☐ Center(0 , -1); tangent to the x-axis
☐ Lies in quadrant I, tangent to both x- and y-axes; radius 3

Answer

Equation of the circle:

Check Answer Similar Problem Help Close

Solution Window

The standard equation of a circle: $(x-h)^2 + (y-k)^2 = r^2$ (1)

Two end points of the diameter are $(a, b)=(3, 0)$ and $(c, d)=(3, 7)$

Hence, the center of the circle is $(h, k)=\left(3, \frac{7}{2}\right)$

Also, the radius of the circle is $r = \frac{7}{2}$

Solution Undo Next Step All Steps

Plot Window

Interaction Window

Great work!
Final Step. Substitute the values of h, k, and r found in previous steps into equation (1) to obtain the standard equation of the circle. Enter this equation in the boxes below.

Check Step 5

$(x-3)^2 + (y-7/2)^2 = 49/4$

Figure 10. "Check Step 4" is correct and move to step 5.

College Algebra - Equation of a Circle

Problem

Find an equation of the circle that satisfies the given conditions

☐ Center(-1 , 1) and radius 2
☐ Center(0 , 0); passes through P(-1 , -3)
☒ End points of a diameter are P(3 , 0) and Q(3 , 7)
☐ Center(0 , -1); tangent to the x-axis
☐ Lies in quadrant I, tangent to both x- and y-axes; radius 3

Answer

Equation of the circle:

Check Answer Similar Problem Help Close

Solution Window

The standard equation of a circle: $(x-h)^2 + (y-k)^2 = r^2$ (1)

Two end points of the diameter are $(a, b)=(3, 0)$ and $(c, d)=(3, 7)$

Hence, the center of the circle is $(h, k)=\left(3, \frac{7}{2}\right)$

Also, the radius of the circle is $r = \frac{7}{2}$

Finally, substitute the values of h, k, and r found in previous steps into equation (1) to obtain the standard equation of the circle.

$(x-3)^2 + \left(y-\frac{7}{2}\right)^2 = \frac{49}{4}$

Solution Undo Next Step All Steps

Plot Window

Interaction Window

Fantastic!
Solution completed!

All Steps Shown!

$(x-3)^2 + (y-7/2)^2 = 49/4$

Figure 11. "Check Step 5" is correct and the solution is completed.

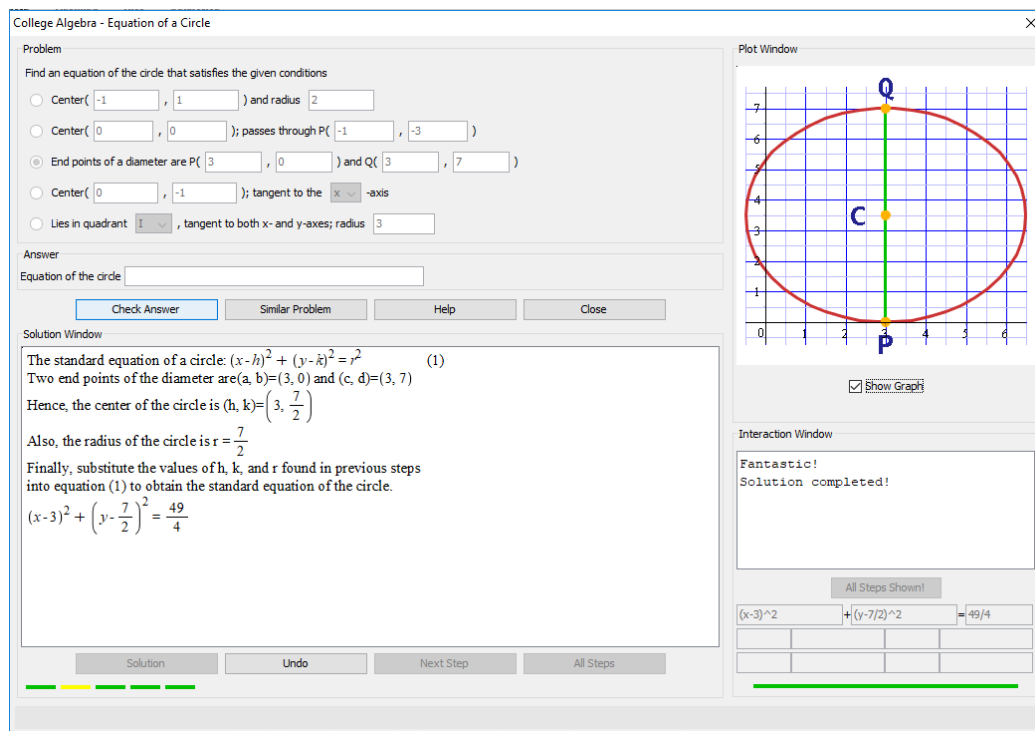


Figure 12. “Show Graph” is checked and the graph is displayed.

The student can also practice more problems by clicking on the “Similar Problem” button. The maplet will generate a new version of the chosen problem as shown in figure 13.

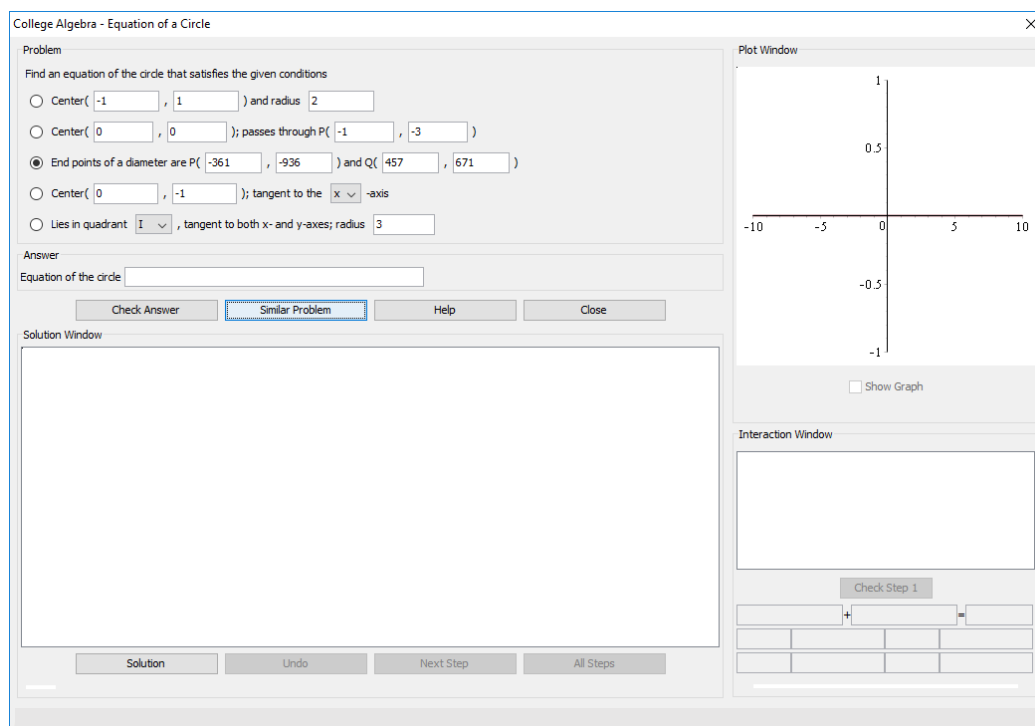


Figure 13. “Similar Problem” is clicked and new points are generated P (-361, -936) and Q (457, 671) for the selected problem.

Figures 14 through 17 show other problems in finding an equation of the circle that satisfies different given conditions and their corresponding detailed solutions when “All Steps” is clicked and “Show Graph” is

checked.

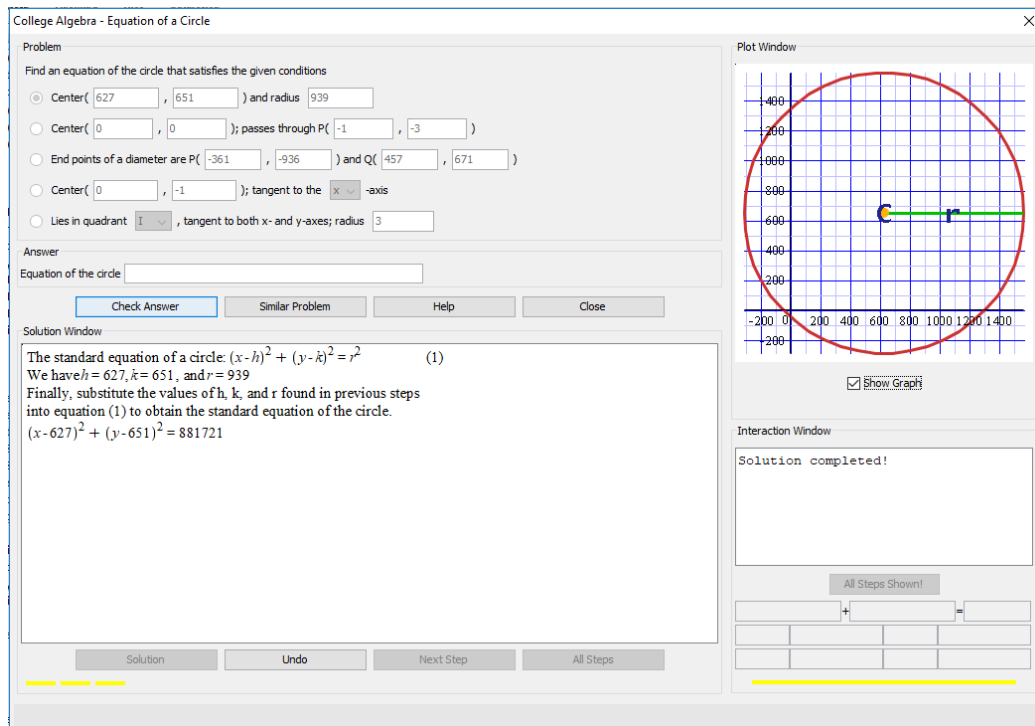


Figure 14. Center (627, 651) and radius 939.

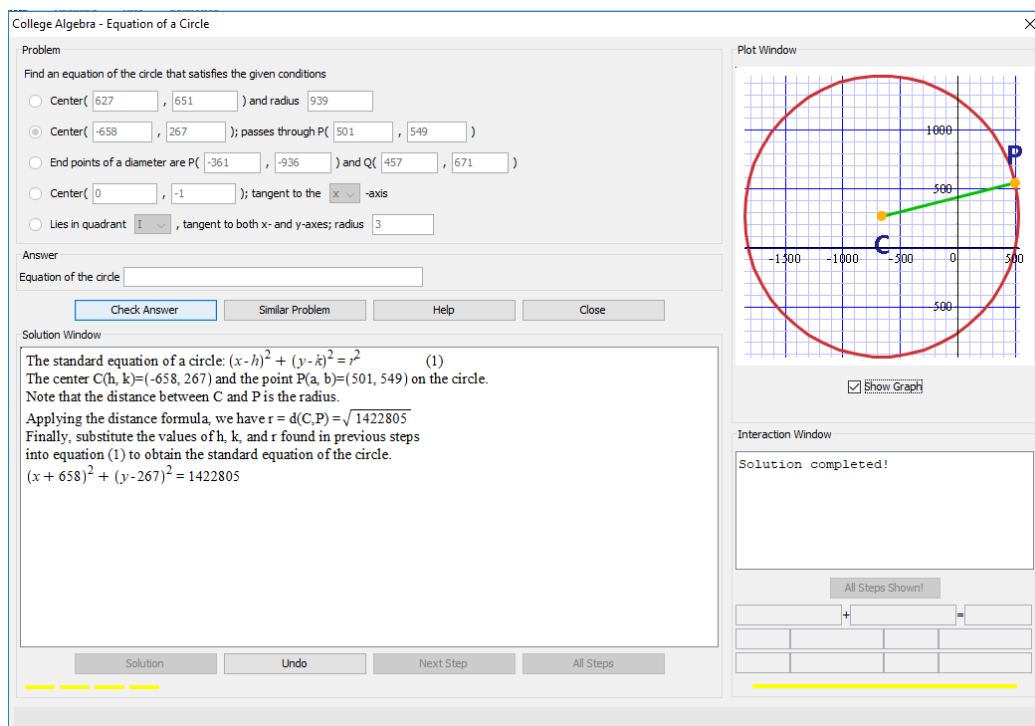


Figure 15. Center (-658, 267); passes through P (501, 549).

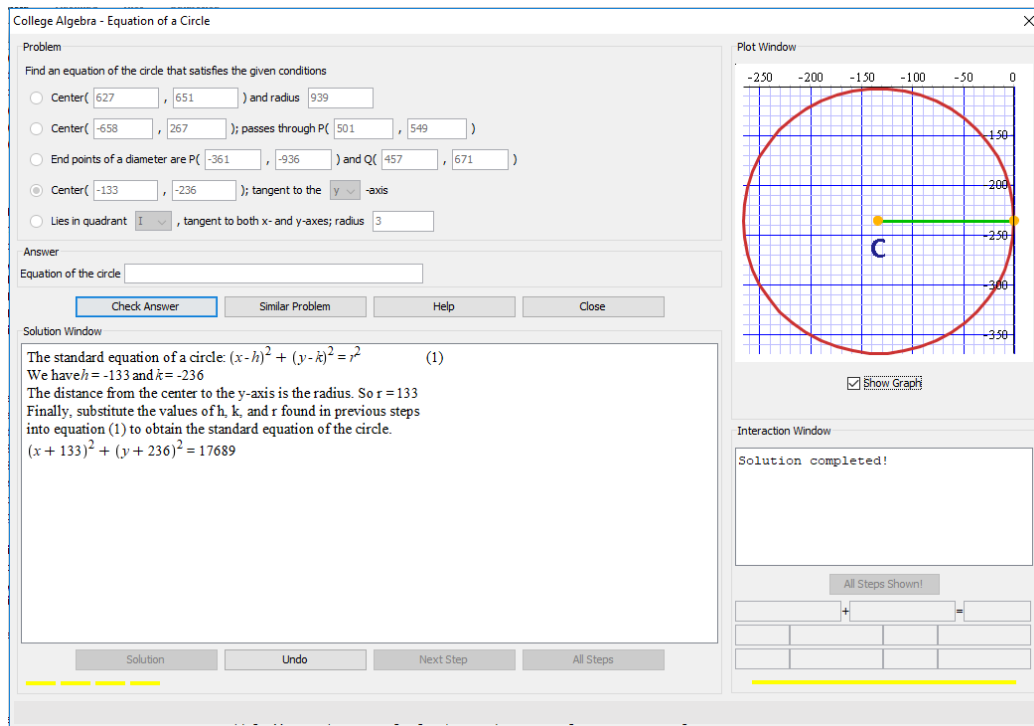


Figure 16. Center (-133,-236); tangent to the y-axis.

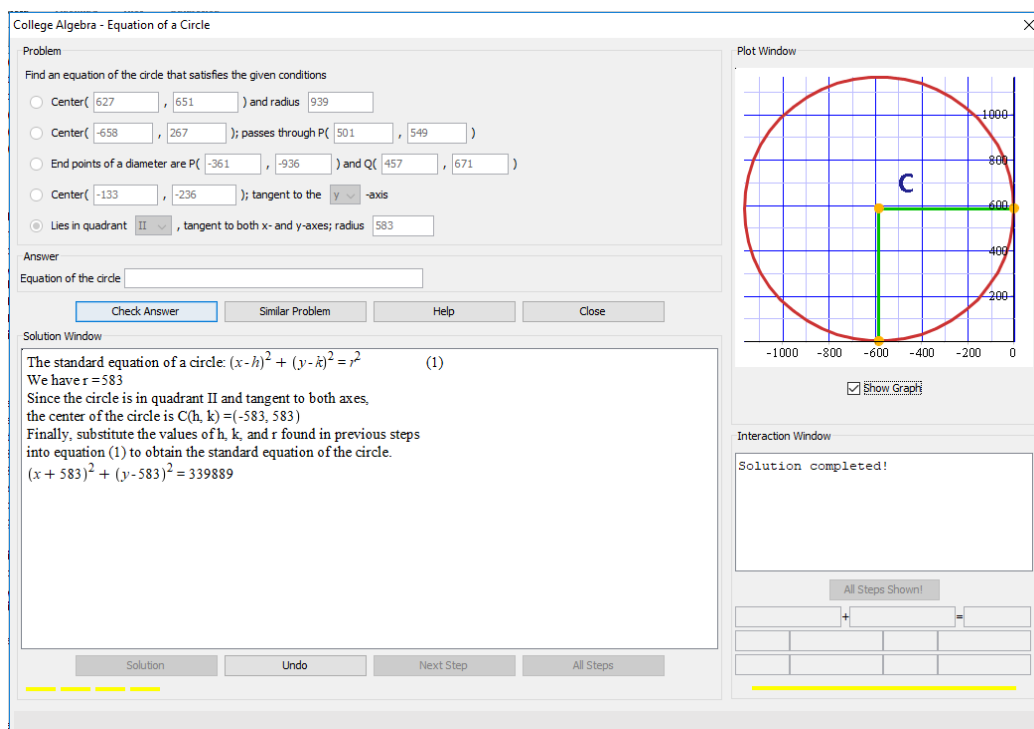


Figure 17. Lies in quadrant II, tangent to both x- and y-axis; radius 583.

4. Conclusion

ColAlgMap significantly helps instructors manage a large pool of students, and also provides students with adequate practice to prepare for their courses. It can be used for demonstrations in lectures to reveal a new concept, as a group activity in a lab setting, or as a drill-and-practice tutor for individual students. The

maplets support both randomly generated problems as well as user-entered problems. This allows students to enter a specific problem from another source. Also, the algorithmically-generated problems allow students to work on different problems and to use their experience to derive a general method for a class of similar problems. For example, the Equation of a Circle maplet provides a general idea for finding the equation of a circle by first identifying its Center and Radius.

ColAlgMap uses a combination of symbolic, graphic (2D/3D, sometimes with animation), numeric, and verbal devices to investigate problems. Moreover, immediate feedback and the program's infinite patience are two features students can find very helpful. ColAlgMap can guide students to work through problems step-by-step. Correct answers to earlier steps are required before moving on to later steps. Hints are available, and when errors are detected, instructive feedback is provided. All of this enables students to use ColAlgMap as a tutor without the physical tutor in the convenience of their dorms or at home, without unwarranted stress.

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A Pragmatic Contrastive Analysis of Greeting Strategies in Jordanian Arabic and English

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Abstract

The aim of this research paper is to find the similarities and differences that exist in the sociolinguistic dimensions of greeting forms and strategies in Arabic and English. A DCT instrument was used to collect data from a sample that consisted of 30 Second Secondary Grade Students in North Ghore Directorate of Education. The results revealed that there are varied forms and patterns of Arabic in contrast with English according to Halliday's classification (1979) of time-free and time-bound forms. Moreover, it was found that oral speech strategies were most common in the Arabic language than the English one.

Key words: speech acts, illocutionary acts, verbal greeting

Introduction

Language is a means of communication. As Woods (2006) points out, language is more than just sounds, words and sentences. In using language, we intend to convey particular meanings, and our utterances have consequential effects on our addressee(s). So getting learners, especially EFL learners, more familiar with the functional aspects of the language will develop their communicative competence which is a significant factor for effective communication.

People use language to accomplish such functions as greeting, apologizing, forgiving, etc. These functions, basically, are speech acts that are used in particular discourse environment. EFL learners in most situations tend to translate these speech acts from their first language to the target language. Such expressions may create pragmatic failure in communication with native speakers of English. So, an understanding of speech acts as they are realized in the English language contributes a lot in achieving communicative competence in the target language (Negargar, 2015).

The term speech act was proposed by Austin (1962), and was further developed by his student Searle (1969). The speech act theory analyzes the functions of statements in accordance with the behavior of speakers and listeners in conversation. According to Austin, utterances are the production of words and

sentences on particular occasions by particular speakers for particular purposes. They are not ends in themselves, but means to ends. He asserts that “Speech acts consists of locutionary acts which have a meaning, illocutionary acts which have a certain force in saying something, and perlocutionary acts which achieve certain effects by saying something.” (Austin, 1962: 120).

Illocutionary acts are conventional acts that differ mainly in their immediate purpose. There are thousands of possible illocutionary acts, such as requests, complaints, promises, etc. According to Austin (1962), there are five types of illocutionary acts:

- Assertives: used for expressing a belief, e.g. ‘John is in the library.’
- Directives: used to get the addressee to do things, e.g. ‘Please close the door.’
- Commissives: used to express future action, e.g. ‘I’ll wash the dishes.’
- Expressives: used to express certain feelings toward the addressee, e.g. thanking, apologizing, greeting, etc.
- Declaratives: used to declare the reality, e.g. abdicating, and declaring war.

According to the above classification of illocutionary acts, greetings fall into the category of ‘expressive’. When an English speaker says ‘Hi, how are you?’, he is not concerned much about your physical condition, but showing his politeness in terms of greeting.

Greetings are important and frequent in social interactions all over the world. People cannot start their conversation without a greeting. Consequently, greeting is one of the most repeating expressive speech acts in our life (Jibreen, 2010). Appropriate greeting behavior is crucial for the establishment and maintenance of interpersonal relationships. As a significant aspect of politeness phenomenon, greetings have been studied in disciplines such as sociology, anthropology, sociolinguistics and discourse analysis (Wei, 2010).

The speech act of greeting is considered as a mirror that reflects a particular culture. Duranti (1997) shows us that greeting forms have their correlation with the culture of the speaker. The speech act of greeting reveals more cultural, personal and historical information about the person who utters it or about the nation who use that particular greeting form. Jibreen (2010) also noticed that forms of greeting vary extensively, and that speakers have different forms of greeting for each type or status of person.

In Muslim society, the most common verbal greeting is as- salamu‘alaykum ‘peace be upon you’. This is, according to the Qur’an, how people will be greeted by the angels as they enter Paradise, and it is also the way they greet their fellow humans. The most common reply is walaykum as-salam, ‘and upon you, too, peace’. However, one of the guidance in Qur’an is that “when you are greeted with a greeting, greet with one fairer than it” (Surat An-Nisa', 86), which means that you are invited to redouble the greeting back and out-greet the greeter, as in wa‘alaykum as-salam wa-rahmatullahi wabarakatuhu, which means ‘on you be peace, God’s mercy and His blessing’ (Kirdasi, 2013).

In this paper, the researcher focuses on Arabic and English greetings and draws out some differences in terms of content, semantics, syntax and lexis. Then, some implications for language teaching are presented so that learners can avoid pragmatic transfers from their native language to the second one. The researcher hopes that through the paper, readers will have a deep look into two languages in terms of greetings.

Purpose of the Study

It can be argued that, if there are important differences in the way greetings work within and between ethnic groups who speak different varieties of the same language, there will be greater differences across speech communities where totally different languages are spoken. Thus, the purpose of this study is to reveal the most frequently used forms and strategies of greeting in Arabic and English. One aim of the study is the cross-cultural realization of speech act of greetings, while the other is the linguistic realization of greetings.

Questions of the Study

This study aims at finding answers to these questions:

1. What are the most frequently used forms and strategies of greetings in Arabic and English?
2. What kind of differences and similarities exist in the sociolinguistic dimensions of greeting forms and strategies in Arabic and English?

Significance of the Study

This study is significant in the sense that it explores an area of intercultural pragmatics that has not, to the best of the researcher's knowledge, been sufficiently explored. It might be the only study that investigates greeting forms and strategies in the Arabic and English. Other studies examine greetings in English and other languages. For example, Negargar (2010) studies English and Persian greeting forms, while Meirbekov, Elikbayev, Meirbekov and Temirbaev (2015) explore the sociolinguistic aspects of the speech act of greeting in the Kazakh and English languages.

Review of Related Literature

Different studies have been conducted on greetings in various cultures. 'Greeting' according to Austin's classification (1962) is considered as a kind of performatives concerns behavior towards others to exhibit attitudes and feelings. It is worthy to note that Austin's performatives are included amongst Searle's expressives.

Ferguson (1967) examined the use of interpersonal verbal routines such as greetings and thanks as a universal phenomenon of human languages, related in some way to the widespread 'greeting' behavior of other animals. Examples from Syrian Arabic, American English, and other languages are used to show

differing patterns of structure and use. He considered greeting expressions as an example of "a politeness formula". He said that these expressions are used in different contexts. He also added that greeting expressions are important for their presence or absence in a certain context rather than the specific meaning their constituent parts convey

Goffman (1971) analyzed the rules and rituals of certain social behavior. He described greeting acts as "access rituals" composed of two patterns: passing greetings and engaging greetings. The functions of these patterns of greeting are similar, both of them opens or closes relations. He came up with three generalizations in interpreting greeting behavior. "First, exchanges serve to reestablish social relations, second, acknowledgement of a differential allocation of status, and third, when greetings are performed between strangers, there is an element of guarantee for safe passage" (1971:74).

Firth (1973) also referred to greeting act as rite with verbal and non-verbal forms. The first one can occur in one of the three stated below linguistic unit forms:

- In question forms ("How do you do?", "How are you?" and so on.)
- In interjection forms ("Hello", "Hi" and so on.)
- In affirmation forms ("Good morning", "Good evening" and so on.)

And the second one can be expressed by gestures and mimics or in other words by body language.

Bach and Harnish (1979:51) classified greetings as 'acknowledgments', their reformulation of Austin's behabitives and Searle's expressives. Acknowledgements express "perfunctorily if not genuinely, certain feelings toward the hearer". These feelings and their expressives are appropriate to particular sorts of occasions. 'Greetings', for example "express pleasure at meeting or seeing someone". Such definition assumes that greetings have propositional contents, i.e., pleasure at seeing or meeting someone.

Laver (1981) viewed greeting exchanges as having three components: formulaic phrases, address forms, and phatic communion or small talk (e.g. Nice day). Laver applied the notion of routine to all three categories, thus proposing that greeting exchanges as a whole are routine rituals. In short, greetings are composed of several interlinking behaviors: (1) salutation or the verbal linguistic form, (2) term of address, (3) body language, and (4) social context.

Lungstrum (1987) studied two paradigms for hailing in Kekchi (Mayan) in Pueblo Viejo, Belize. He discussed the nature and use of greeting in that particular culture in India. He found that the form of greeting that was used by people would indicate special social reference to the status of the speaker and addressee, the period of the meeting and the degree of friendliness.

Al-Abdul Halim (1994) studied greetings in Jordanian Arabic. His data were collected from many public places such as hospitals and universities. He revealed many forms for each greeting and that some greetings were used more than others. He affirmed that the relation between the speakers and the addressees affects the choosing of the right greeting.

Ebsworth, Bodman and Carpenter (1996) state that greetings are complex speech acts which involve wide range of behaviors. Greetings in English are made up of a range of linguistic and non-verbal choices

which may include a simple wave or smile, a single utterance or a lengthy speech act set. English greetings have different pattern and role compared to greetings in other cultures such as: Persian (Salmani-Nodoushan, 2007), Vietnam (Hang, 2009), Ghanaian (Sekyi-Baidoo& Koranteng, 2008) and China (Li, 2009).

Ebsworth, et al. (1996) classified eight types of greeting by native speakers. 1) **Greetings on the run**: It is greeting among intimates and acquaintances. 2) **Speedy greeting**: It begins and ends abruptly through which the information is exchanged. 3) **The chat**: This greeting includes a short discussion on a topic or two before either leave-taking or the real purpose of the communication is introduced. 4) **The long greeting**: involves reestablishing bonds between two people after a period of separation. 5) **The intimate greeting**: occurs between people who know each other well and speak frequently. 6) **All-business greeting**: It is sometimes characterized with a very short preliminary greeting or, sometimes, no greeting at all. 7) **The introductory greeting**: involves greeting between two people who are meeting for the first time. 8) **The re- greeting**: involves acknowledging someone you have greeted earlier or see repeatedly during the day. It can involve a nonverbal gesture (a nod or a wave) or a few quick words which refer to a shared topic.

Nodoushan (2007) carried out a study to compare English and Persian greeting forms. He provided some examples and explanations for the most common used greetings in English. The corpus used for the study comprised of Persian greetings used in naturalistic contexts, and English greetings used in movies and other video or audio media. The analyses revealed two patterns for English greetings and five patterns for Persian greetings.

Meirbekov, Elikbayev, Meirbekov& Temirbaev(2015) investigated the sociolinguistic aspects of the speech act of greeting and its differences with regard to forms of greeting in the Kazakh and English languages. The focus of the study was on the descriptive sociolinguistic analysis of the speech act of 'greeting' in the Kazakh and English languages and the ways of exchanging greetings. Methods used in collecting data were a questionnaire, an observation, an interview, introspection and statistical analysis. The materials which were analyzed involved Kazakh greetings that took place in real-life, and English greetings occurred in audiovisual materials from the internet. The results showed that social contexts had their influence on expressing the speech act of greeting in both Kazakh and English languages, and that each language has its own peculiarities and some similarities.

Negargar (2015) investigated the structure, formality level and the frequency of the greeting speech acts in two Persian and English soap operas in a contrastive way in order to find out differences in this particular type of speech acts. Searl's (1979) classification of speech acts was applied to accomplish the purpose of the study. The study focused on the interactions among the characters. The findings of this survey can provide some insights into the importance of teaching culture as well as making learners aware of the functional roles of a language.

Inawati (2016) analyzed the pragmatic content of nine school textbooks intended for use in Indonesian secondary schools. The article examined how greetings are linguistically presented in the textbooks and whether adequate metapragmatic information is provided to facilitate the learning of the greetings. The analysis showed that less various types of greetings were presented in the textbook and meta-pragmatic information was limited.

Greetings are often people's first impressions of one another; therefore, learning how to greet someone appropriately is important in making a good first impression and avoiding pragmatic failures. Greetings, then, are Austin's (1962) perlocutionaries, Searle's (1969) expressives, Bach and Harnish's (1979) acknowledgements, Ferguson's (1967) politeness formula and Goffman's (1971) access rituals. Many studies have been conducted on the speech act of greetings, and greetings in different cultures (for example, Nodoushan, 2007; Meirbekov et al, 2015 and Negargar, 2015). While different researches have been done on Arabic greeting strategies or English greeting strategies, no previous study put Arabic and English greetings in comparison.

Methodology

Sample of the Study

The sample consisted of 30 students from Second Secondary Grade (Tawjihi) in Al-Shuna Secondary School for Girls in North Ghore Directorate of Education, Jordan. They were selected purposefully.

Instrumentation, Data Collection and Analysis Procedures

To achieve the purpose of the study, a Discourse Completion Test (DCT) was used (see appendix A). The format of the DCT consists of 10 conversational situations regarding greeting. To check the validity of the instrument, it was given to two TEFL professors at Yarmouk University. One professor recommended using a university in an Arabic country instead of a foreign one in situation three to be closer to students' real life (see appendix A). The other professor suggested using "the Eid" instead of "Eid party" in situation one so as to distinguish it from a name of a person called "Eid" (see appendix A). Thus, the researcher took these notes into consideration in building the instrument.

The subjects of the study were asked within a class period to read the situations carefully and write down how they would react to the situations in Arabic then in English. After collecting the questionnaire, the responses were classified into two forms: Time-free greetings and time-bound greetings (Halliday, 1979).

The researcher selected the forms to be described, then provided a full description of greeting forms in Arabic and English using Halliday's classification (1979) (see Appendix B). Finally, the researcher compared and contrasted the greeting forms in Arabic and English to come up with similarities and differences between the two languages.

1. English Greeting Forms

Halliday (1979) uses time-free greetings and time-bound greetings according to American society since each society has its own particular customs and ways of acting. However, Halliday (1979) states that generalizations about American manners, customs and greetings are difficult to make. The following are the suggested forms of time-free greetings and time-bound greetings:

1. Time-free greetings:

(How do you do? Hello/Hi. How are you? Glad to meet you! Good / Nice to see you!)

2. Time-bound greetings

-Daily formal greetings: (Good morning, Good afternoon, Good evening, Good day, Good night).

-Seasonal (in) formal greetings: (Happy New Year! Happy Anniversary! Happy Easter! Happy Birthday (to you)! Many happy returns (of the day)! Merry Christmas! (Halliday, 1979)

Halliday cited in Nodoushan (2006:10) states that American society has a certain amount of informality especially in customs of introductions and greetings. Generally speaking, Americans ignore social status. When a person meets an acquaintance on the street, the most common greeting form in the United States is "Hello." It is uttered on most formal occasions. In spite of the informality of Americans, they use somewhat formal language when talking to superiors. More formal greetings are "Good morning," "Good afternoon," and "Good evening."

This is as far as the American society is concerned, what about the British one? Greese (1991:43,45) states that generally, English people are formal, polite, indirect and cold as opposed to the Americans where they are informal, loud, direct and pseudo-friendly. In addition to that, Americans use first names more than the British who use titles and last names. Therefore, English society used to use formal greeting forms than the informal ones. Thus, 'Hi' is more informal than 'Hello', which is in turn less formal than the 'Good' forms (Good morning, etc). However, these 'Good' forms can be abbreviated by the omission of the word 'Good' itself. This is used in American English specifically:

A: Come on, Charles. Morning.

B: Morning (Am. E)

B: Good Morning (Br.E)

According to Greese (1991), both British and American people can just say "Hi" in informal occasions. Nowadays the young generation in America tends to use greeting forms like "What's up?" and "Hi!" The greeting speech act "What's up?" equates to "How are you?" Greetings such as "Hi" and "Hey" may be followed by a person's given name. Dialectally, there are also rare restricted forms such as 'Hiya' and 'Wotcha' in Br.E whereas in America, there are 'Hey', and 'how are you doing?' The form 'Good day' is rare as a greeting form in both Am. E and Br. E, but it is commonly associated with Australian English.

This is as far as verbal greeting types with its forms are concerned, what is about nonverbal greeting forms with its types, i.e., formal vs. informal? Nodoushan (2006) states that shaking hands and kissing the cheeks are the most forms of non-verbal greetings. Shaking hands is considered as one of the formal types of non-verbal greetings. When men are introduced, they generally shake hands while women do this less frequently. If a man and a woman are being introduced, they may or may not shake hands; usually the latter

extends her hand first. Therefore, if an American does not shake hands when he/she meets an acquaintance, he/she will not be judged to be impolite. Similar to Americans are the British people, they shake hands with strangers not with people who work together. Nodoushan also states that kissing the cheek is not so common among Americans. Hand kissing is only used in absolutely formal situations on certain occasions.

2. Arabic Greeting Forms

Mohammad and Hazaymeh (2012) state that Greeting is an integral part of the Arab hospitality, tradition, islamic values and culture. Greeting in Arabic could also be divided into two major subcategories: time-free, and time-bound. The following list is an attempt at manifesting the major forms of greetings in Jordanian Arabic:

1. Time-free greetings:

- Kaif Asbahtum? keaf ilhal, keafak, shlunak, shu u'luumak, shu akhbarak hayyak allah , Allah yehayeek, hayyak allah webayyak [How do you do? How are you?]
- As-salamu alaykum [Hello.]
- Wa-alaykum as-salam! [Hi]
- marhaba with its variants (Ahlan, marhabtean, maraheb, a'la'afyah , qawwak, sah badanak) [Hello]
- Fursa Saiedeh [Glad to meet you!]
- ahlan wa sahan with its variants(hala wemaraheb, ya hayallah, [welcome]
- tehya weddoom ,tahyyati waashwaqi, tahyyati, meet wardeh [Nice to see you]

2. Time-bound greetings

Daily formal greetings:

- Morning: sabah ilkhear with its variants(sabhu, sabah ilnoor, sabah ilward, sabah ilyasmeen, sabah ilful ,ysa'id hal sabah, ysa'id sabahek [Good morning]
- Evening: masa'a ilkhear with its variants(masa'a ilnoor, massaa' ilyasmeen ,masaa' ilward , masaa' ilful masseeku ilkhear, [Good evening]
- Night: tusbeh ala khear [Good night]

Seasonal (in) formal greetings:

- Kul am wa antum bi khear [Happy New Year!]
- Eid Saiid, Kul am wa antum bi khear, Taqabel Allah Ta'atekum, Kul Saneh wa anta salem, Eid Mubark. [Happy Eid!]
- Eid Saiid, Uqbal almeeyah, Al omor kulo, Kul am wa antum bi khear [Happy Birthday (to you)!]

According to Mohammad and Hazaymeh (2012), there are different types and forms that are used in Jordanian Arabic for greeting such as the following:

1. Religious Patterns. The most prominent religious term of greeting in Jordan is assalamu a'laykum warahmatu illahi wabarakatuh (may the peace, mercy and blessing of Allah 'God' be upon you) because it is the main greeting of Islam. This greeting might be shortened into various forms, which are also widely used in Jordanian Arabic such as assalamu a'laykum (peace be upon you). The reply would also be by using these patterns with the Arabic conjunction 'wa, and'. Such patterns include wa a'laykum issalam warahmatu illahi wabarakauh (and may the peace, mercy and blessing of God be upon you) or wa a'laykum issalam (may the peace be upon you)

2. Rural Patterns. Certain greeting patterns are related to the farmers. When someone visits them while they are plowing or harvesting, he would greet them with patterns as a'la'afyah (May you have good health) or sah badanak (May your body be in health). Other patterns are, qawwak (May you have a power) ya'teek ila'fyah (May Allah give you the good health). The replies would be Allah ea'afeek (May Allah give you the power) or qweet (May you have a strong body). Such patterns are not only limited to farmers but they also extended to be used as patterns of greeting for anyone who does a hard job that needs a power and strong body.

3. Morning / Evening patterns. A number of expressions have been used as patterns of greeting in the morning or evening in Jordanian Arabic. They are based on the two words sabah 'morning' and masa'a 'evening'. One would greet another person whether he knows him/her or not with one of the following greetings : sabah ilkhear (good morning) masa'a ilkhear (good evening). Other patterns are also formed such as sabah ilnoor (a light morning), masa'a ilnoor (a light evening). Moreover, certain kinds of flowers are used with the words sabah 'morning' and masa'a 'evening' such as sabah ilward (the morning of roses), sabah ilyasmeen (the morning of jasmine), masaa' ilward (the evening of roses), masaa' ilful (the evening of Arabian jasmine), masaa' ilward wilyasmeen (the evening of roses and Arabian jasmine), masaa' lqrunful (the evening of carnation) and masaa' ilful wilyasmeen (the evening of Arabian jasmine and jasmine). These flowers are used to show respect, intimacy and love of the speaker towards the addressees. Other greetings are derived from the two words sabah 'morning' and masaa' 'evening' such as sabhu (have a good morning) ysa'id hal sabah (May your morning is a happy one), massak allah bilkhear (may Allah make your evening full of welfare), masseeku bilkhear (I wish a good evening for all of you)

4. Welcome patterns. The Arabic words marhaba and ahlan 'welcome' are among the regular greetings in Jordan. All Jordanians with no consideration for age, gender, social class or position use them. Jordanians use other greeting expressions which are accompanied with certain numbers in order to show the intimacy such as marhabtean (two greetings), meet marhaba (one hundred greetings), a'shar maraheb (ten greetings) and maraheb (greeting with unlimited number). Other greetings are hala wemaraheb (greeting and greeting), ahlan (greeting), ahlan wa sahan (most greeting), ahlean (greetings), ahlean wesahlean (two greetings), halalta ahlan wawatea'ta sahan (you are most welcome), hala (welcome), hala wemaraheb (many greetings), yah ala (welcome). Hayyak allah (may God greet you), Allah yehayeek (may Allah greet you), hayyak webayyak (may God greet you a lot). Other greetings are tehya weddoom (may you live and

last for a long time), tahyyati waashwaqi(my greetings and yearnings), tahyyati (my greetings), meet wardeh(one hundred roses for you).

5. Patterns asking about health. Other greeting patterns are also used in Jordanian Arabic such as keaf ilhal (how are you?), keafak (how are you?), shlunak (how do you do?), Expressions as kefak ilyaom (how are you today), keaf asbaht (how is your morning), keaf akhbarak (how is your news), shu akhbarak (what is your news).

6. Eid patterns. Jordanians often greet others during the Eid or birthday with Kul am wa antum bi khear (every year you are in a good health) Eid Saiid(Happy Eid) Kul Saneh wa anta salem (Every year you are fine) and Eid Mubark(blesses Eid).

7.Non-verbal patterns. Jordanians use certain body movements and gestures as greetings in their daily life. Hands, fingers, eyebrows and head form the tools for these greetings. In many cases such movements and gestures are used as forms of greeting when the one being greeted is far away or that the greeter is driving a car or any vehicle and passing near a person that he may know or not .Many people would wave their hands particularly the right one with their palm is completely opened to greet others. Others would raise their forefinger as a greeting when they are driving and cannot left their hand of the steering wheel. Besides, Jordanians usually shake hands with acquaintances, colleagues, friends and families. They sometimes exchange kisses if they have not seen each other for a long time. In addition, if a person walks by a group, he should greet the whole group even if he/she doesn't know any of them. In Arabic culture, if a passer-by does not say Hello to the group he will be criticized publicly since this act shows social etiquette with a religious obligation.

Therefore , any attempt to analyze speech acts in Arabic society must recognize Islam as their foundation. Everything occurs as God wills since Arabic has its faith in Allah (God).

Findings and Discussion

The DCT data (10 situations) were analyzed to find out the similarities and differences between Arabic and English greetings. The number and use of greeting strategies are evaluated and interpreted on the basis of descriptive statistics, quantitative and qualitative analysis. Table 1 shows the categories of the coding scheme for DCT.

Table 1: The Categories of Coding Scheme for DCT

Main category	Subcategory
1)Oral Speech	<i>Initiation words</i>
	<i>Terms of address</i>
	<i>Declarative sentences</i>
	<i>Interrogative sentences</i>
	<i>Occasion phrases</i>
	<i>Politeness strategies</i>

2)Body language	
3)others	<i>Non-initiation</i>
	<i>Ignoring</i>
	<i>Bringing gift</i>

Number and use of strategies:

Table 2 indicates the number of strategies used by all participants for each situation.

Table 2: Number of Strategies Used by All Participants for each Situation.

Situation	No. of Arabic strategies	No. of English strategies
1	38(27 occasion, 8 initiation, 1 interrogative, 1 body language, 1 ignore)	38(26 occasion, 9 initiation, 1 politeness, 1 body language, 1 ignore)
2	46(25 initiation, 10 interrogative, 9 politeness, 1 ignore, 1 non-initiation)	47(25 initiation, 10 interrogative, 9 politeness, 1 ignore, 1 body language, 1 non-initiation)
3	66(17 initiation, 17 interrogative, 20 politeness, 10 terms of address, 1 body language, 1 declarative)	64(20 initiation, 17 interrogative, 4 politeness, 13 declarative, 10 terms of address)
4	53(30 initiation, 8 interrogative 17 terms of address, 1 politeness)	56(30 initiation, 7 interrogative, 19 terms of address,)
5	62(26 initiation, 21 terms of address, 11 politeness, 1 declarative, 2 ignore, 1 body language)	60(26 initiation, 20 terms of address, 10 politeness, 1 declarative, 2 ignore, 1 body language)
6	65(19 initiation, 15 interrogative, 6 terms of address, 23 politeness, 1 declarative, 1 body language)	58(15 initiation, 15 interrogative, 6 terms of address, 20 politeness, 2 declarative)
7	48(19 initiation, 7 interrogative, 3 politeness, 16 declarative, 1 ignore, 2 body language)	43(13 initiation, 2 interrogative, 1 politeness, 15 declarative, 1 ignore, 11 body language)
8	58(22 initiation, 26 interrogative, 7 politeness, 3 declarative)	52(18 initiation, 27 interrogative, 6 politeness, 2 declarative)
9	55(29 initiation, 20 interrogative, 1 politeness, 5 terms of address)	61(30 initiation, 21 interrogative, 10 terms of address)
10	31(30 occasion, 1 bringing a gift)	31(30 occasion, 1 bringing a gift)
Total	522	510

The total number of Arabic greeting strategies was 522 whereas the number of English strategies was 510. So, more greeting strategies were used in Arabic than English because it was easier for students to express themselves in Arabic than English.

Arabic language contributed the most numbers of strategies on Situation three (66) and Situation six (65). On the other hand, the top two situations for English strategies were Situation three (62) and Situation nine (61). This result was due to the fact that in situations three, six and nine the student can use different forms and strategies of greetings within the same utterance such as the following in situation three:

(A) Marhaba mu'alimati alfadela. Kaif halek? Ana talebatek Sara.

(E) Hello, teacher. How are you? Remember me! I'm Sara, One of your students at High School.

In this situation, the student used initiation (Marhaba, hello), interrogative (Kaif halek? How are you?) and politeness (introducing the self- ana talebatek Sara, I'm Sara).

There were certain similarities between Arabic and English in the number and use of initiation, interrogative and occasion strategies. Regarding number, it was approximately the same (Table 2). The use of these strategies was almost similar in both languages. Situation nine was a good example of similarities between both languages:

(A) Sabah ilkhair, Kaif halukum?

(E) Good morning, how are you?

Another example is in the last situation in the DCT:

(A) Eid Saied.

(E) Happy birthday

Unlike English, Arabic language has different variants of the same form as mentioned earlier (Kaif Asbahtum? keaf ilhal, keafak, shlunak, shu u'luumak, shu akhbarak) and (sabah ilkhair, sabhu, sabah ilnoor, sabah ilward, sabah ilyasmeen, sabah ilful, ysa'id hal sabah, ysa'id sabahek).

Interestingly, Jordanians tend to use more polite forms in Arabic than English. For example, in situation six most of students offered help to the old woman by saying:

(A) Hal tahtajeen musa'deh?

(E) Can I help you? Or Please let me give you hand with that.

In addition, the use of honorific titles in Arabic such as (Utuftek, Sa'adtek, Ma'alik) add more politeness to the speech. One of students' responses to situation five was:

(A) As-salamu alaykum, Utoftek. Tafadel.

(E) Hello, Sir. Nice to meet you.

Moreover, politeness in Arabic can be expressed by the use of (law Samahet) which means if you give me permission as in situation five:

(A) Marhaba, law samaht oreed al-sayed Tawalbeh.

(E) Hello, are you Mr. Tawalbeh?

Table 3 indicates the overall use of three major categories in Arabic and English.

Table 3: Overall Use of Three Major Categories in Arabic and English

No.	The category	Arabic	English
1.	Oral Speech	512	490
2.	Body language	6	13
3.	Others	7	7
4.	Total	522	510

The three main categories under greeting strategies are: oral speech, body language, and others. Evidently, oral speech was the most used category in Arabic and English, followed by body language and then other actions. The reason behind that was the feasibility of oral speech and its comprehensibility in conveying the right message. However, Arabic used more oral speech than English because of the different variants of the Arabic forms mentioned before, and Arabic used more body language and other actions than Americans and that had to do with culture.

Oral speech strategies

Table 4 indicates the preferred oral strategies in Arabic and English.

Table 4: The Preferred Oral Speech Strategies in Arabic and English.

No.	Oral Speech Categories	Arabic	English
1.	Initiation words	195	186
2.	Interrogative sentences	104	99
3.	Politeness strategies	75	51
4.	Terms of address	59	65
5.	Occasion phrases	57	56
6.	Declarative sentences	22	33
	Total	512	490

According to Table 4, the most used oral speech strategies in English and Arabic were: Initiation words (e.g., as-salam alaikum, hello), the second frequent was the interrogative sentences, such as, (Kaif halek? how are you?). Next, were the politeness strategies with its subcategories such as: compliment, offering help, gratitude, inviting, and introducing one. All of them were used more in Arabic. Politeness, for instance, can show gratitude (e.g., Thanks for inviting me, Ashkurak ala al-da'wa ela Al-hafleh), offering help (e.g., Hal tahtaj musaede? Can I help you with anything?) and complimenting (e.g., anti tabdeen jameela, You look beautiful). Before the last came occasion phrases (e.g., Eid Mubarak, Happy New year). The least used oral speech strategy was declarative sentences (e.g., eshte qto lek, I miss you, or it's nice to see you). Overall, Arabic had more opening words, politeness strategies, and occasion phrases than English which might be due to the derivational aspect of the Arabic language by having different forms and dialects of the same word (Sabah ilkhair, sabahu, yes'id sabahak...etc)

Body Language Strategies

Table 5 shows the number of body language strategies that is used in Arabic and English.

Table 5: Body Language Strategies in Arabic and English.

No.	Body Language Strategies	Arabic	English
1.	Handshake	3	2
2.	Cheek kiss	1	0
3.	Hug	1	0
4.	Waving hands	1	11
	Total	6	13

Table 5 presents the use of body language strategies in Arabic and English. Both Jordanians and Americans used handshakes but in a different way. For example, Jordanians usually hand shake with acquaintances while Americans with strangers. Thus, in situation two (You meet Salma, a classmate with whom you are not very familiar, here you can shake hands with her if you are an American). Cheek kiss is more familiar with Jordanians while waving hand with Americans. So Arabs in general tend to use a lot more cheek kiss and slightly more hug than Americans. This is considered part of their cultures, beliefs, traditions and values.

Other Strategies

Table 6 indicates the number of other strategies used in Arabic and English.

Table 6: Other strategies in Arabic and English

No.	Other Strategies	Arabic	English
1.	Ignoring	5	5
2.	Bringing gift	1	1
3.	Non-initiation	1	1
	Total	7	7

According to the statistics of DCTs, Arabic and English were nearly the same in using other strategies. Five students out of 30 ignore the person, one student brings a gift for birthday and another one waits for the other part to initiate the greetings. These strategies are rarely used because most of the time students respond and react to the situations. Ignoring shows a sense of disrespect and impoliteness. So, it is avoided most of the time.

Conclusion

The current study examined the most greeting forms used in Jordanian Arabic and English in terms of time-free and time bound as well as the most greeting strategies used in both languages regarding oral speech, body language and other actions. It was found that, unlike English, there were different greeting patterns and forms in Arabic. This was due to different factors such as Islam, environment, relations and

education (Mohammad & Hazaymeh, 2012). Moreover, it was revealed that oral speech strategies were most common in the Arabic language than the English one (Kirdasi, 2012).

Recommendations and Implications for Classroom Practice

Greeting is considered as the mirror of culture. If students do not know well about distinct features of the new culture especially the socio pragmatic features of greetings, they may violate cultural values and commit certain failures in greetings. So it is preferable to raise student's awareness of cultural similarities and differences between English and Arabic greetings. The contrast patterns need to be clarified well in order to avoid communication failures. Moreover, in classroom, it is good to create communicative opportunities for students to practice. Role plays in a variety of contexts are given so that students so that they can practice greeting in Real-life situations.

It is also important that teachers be flexible in their approach and not to rely only on textbook. According to Schleicher (1997), the use of hand gestures, body language, and auditory sounds which may play a larger role in greetings should be considered. Teachers also may want to incorporate the use of role plays, and present alternative ways of greeting people (along with other forms of English) within the classroom setting, according to Samovar and Porter (1995).

For students, they should be aware that learning only grammar does not mean success in communication. Therefore, they should learn more about culture and life style of other people in the world in order to be confident in communicating. Such contrastive knowledge in students' mother tongue and the second language also give them a clear distinction in order to avoid misunderstanding (Hang, 2013). Therefore, further research is recommended to be carried out on how greetings are actually performed.

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Appendix (A)**Discourse Completion Task (DCT)**

1. Age:.....
2. Nationality:.....
3. Gender:
 - a. Male
 - b. Female
4. Level of education:
 - a. School name:
 - b. Class:

Dear Students,

The researcher is conducting a study entitled **A Pragmatic Contrastive Analysis of Greeting Strategies in Jordanian Arabic and English**

You are kindly requested to read the following situations carefully, imagine yourself in such situations and write down as exactly as possible how you would react to each of the situations described below. There are no correct or incorrect responses. Please be assured that all responses are completely confidential. The results of the DCT will be used for research purposes.

Directions:

- Please specify everything you might say /or do, like *handshake, hug, cheek-kiss*, or even if you would do /or say nothing and **ignore** the person.
- Please respond to the following situations as honestly as possible.
- First answer in Arabic (A) then answer in English (E).

Situation #1: You visit your close friend Ruba during the Eid at her house. You enter the house and you see her talking to a group of people.

You walk towards her and say:

- (A).....
- (E).....

Situation #2: You meet Salma, a classmate with whom you are not very familiar, at the school welcome party. You see her having a drink.

You walk towards him and say:

- (A).....
- (E).....

Situation #3: You are a student at Saudi Arabia University. You are back in your hometown during winter vacation. In the supermarket, by chance you see a teacher of yours from high school. Provide an appropriate greeting.

(A).....

(E).....

Situation #4: You and a friend are walking down the hallway at your school. Your English teacher enters the hallway and says hello. Provide an appropriate greeting.

(A).....

(E).....

Situation #5: You are working in an office. One day, an important person comes to your office to have a meeting with your boss. The person makes eye contact with you. Provide an appropriate greeting.

(A).....

(E).....

Situation #6: You are walking downtown on your way to meet a friend at a coffee shop. As you turn a corner, you come face-to-face with an older woman who is your neighbor. She has lived in your neighborhood for many years and is friends with your mother. Provide an appropriate greeting.

(A).....

(E).....

Situation #7: You meet your friend on your way to school in a hurry. You do not have time to talk to her. Provide an appropriate greeting.

(A).....

(E).....

Situation #8: You have a meeting with Mr.Tawalbeh whom you do not know. You enter the company and you see a person sitting there behind a desk. You want to check if he is the right person. Provide an appropriate greeting.

(A).....

(E).....

Situation #9: Mrs. Mariam is a teacher at school. She enters the classroom in the morning to salute her students. Provide an appropriate greeting.

(A).....

(E).....

Situation #10: You are invited to Dania's birthday. She is one of your best friends. You meet her during the party. Provide an appropriate greeting.

(A).....

(E).....

Appendix (B)

The Instrument

Halliday's classification of greeting forms in English and Arabic

Main category	Subcategory	English example	Arabic Example
1)Oral Speech	<i>Initiation words</i>	Hello/Hi/Good morning	As-salamu alaykum
	<i>Terms of address</i>	My friend, guys	uttuftek sa'adet, ma'ali
	<i>Declarative sentences</i>	I Miss you, It's nice to see you	ya hayallah, ya hala
	<i>Interrogative sentences</i>	How are you?	keaf ilhal?
	<i>Occasion phrases</i>	Happy Eid	Kul am wa antum bi khear
	<i>Politeness strategies</i>	You look nice today	Shu hal heloo
2)Body language		Shake hands	Wave
3)others	<i>Non-initiation</i>	Wait for response	Wait for response
	<i>Ignoring</i>	Ignore the person	Ignore the person
	<i>Bringing gift</i>	Flowers	accessories

Educational approach for fault detection in Internal Combustion Engines with Matlab Toolbox Fuzzy Logic

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Abstract

Fuzzy logic is the logic defined from the theory of fuzzy sets. It differs from the crisp logic (traditional) in their characteristics and their details. In textbooks on fuzzy inference systems, exemplified superficially implementation creating doubts among computer science students. Traditionally, teachers teach IC with the use of conceptual models. This model was to serve specified parameters computing courses, allowing students to study and development of computational models using Matlab Fuzzy Logic Toolbox (MFLT) for fault detection in engines. This paper proposes an academic learning model based on fuzzy inference and modeling to detect incipient faults in components of internal combustion engines.

Keywords: Fuzzy logic, Matlab Toolbox, Computer Science.

Introduction

Fuzzy logic was initially set by Zadeh [1] and shared in the scientific community through his article "Fuzzy Sets" published in the journal Information and Control[2]. Zadeh introduced the concept of fuzzy sets defining them in terms of mapping a set in the unit interval on the real line[3]. The problem of making decisions to classify the objects of the universe into two or more classes was considered appropriate in the context of the theory of fuzzy sets[4]. Fuzzy logic is a logic based on the theory of fuzzy sets [5]. It differs from traditional logic systems in their characteristics and their details. In this logic, the exact reasoning corresponds to a limit case of approximate reasoning, being interpreted as a writing process of fuzzy relations[6]. Being a key topic in the discipline of Computational Intelligence (CI), in several Computer courses, considered a method of excellence in the world of computer systems to support decision making. Traditionally, teachers teach IC with the use of conceptual models. This model was to serve specified parameters computing courses, allowing students to study and development of computational models using Matlab Fuzzy Logic Toolbox (MFLT) for fault detection in engines. Matlab is a renowned software environment and widely used for research and teaching applications in control and automation, powerful linear algebra tool, with a good collection of toolboxes that extend the basic functionality of Matlab, with an interactive open environment[7]. This paper proposes an academic learning model based on fuzzy inference and modeling to detect incipient faults in components of internal combustion engines. The proposed method allows detection of incipient faults in the main motor, whereas the values of the following quantities: the combustion pressure in the cylinder, and cooling water temperature and pressure. The proposed failure patterns are based on values set in the characteristic structure of the machine so that they can be reproduced in a wide range of sets of motorcycle generators. The advantages of the proposed system are its low intrusiveness, simplified installation and cost efficiency. A laboratory test was designed to simulate failures in a small diesel generator and apply the methodology for detecting the values of these quantities.

Problem statement

Matlab Fuzzy Logic Toolbox is a collection of functions built in numerical computing environment MATLAB, which provides students tools to create and edit fuzzy inference systems under the Matlab [8]. The student can build independent programs in C language calling diffuse systems built with Matlab. This toolbox depends heavily on Graphical User Interface (GUI) tools to help you do your job. The objective and exemplify the use of MFLT to create these fuzzy inference systems.

Methodology

The fuzzy logic is the point of an input spatial map to an output space, and the main mechanism to define this space is a list of if-then rules called instructions. Unlike conventional logic, Fuzzy logic uses the idea that all things admit membership degrees[9] [10].

Fuzzy logic-based adaptive controller design depends upon proper formulation of control rule base [11]. All rules are validated in parallel, and the end of the rules depends on the expertise of the

specialist[12]. The rules are useful because they refer to variables and adjectives that describe these variables.

Rules If ... Then: The basic rules logically lists the information that forms the knowledge base of the fuzzy system[13].

The fuzzy inference model adopted for the failure prediction system of the engine is based on computer simulations of the combustion pressure in the cylinder values and cooling water temperature and pressure, selected as relevant variables for analysis.

So it can be built the system that interprets the rules, you must first define all terms adjectives that describe them.

Formally, a fuzzy set A is defined by a membership function μ_A : [0-1]. This function assigns to each element x of the fuzzy set A is a degree $\mu_A(x)$ of relevance, that is the degree of compatibility between x and concept expressed by A[14] [15].

As an example, the description of the membership functions with numeric range and the linguistic value of each selected variable, are presented in Table 1:

Table 1: System Suitability Functions.

Typ e	Linguistic variables	set Cloudy	Numeric range	description
Input	Water temperature (TAGUA)	Low	[0 - 100]	The expected value for the water temperature is between 40 and 80 degrees Celsius.
		Normal		
		High		
	Water pressure (Pagua)	Low	[0 - 6]	The expected value of the water pressure is between 2 and 5 bar.
		Normal		
		High		
	Combustion pressure (PComb)	Low	[0 - 220]	The expected value for the combustion pressure is between 40 and 180 bar.
		Normal		
		High		
Output	Instability	Normal	[0 - 100]	The expected value for stability is up to 50 points.
		Not normal		

Source: Authors, (2019).

In the Command window of *Matlab*, type the word fuzzy (fuzzy >>), and then press the enter key which will display the initial window of this toolbox as shows what appears in Figure 1.

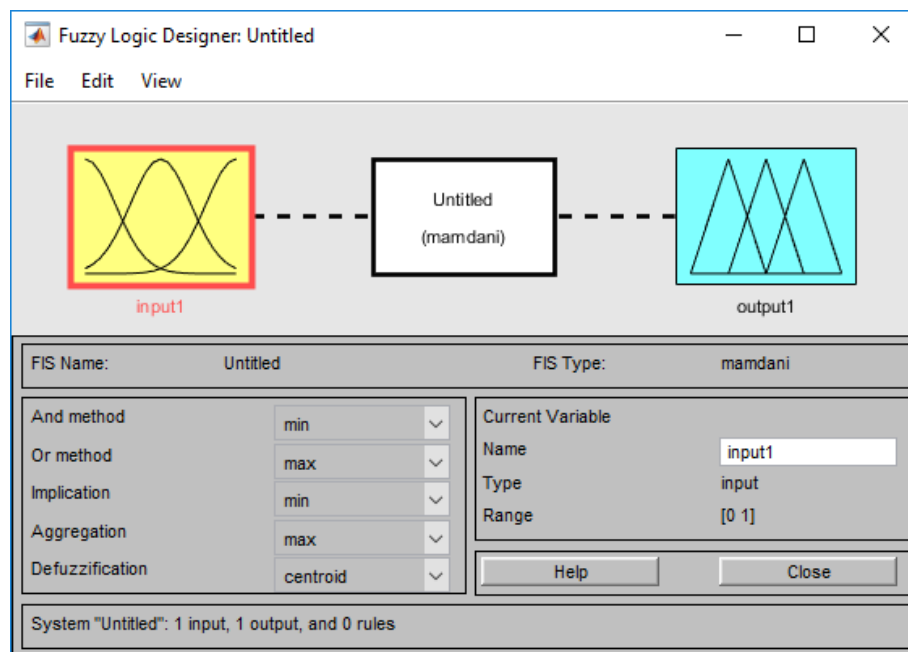


Figure 1: Initial Window Toolbox Matlab.

Source: Authors, (2019).

In Figure 1, it is highlighted the option for the type of analysis described as fuzzy Mamdani name.

The Fuzzy Logic Toolbox MATLAB provides two options methods, Mamdani and Sugeno. Because of the simplicity and efficiency, the use of linguistic variables and is very consistent, brings us closer to human intuition[16]The contents of this work has been specified using the following methods: Mamdani method, the inference step and the method of center of gravity (centroid), the defuzzification step.

A fuzzy output to a defuzzification system, it is a procedure or a method to find a common (non-fuzzy) output means for each linguistic variable [17].

It is not the aim of this study detailing these methods of inference and fuzzification, it is suggested to get a better understanding, reading Pedrycz & GOMIDE [18].

Adding Input / Output variables

To add the input variables or output by selecting the options exemplified in Figure 2:

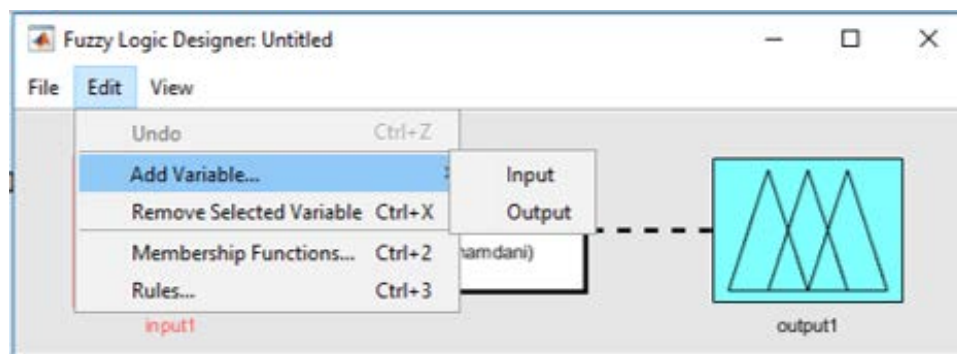


Figure 2: Adding input / output variables.

Source: Authors, (2019).

It is emphasized that there can be no input variables and output. In this work, it will be considered the three input variables and a system output, which is described as Multiple Input and Simple Output (MISO)[19].

In Figure 3, an example is implemented the failure prediction system in the interface area Graphic user.

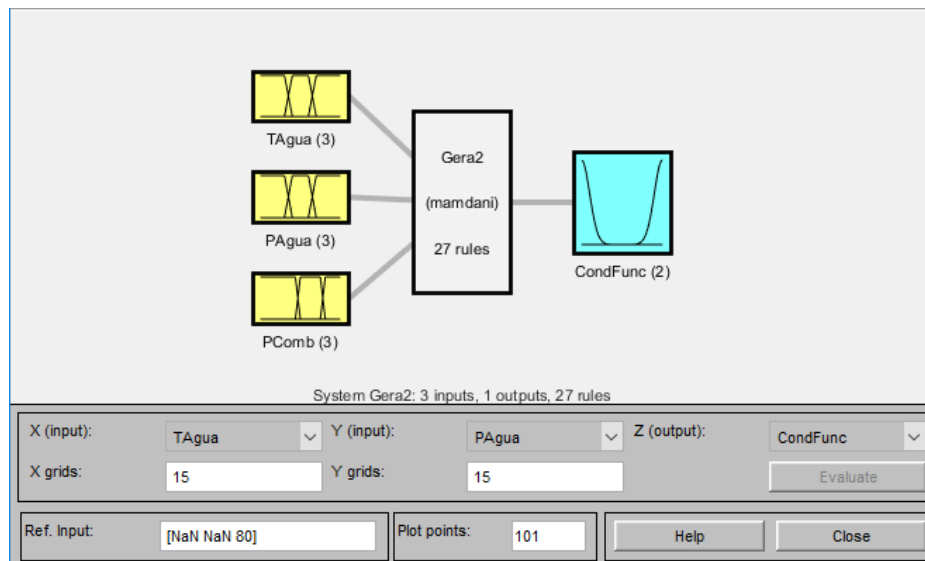


Figure 3: Variables input and system output.

Source: Authors, (2019).

Changing the domain of input variables and / or output

To determine the domain of each variable, you must double-click on the "box" of the variable, changing the value of the option of the text box RANGE seen in Figure 4, and press Enter.

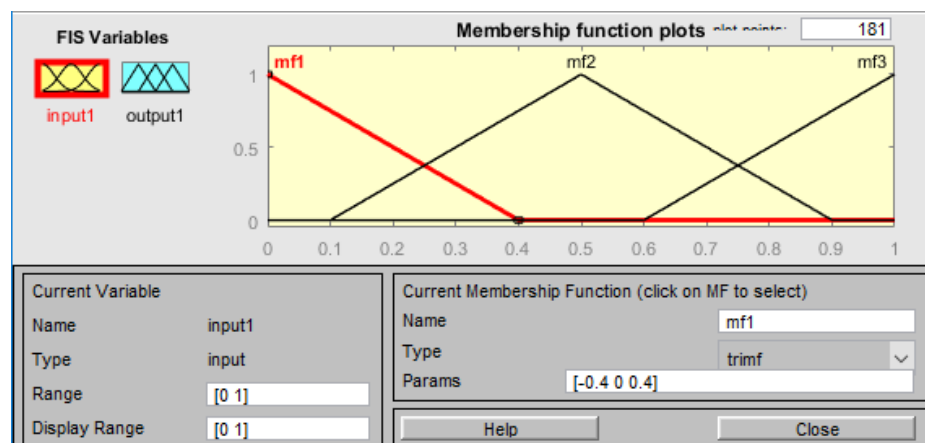


Figure 4: Variable Properties dialogue box.

Source: Authors, (2019).

Defining the membership functions

To change the number and shape of the relevance of the input variables of functions should be, from what is indicated in Figure 5, press the left mouse button on the Edit menu:

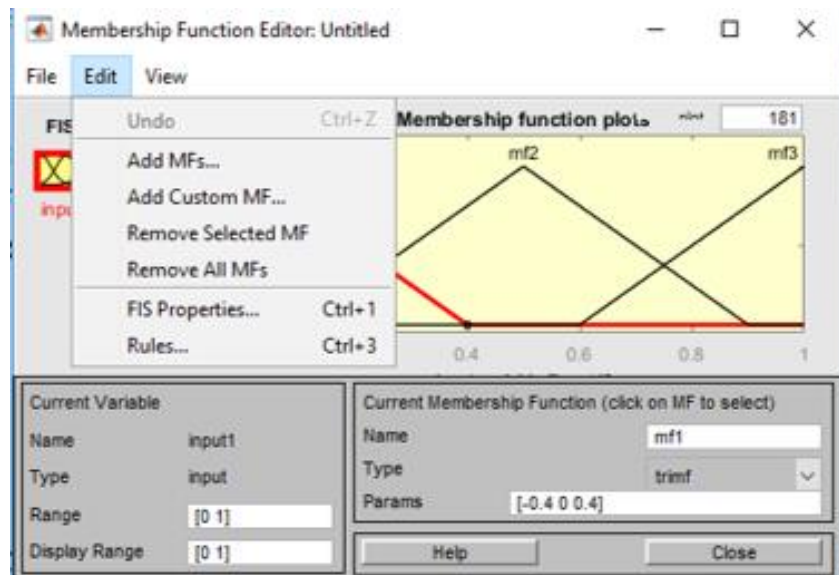


Figure 5: Editing Relevance functions of each variable.

Source: Authors, (2019).

Once the number and format of the membership functions are selected, for each of the membership functions, the values associated with the maximum and minimum membership should be determined, with the maximum values being equal to 1 (one) and the associated values the least pertinence is equal to 0 (zero) [20]. This procedure is different for the different shapes of the membership functions available on MFLT. The most commonly used formats for membership functions are triangular (trimf), trapezoidal (trapmf) and Gaussian (gaussmf).

Regarding the description of the variables they represent the knowledge of the expert in the fuzzy inference being termed as input variables and system output, matched linguistically representing inaccuracy mode[21] [22]. Thus, the variables of the proposed system are:

Tagua- The water temperature may not be less than 40 degrees Celsius or exceed 80 degrees Celsius. The fuzzification of this variable is trapezoidal, as shown in Figure 2.

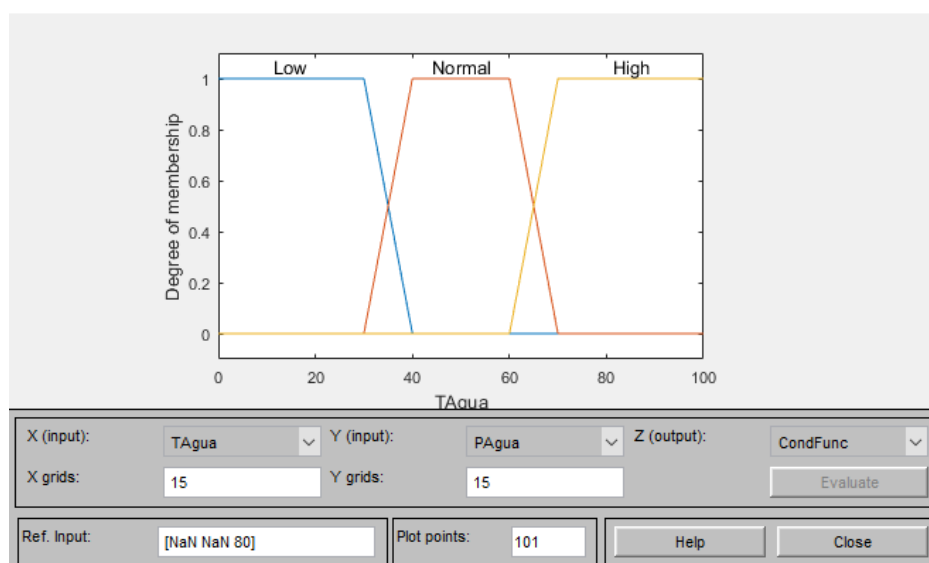


Figure 2: Variable Tagua.

Source: Authors, (2019).

Pagua- The water pressure must not exceed 5 bar. The fuzzification of this variable is trapezoidal and triangular ends in the central part of the graph, as, according to Figure 3.

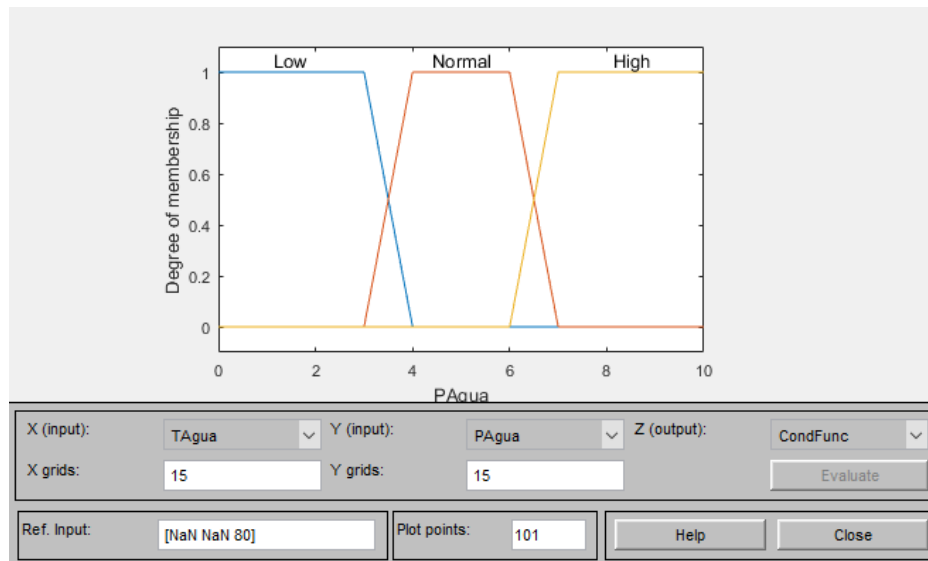


Figure 3: Variable PAgua.

Source: Authors, (2019).

pComb- The combustion pressure can not exceed 180 bar. The fuzzification of this variable is trapezoidal and triangular ends in the central part of the graph, as, according to Figure 4.

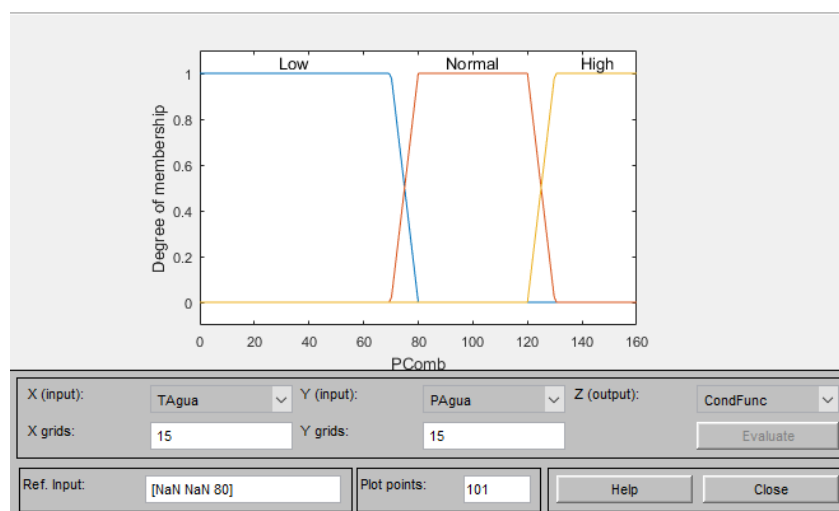


Figure 4: Variable pComb.

Source: Authors, (2019).

CondFunc - associations of input variables are related to the output variable operating conditions (CondFunc), which has a fuzzification shown in Figure 5.

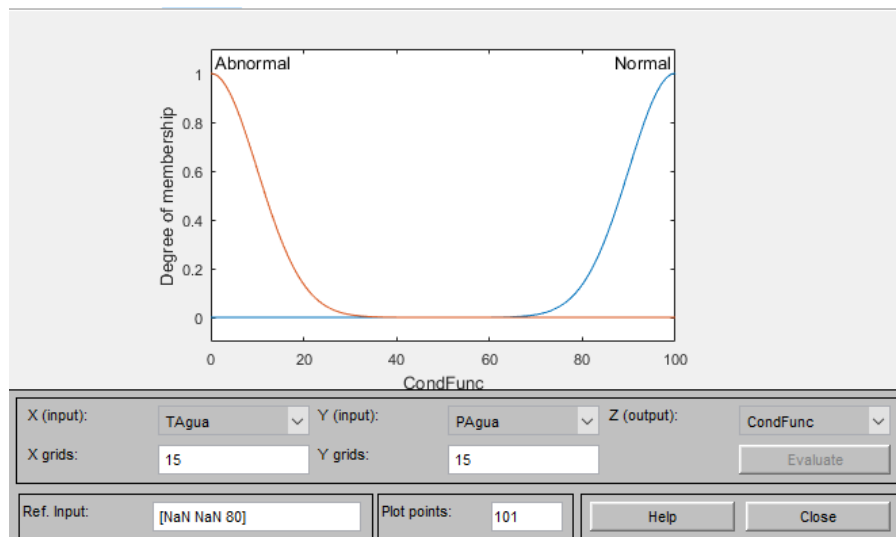


Figure 5: Instability output variable.

Source: Authors, (2019).

Demonstration of main Inference Rules base of linguistic variables resulted in 27 combinations, applied in this fuzzy solution, where part of power seen in Figure 6.

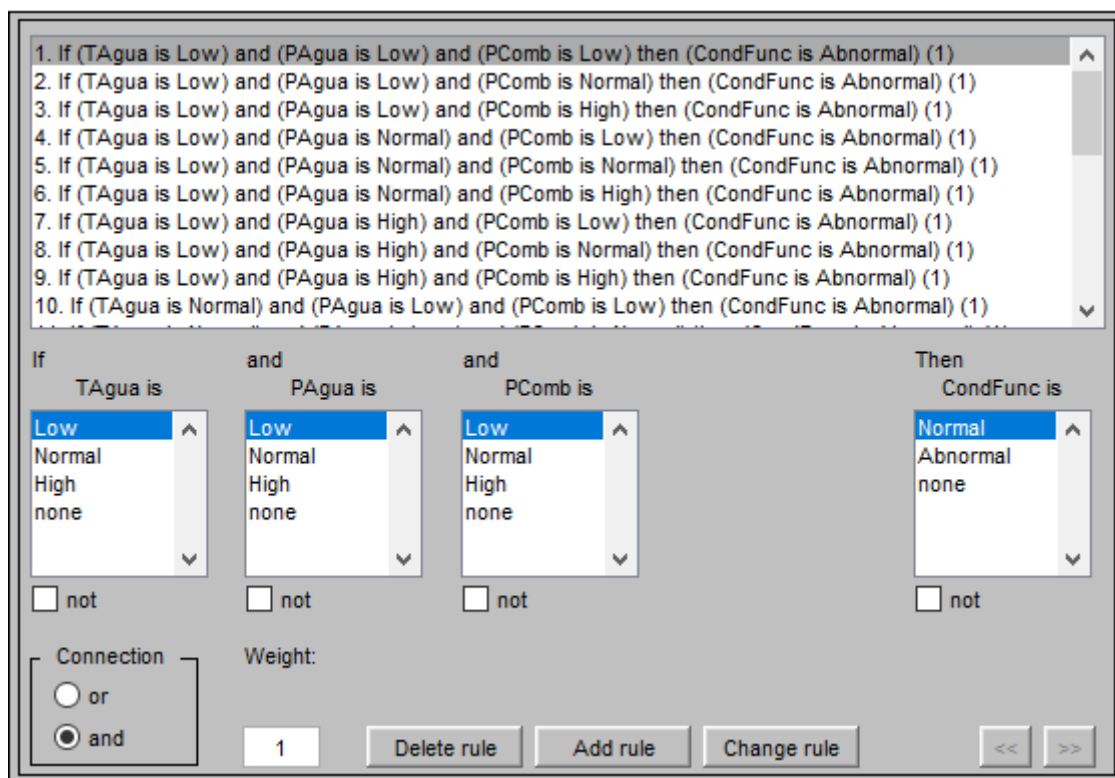


Figure 6: Inference rules of linguistic variables.

Source: Authors, (2019).

Results and discussions

In the viewer rules Matlab Toolbox, the data is arranged in a way that facilitates the simulation and interpretation of various scenarios by combining values for inferences variables of the fuzzy inference process, showing the functions that reflect the overall result of the system.

By varying the input values it is possible to evaluate the outputs of the proposed system, obtaining a value that allows a correct analysis of the efficiency of the method adopted for fault detection in motor operation, seen in Figure 7.



Figure 7: Results shown from inferences.

Source: Authors, (2019).

Adopting hypothetical input values, considering them wherein for the water temperature input variables is 50 Celsius, the water pressure of 5 bar and the combustion pressure 80 bar, resulting is an operating condition 99.5 %, i.e. a favorable environment for the operation of the motor generator.

In any other operating condition exceeds the upper or lower limits of normal for the variables defined, has a worst case scenario for operation of the motor generator, indicated with the same shut down for maintenance.

Figure 8 shows the resultant surface plot of the proposed system.

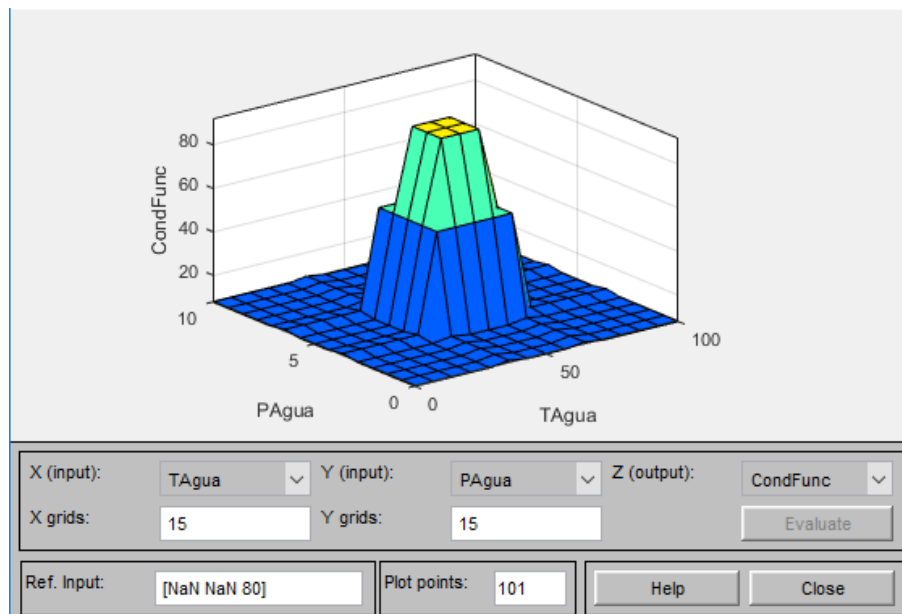


Figure 8: Graph surface.

Source: Authors, (2019).

Summary

In this work, an approach to implement a simplified fuzzy inference model using Matlab Fuzzy Logic Toolbox is presented to students in general who have difficulties with complex books about this tool. This approach uses a system for monitoring the operating conditions of the motorcycle generators, based on three quantities. Students and teachers can use this approach as parameters to implementations and studies of other fuzzy systems.

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Impact of The Application of Audio-Visual Aids in Improving Teaching and Learning of Computer Science in Senior Secondary Schools in Awka North Local Government Area in Anambra State.

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Abstract

The purpose of the study is to identify the impact of the application of audiovisual aids in improving teaching and learning of computer science in Senior Secondary School in Awka North Local Government Area of Anambra State. Out of 1500 Secondary Schools in Awka North Local Government Area. Seventy (70) Students from Senior Secondary School (SS1) students were selected using random sampling technique to serve as the sample. Structured questionnaire was the instrument used for data collection. Mean and percentage were employed for data analysis. The major findings are that, Audio visual materials are not usually available for teaching and learning of computer science in senior secondary schools. Using audio visual materials in teaching and learning of computer science has positive effects on students' academic performance. Audio visual aids have a lot of benefits in improving qualitative computer education in senior secondary schools. Government and other citizens should provide audio visual materials to secondary schools in Nigeria. Experienced and qualified computer science teachers at least with Nigeria Certificate in Nigeria (NCE) should be employed to teach in secondary schools in Nigeria. School authorities should always checkmate whether teachers make use of audio visual aids in teaching.

Keyword: *audiovisual aids, science teaching, computer science*

INTRODUCTION

Background to the Study

For thousands of years, education has been an integral part of society. But is it the single most important factor in the development of a developing country? I believe it is of great significance instead of the most important factor. First and foremost, a complete education system provides large number of qualified people with advanced knowledge and skills in a wide range of subjects. Through attending various educational institutions, including but not limited high school, college and universities, people can get themselves prepared for and contribute to the development of the country, which clearly requires the effort from all profession. In addition to talents cultivation, education in itself has tremendous influence on civilization, which accounts for a large part in a country's development. As a place where knowledge is handed down and wisdom passed around, school represents the homeland of scholars who had huge impact on the promotion of spirit civilization, and the birthplace of innovative ideas. According to Tosin (2013), education is of utmost importance for eradicating the unemployment problem of our country through enlightening citizens on how to be self employed. It is also essential to improve the trade and commerce, and to bring prosperity to our country. It is also the backbone of developing countries because sustainable development of economy and society is achievable if knowledge in science education is embraced.

Science education is very important to the development of any nation that is why every nation must take it very serious in all institutions of learning. It deals with sharing of science content and process with individuals who are not considered traditionally to be member of the scientific community. This branch of education comprises six subjects namely biology, chemistry, physics, integrated science, computer science and mathematics. Developed countries like United States, United Kingdom, Germany and others that have highly developed economy and advanced technological infrastructure were able to achieve these because they realized the importance of science education and embraced it earlier. Developing and underdeveloped nations like Nigeria and other still have difficult challenges seeing how her economy can be highly developed and advanced technologically. According to Kola (2013), the sense of responsibility and caution that science provides along with understanding of how things work (be they chemical reactions, human development, or nutritional needs) can help future parents to provide safe, health environments for their own children. The communication, research, reporting, and collaboration skills that science provides can produce a generation of individuals who are better prepared for any career and can make greater contributions to society. Also, students who have a solid knowledge base in science will later be more open to emerging technologies and ideas that can boost business and stimulate the economy. Ochu (2007) noted that the difference between developed and developing country is based on the quantity and quality of science and technology they possess. Adikwu (2008) maintained that, if Nigeria must survive as a nation we need science and technology used and managed by Nigerians.

Despite the realization of the importance of science education in developing a nation, students hardly choose computer science when they are given the opportunity to choose subjects they would offer in SS2. This made the researchers to investigate the causes of this nonchalant attitude among students could it be

teaching method, poor funding, lack of adequate infrastructure or others? Many researchers have tried different methods like demonstration, study group and others according to Katherine (2009) yet none of this have sufficiently improved students performance in computer science. This made the researcher to conduct a research on the impact of the application of audio visual aids in improving teaching and learning of computer science in senior secondary schools.

Ashikuzzaman (2013) define audio visual aids as those materials which do not depend solely upon reading to convey meaning and present information through the sense of hearing as audio resources or through a combination of both senses. From time immemorial, audio-visual materials existed but were not incorporated into educational system. According to Green (2012), the advent of audiovisual is long but it is the use that has been limited until in the 1960s and 1970s when libraries realized the use of these materials and started incorporating them into the library collections for future use. He also said that audio-visual aids strengthen an instructor's verbal presentation while helping his students capture specific message. Audio visual aids keep an audience attention throughout a presentation and help them remember particular information. If simple and efficient aids are used, they will enhance teaching. Examples of audiovisual aids include white boards and flip charts, overhead transparencies and handouts, slides, sound recording and video, physical objects, props and models. Audio-visual aids are very relevant in the teaching of computer science.

Agudosi, (2014) define computer science as the study of computers and computer concept. It includes hardware and software as well as networking and internet. In teaching of computer science in this modern era, the most common tool being used in the classroom these days is PowerPoint slides, which makes the class more interesting, dynamic and effective. Moreover it also helps to introduce new topics in easy way.

However, despite the realization of the relevance of audiovisual aids in teaching and learning of computer science, it has not been adopted in Nigerian educational system. Although computer education was introduced into the nation's secondary school system in 1987 during the 32nd ministerial council meeting, computer science as a subject was not taught both in urban and rural schools in Anambra state according to Jegede (1998). Eventually, it was later introduced when Dr. Peter Obi was the incumbent Governor of Anambra State. During his tenure, computer laboratory buildings, computer systems and Information Communication Technology (ICT) facilities were given to 85% of the secondary schools in Anambra state including secondary schools in Awka North Local Government Area. It was discovered that female student see computer science as a subject meant only for male students, and did show little interest whenever it is being taught in school. This could probably be as a result of lack of application of audio visual aids in teaching and learning of computer science. At this juncture, it becomes important to investigate the impact of the application of audio visual aids in improving teaching and learning of computer science in senior secondary schools in Awka North Local Government Area.

Statement of the Problem

The act of teaching computer studies in secondary is fundamentally concerned with passing technical ideas, skills and attitude from the teacher to the learner. In Nigerian secondary schools, for example, experience has shown that spoken words alone in communication of ideas are grossly ineffective and inefficient in producing desired learning outcomes for computer students in these schools. There are parts of computer studies that pose problem of comprehension to students especially in areas like Corel draw, Photoshop and even hardware coupling and repairs. These cannot be taught effectively without audiovisual instruction materials. With this problem in mind, the question that readily comes to mind is the impact of application of audiovisual aids in improving teaching and learning of computer science in secondary schools especially in Awka North Local Government Area of Anambra State.

Purpose of the Study

The main purpose of this study is to identify the impact of the application of audiovisual aids in improving teaching and learning of computer science in senior secondary schools in Awka North Local Government Area in Anambra State. The specific purposes include to:

1. Examine audiovisual materials that are available for teaching of computer science in senior secondary schools in Awka North Local Government Area.
2. Ascertain the effects of using audiovisual materials in teaching of computer science in senior secondary schools in Awka North Local Government Area.
3. To find out the benefits of using audiovisual materials in teaching of computer science in senior secondary schools in Awka North Local Government Area.

Significance of the Study

The result of this study, when successfully completed, will be beneficial to the following groups of people; students, teachers, parents, curriculum planners and society at large. With the use of audiovisual aids as instructional materials, the students should be able to learn effectively and also retain what they learnt. Audio-visual aids encourage teachers because there will be an increase in productivity if effective teaching and takes place. The parents and society at large will also benefit from this study because when the quality of education their children receives in school is solidified using audiovisual aids, their children will help them do some jobs they do take to business centers and this saves them from spending lots of money. This study will enable curriculum planners plan a curriculum that will address a holistic oriented curriculum which will be beneficial to the society.

Scope of the Study

The study investigated impact of the application of audiovisual materials in improving teaching of computer science in the senior secondary schools in Awka North Local Government Area in Anambra State. The study involved Senior Secondary (SS1) one students from our randomly selected schools in Awka North Local Government Area of Anambra State.

Research Questions

1. What audiovisual materials are available for teaching of computer science in senior secondary schools in Awka North Local Government Area?
2. What are the effects of using audiovisual materials in teaching of computer science in the senior secondary schools in Awka North Local Government Area?
3. What are the benefits of using audiovisual materials in improving qualitative computer education in secondary schools in Awka North Local Government Area?

Research Design

The study adopted a descriptive design. According to Nwogu (2006), Survey is those studies which aim at studying in a systematic manner, the characteristics features of facts about a given population. This study therefore seeks to investigate the impact of the application of audio-visual aids in improving teaching and learning of computer science in senior secondary schools in Awka North Local Government area.

Area of Study

The area of study is community secondary school, Amansea. Amansea is one of the towns under Awka North Local Government Area of Anambra State.

Awka North is perhaps unique in that it is so centrally located and it is bounded with Oji river Local Government Area of Enugu State. Amansea people are mostly known as farmers and traders.

Population of the Study

The population of the study comprised all the senior secondary schools in Awka North Local Government Area with over 1500 senior secondary students.

Sample and Sampling Technique

The sample is made up of selected seventy students out of the senior secondary one (SS1) students in community secondary school, Amansea.

Instrument for Data Collection

A questionnaire tagged Impact of Audio-visual aids Questionnaire (IAVAQ) was constructed by the researcher and used as instrument for data collection. Part A of the questionnaire was concerned with the personal information about the respondents. The respondents were required to tick good (✓) in the appropriate box in order to indicate their choice of opinion as they apply to them. Part B of the questionnaire contains fifteen (15) structured items and was distributed evenly. The questionnaire was developed on three-point scale and also four-point scale of:

Available (A)		
Not available (NA)		
Do not know (DK)		
Strongly Agree (SA)	—	4 points
Agree (A)	-	3 points
Disagree (D)	-	2 points

Strongly Disagree (SD) - 1 point

Validation of Instrument

The validation of an instrument is the determination of the degree to which a test actually measures what it is meant to measure. To ascertain the validity of the instrument, copies of the questionnaire were given to experts in measurement and evaluation. The project supervisor was also given the instrument for correction and final approval.

Reliability of the Instrument

To ensure the reliability of the instrument, clarity of content, ability of the instrument to test what it is supposed to test as well as the ability of instrument to address the level of respondents' answers, twenty copies of the questionnaire were given to twenty senior secondary two students who are not among the sample. The twenty questionnaires were later collected. Pearson Product Moment Correlation was used and it yielded a coefficient of 0.73. According to Nwogu 2006, a reliability coefficient of 0.7 is very highly related and this was considered adequate for the study.

Method of Data Collection

The instrument was personally administered by the researcher. The purpose of adopting on the spot technique was to reduce loss of instrument and ensure a high percentage return.

Method of Data Analysis

The statistics used for the analysis was mean and percentage. The mean and percentage were used to answer the research question. The mean of the responses of the respondents was calculated using the formula:

$$\bar{x} = \frac{\sum fX}{N} = \frac{4+3+2+1}{4} = \frac{10}{4} = 2.50$$

Where:

$\bar{x}$ = Mean

$\sum$ = Summation

F = Frequency

X = Number Value

N = Total number of Scale

While the percentage of the respondents in research question one was calculated using normal percentage calculation using this formula:

$$\text{Percentage for Available} = \frac{\text{No of respondents who ticked Ava}}{\text{Total no of students}} \times 100$$

$$\text{Percentage for Not Available} = \frac{\text{No of respondents who ticked Not Ava}}{\text{Total no of students}} \times 100$$

$$\text{Percentage for Do not Know} = \frac{\text{No of respondents who ticked Not Ava}}{\text{Total no of students}} \times 100$$

Decision Rule

For items that require available, not available or do not know, the option that has the highest percentage among the three options would be regarded as Agree. For items that require strongly agree, agree, disagree or strongly disagree, the decision point was 2.50. Therefore items with a mean response score 2.50 or above would be regarded as Agree, while items with mean score below 2.50 would be regarded as Disagree by the researchers.

PRESENTATION AND ANALYSIS OF DATA

Data analyzed were dependent on the responses from the questionnaire administered to the respondents. Seventy (70) copies of the questionnaire were distributed and seventy were duly completed and returned. The analysis was done based on the questions posed to guide the study.

Research Question 1

What audio visual materials are available for teaching and learning of computer science in senior secondary schools in Awka North Local Government Area?

Table 1: Percentage response on availability of audio visual materials in senior secondary schools in Awka North Local Government Area.

S/ N	ITEMS	A	A%	NA	NA %	DK	DK %	N	DECISION

1. Audio visual materials 64 91% 4 6% 2 3% 70 AVAILABLE

like white boards and
flip charts are available
for teaching and learning
purposes in computer lab.

S/ N	ITEMS	A	A%	NA	NA%	DK	DK%	N	DECISION

2. Videos tapes are also 0 0% 60 86% 10 14% 70 NOT AVA

available in the computer laboratory.

S/ N	ITEMS	A	A%	NA	NA%	DK	DK%	N	DECISION

3. Power point slides are 0 0% 60 86% 10 14% 70 NOT AVA

available for teaching computer science.

S/N	ITEMS	A	A%	NA	NA %	DK	DK%	N	DECISION

4. Projectors are available 0 0% 67 96% 3 4% 70 NOT AVA

for teaching computer science.

S/N	ITEMS	A	A%	NA	NA %	DK	DK%	N	DECISION

5. Televisions are available 0 0% 57 81% 13 19% 70 NOT AVA
for teaching computer science.

From the results of the above table, white boards and flip charts scored 91% for available while videotapes, power point slides, projectors and television scored 86%, 76%, 96% and 81% respectively for not available. This shows that audio visual materials are not usually available for teaching and learning of computer science in secondary schools.

Research Question 2

What are the effects of using audio visual materials in teaching of computer science in senior secondary schools in Awka North Local Government Area?

S/N	ITEMS	SA	A	D	SD	N	$\bar{x}$	DECISION

6. An audio visual aids keeps students 47 20 2 1 70 3.6 AGREE
attentive throughout the whole
lesson period.

7. An audio visual aid makes a lesson 50 13 5 2 70 3.6 AGREE
not to be boring.

8. Audio visual aids help students to 61 7 2 0 70 3.8 AGREE
Participate and observe what the
Teacher is teaching.

9. Audio visual aids help students to 59 7 3 1 70 3.8 AGREE
understand a lesson with ease.

10. Audio visual aids help to clear 41 14 8 7 70 3.3 AGREE
Some doubts or confusion in the
minds of the students.

From the results of the above table, item 6, 7, 8, 9, and 10 scored 3.6, 3.6, 3.8, 3.8 and respectively. This shows that using audio visual materials in teaching and learning of computer science has positive effects on students.

Research Question 3

What are the benefits of using audio visual materials in improving qualitative computer education in senior secondary schools in Awka North Local Government Area?

S/N	ITEMS	SA	A	D	SD	N	$\bar{x}$	DECISION

11. Audio visual aids attract learners 38 20 7 5 70 3.3 AGREE
attention.

12. Audio visual aids make class more 43 14 9 4 70 3.4 AGREE
interactive and interesting.

13. Audio visual aids provides oppor 34 19 10 7 70 3.1 AGREE
tunities for effective communi
cation between teacher and students
in learning.

14. Audio visual aids help in maintaining discipline in the class.	25 29 7 9 70 3.0	AGREE
15. The use of audio visual aids help makes the students to remember the concept for a longer period of time.	52 11 5 2 70 3.7	AGREE

From the results of the above table, item 11, 12, 13, 14 and 15 scored 3.3, 3.4, 3.1, 3.0 and 3.7 respectively. This shows that audio visual aids have a lot of benefits in improving qualitative computer education in senior secondary schools.

Summary of findings

The major findings of this study were:

- Audio visual materials are not usually available for teaching and learning of computer science in senior secondary schools.
- Using audio visual materials in teaching and learning of computer science has positive effects on students' academic performance
- Audio visual aids have a lot of benefits in improving qualitative computer education in senior secondary schools.

Discussion of Findings

Discussion of findings in relation to research question one which investigated the availability of audio visual materials for teaching and learning of computer science connotes that whiteboards and flipcharts are the only audio visual materials available for teaching and learning of computer science in most secondary schools. Audio visual aids like television, video tapes, power point slides and projectors are not usually available for teaching and learning of computer science in most community secondary schools. This does not help to inculcate the needed skill of computer technology hence the students get to see computer science as a difficult subject. These findings agree with Eze (2013). Eze's study reveals that human beings learn more easily and faster using audio visual processes than by verbal explanations alone.

Again, the result of this study revealed the positive effects of using audio visual materials on students performance in computer science in the sense that students attention remains focused throughout the whole lesson period. The findings here also revealed that application of audio visual aids in teaching and learning of computer science is useful in achieving positive academic performance amongst students in senior secondary schools since the computer knowledge is practical oriented. Students also get involve in seeking out required information, process the information and go on to utilize them in their everyday living. This finding agree with Katherine (2009). Katherine's study stated that audio visual aids provides learning situation which makes a child learn faster because of his natural reactions of the provided materials.

Further findings have also shown that audio visual aids have a lot of benefits when used as a means of impacting qualitative computer education on students academically. Learners' attentions are attracted and learning environment becomes much more interactive and interesting. These findings agree with that of Oketunji (2000). His study revealed that audio visual aids when effectively applied in teaching and learning lessen major weakness of verbalism, humanize and vitalize subject matter.

Finally, since application of audio visual aids in teaching of computer science will have a great positive impact in the academic performance of senior secondary students, government can adopt measures that can trigger excellence in students' performance such as the following:

- ❖ Provide audio visual materials for senior secondary schools.
- ❖ Collaborate with professional science teachers association like science teachers association of Nigeria (STAN) in seeing that certified and qualified computer science teachers are employed for teaching of computer science in senior secondary schools.
- ❖ Collaborate also with educational organization like Curriculum Development and Instructional Material (CUDIMAC) to make sure that funding of audio visual aids which also serve as instructional materials are purchased and distributed to senior secondary schools.
- ❖ Build well equipped computer laboratory with constant power supply whenever lesson is going on.

Conclusion

If urgent attention is given to see that audio visual aids are being used on a daily basis while teaching of computer science in senior secondary schools in Awka North Local Government Area, there will be an improved performance of student in computer knowledge. Again, twenty-first century which is a digital age will be embraced by these students which will be utilized by them. Students in senior secondary school are active and vibrant and so enabling them to learn positively would farewell for all Nigerians generally and the education sector particularly.

Recommendations

Based on the findings of this study, the researchers wishes to make the following recommendations:

- ❖ Government and other citizens should provide audio visual materials to secondary schools in Nigeria.
- ❖ Experienced and qualified computer science teachers at least with Nigeria Certificate in Nigeria (NCE) should be employed to teach in secondary schools in Nigeria.
- ❖ School authorities should always checkmate whether teachers make use of audio visual aids in teaching.
- ❖ School authorities should sometimes interview students may be weekly or monthly to know if their teachers in their school actually use audio visual aids during computer science lessons.
- ❖ The training and retraining of teachers on the use of audio visual aids while teaching should be given serious attention. Seminars symposia or workshops should be organized for teachers and staff from time to time to upgrade and update them on how to use any newly invented audio visual aids.

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Hospital Based Cancer Statistics as an Initial Step towards Establishment of Effective Cancer Intervention in Tanzania

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ABSTRACT

There is an increasing public awareness that cancer in terms of increasing incidence rates and low curability become a serious problem in Tanzania. Due to limited human and physical resources in Tanzania, cancer interventions that address high incidences, curability and socio-economic impact must be given top priority. This information is often obtained in Population Based Cancer Registry (PBCR) which is not only lacking in Tanzania but its production requires relatively long period of follow-up and high cost of registration. Since establishment of effective cancer intervention is urgent, the desired information needed to accord this priority has been obtained from Hospital Based Cancer Statistics at Ocean Road Cancer Institute (ORCI). From this study, it was found that interventions of cancer of the cervix, breast, kaposi sarcoma, esophageal and head and neck has to be given high priority. It was also observed that treatment outcome for cervical cancer patients of all stages ranged between 34.2 % and 39.1% in the year 2010 and 2015 respectively. Using incidence, curability and socio-economic indices, the cancer type which require effective intervention are cancer of the cervix, breast and kaposi sarcoma. Implicitly, in the low cure rate of each detected cervical cancer in Tanzania compared to high cure rate reported in developed countries, early detection interventions and dose delivery accuracy should be improved.

Key words: cancer statistics; cancer incidence; cervical cancer; Tanzania; radiotherapy;

1. Introduction

Among the non-communicable diseases cancer is becoming a worldwide health burden in various part of the world in recent years due population's growth, increase of life expectancies, and adopts lifestyle behaviors that increase cancer risk [1, 2]. In 2008, for example, about 12.7 million new cancer cases and

7.6 million deaths has occurred worldwide [3]. By the year 2012, cancer incidences had increased to 14 million new cases and 8.2 million deaths [4]. Earlier projection showed that over 18.1 million diagnosed with cancer in 2018 and 9.6 million would have died from this disease [5]. Since mortality-to-incidence ratio is high for several cancer types, especially in the country with low human development index (LHDI) [6], early detection and improvement of cancer care are necessary to decrease this burden. Reduction of cancer incidence rate as a method to lessen this burden is more difficult than reduction of mortality rate since causes of cancer are not as clearly understood. In case where cancer prevention intervention is possible, the prevention strategies are not as readily implementable as in cancer management intervention because in most cases preventive measures are voluntary. The interventions used to reduce the burden of cancer are therefore premised more in reduction of cancer morbidity by early detection especially for the cancer types with both high incidence and cure rate and cancer type that have high socio-economic impact on the society. Unfortunately this information varies from one region to another in developing world. For this reason, strategies for reduction of cancer burden in one nation, especially in developed world, cannot be directly applied in another nation like Tanzania without taking into consideration relevant cancer statistics which in this case, is population based cancer statistics. Since this statistics is not entirely available in many countries, many researchers have used hospital based statistics [7, 8, 9], to generate valuable information in the advancement of epidemiological data used in population-based cancer registry. Because of the increase burden of cancer in Tanzania in recent years, the hospital based statistics will enable hospital management to formulate a cancer management strategy that will have a visible and immediate impact in the Tanzania society. For this reason, this study aimed to produce such statistics for subsequent development of cancer management strategies and to provide a basis for evaluating the prognosis and survival rates of patients to reduce the increasing cancer burden in Tanzania.

2. Material and Methods

2.1 Study design and procedures

This was a retrospective study conducted at ORCI which is a specialized national hospital for cancer care and receives patients referred from all regions of Tanzania. The details of patients were retrieved from patients' files found in the registry department at ORCI. Information retrieved includes socio-demographic data, clinical presentation of patient, tumor type and stage, number of treatment fractions, and curability status of the disease. The study included all patients diagnosed with cancer and presented at the Institute from January 2005 to December 2015.

3. Results

3.1 Statistics of selected cancer types at ORCI

Among the 47,415 patients who attended cancer treatment at ORCI, 16,343 (34%) were diagnosed with cervical cancer (Table 1). The rapid increase and trend of cervical cancer and other four major cancer types in Tanzania were identified over a period of ten years from 2005– 2015 and presented in figure 1.

Table 1. Summary of new cases for selected cancer types for a period of 10 years at ORCI

Cancer type	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cervix	879	955	1006	1288	1374	1510	1881	1896	1795	1867	1892
KS	286	295	404	418	447	681	814	789	654	680	674
Breast	206	244	245	275	322	386	526	667	705	733	742
Esophageal	196	181	256	282	307	380	511	573	601	625	643
Head&neck	174	155	206	244	272	289	361	386	411	427	439
Lymphoma	157	201	199	226	245	186	269	295	295	307	314
Leukemia	66	46	78	87	103	142	261	252	259	269	253
Urinary	63	46	88	87	98	109	153	168	168	175	182
Skin	79	40	108	111	123	129	141	147	147	153	161
Eye	61	46	76	80	95	84	119	131	134	139	143
Prostate	54	51	69	75	85	96	93	101	116	121	129
Others	195	467	403	307	305	203	115	124	179	186	192

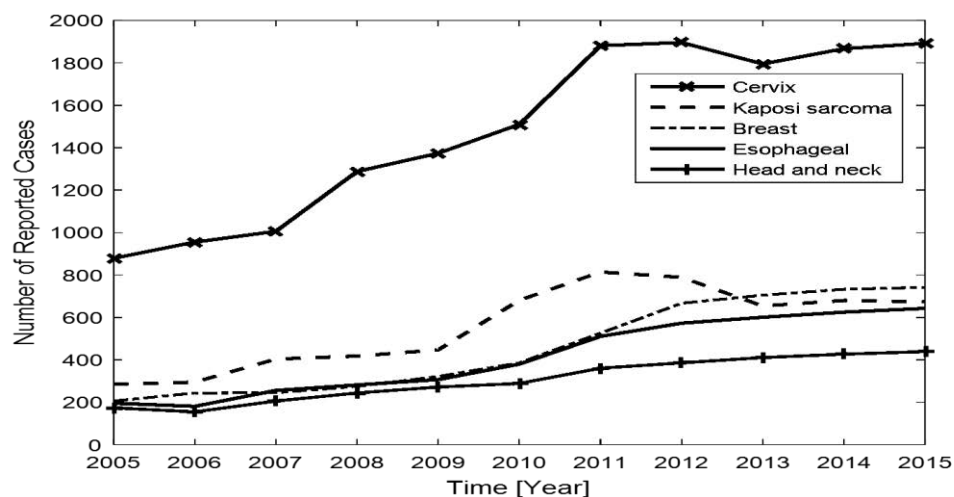


Figure 1: Reported incidence of five major cancer types at ORCI between 2005 and 2015

3.2 Distribution of cervical cancer patients according to Tanzania Zones

Among the reported cancer cases at ORCI, cervical cancer has the highest occurrence of all malignancies registered in this institution. Figure 1 shows cervical cancer as the leading disease with highest occurrence as compared with other four cancer types, namely, Kaposi sarcoma, breast, prostate and esophagus. This study has found that the coastal zone (Dar es Salaam, Pwani, Tanga, Lindi and Mtwara), have significantly high number of cervical cancer patients as compared with other Tanzanian zones. Table 2 show the distribution of cervical cancer patients as recorded at ORCI in the years 2010, 2015 and 2017 in different Tanzanian zones.

Table 2: Distribution of cervical cancer incidence according to Tanzania Zones

Zones	2010; n=758	2015; n=839	2017; n=1171
Coastal	54.28%	47.32%	38.59%
Lake	14.53%	18.62%	18.87%
Central	11.31%	11.68%	16.73%
Southern highlands	11.74%	11.62%	16.73%
Northern highlands	3.46%	6.29%	5.38%
Zanzibar	3.96%	3.45%	3.67%

Based on the statistics, cervical cancer patients at ORCI were also reported in terms of their disease stages (Figure 2). A total of 839 patients with intermediate-stage cervical cancer were admitted at ORCI between January 2015 and December 2015.

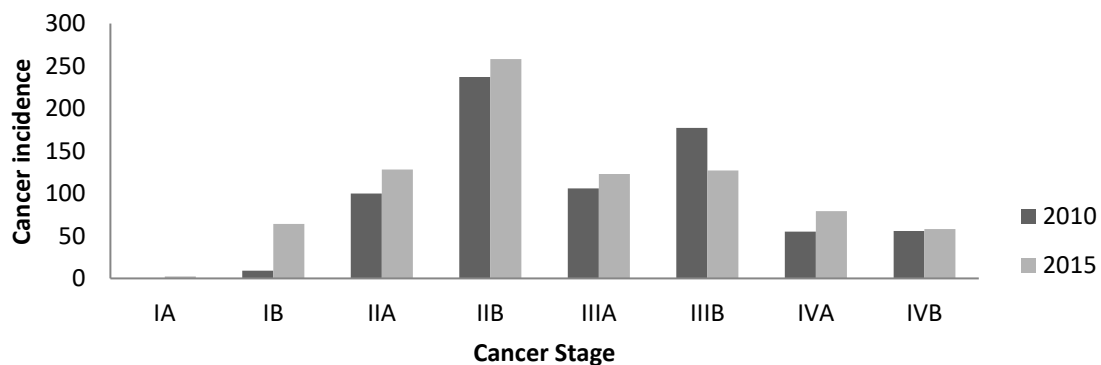


Figure 2: Cervical cancer incidences according to FIGO stage of diseases at ORCI in the year 2010 and 2015

3.3 Treatment assessment of cervical cancer

Treatment data were abstracted from patient's records and the treatment duration was the time between the first and the last fractions. Radiation dose was considered complete if the cervical cancer patient received the total dose that she was prescribed by the medical oncologist. Patient with no radiation dose or who did not complete prescribed dose were considered as absconded. In terms of cervical cancer treatment outcomes (Table 3), a high percentage of cervical cancer patients completed treatment sessions and their outcomes found to be good in the year 2015 as compared to the year 2010.

Table 3. Radiotherapy treatment outcome of cervical cancer patients at ORCI

Year	No. of patients	Complete radiotherapy	Absconded treatment	Cured	Not cured	Died at Hospital
2010	758	658(86.80%)	100(13.18%)	225(34.20%)	366(55.60%)	68(10.20%)
2015	839	519(61.86%)	320(38.14%)	203(39.10%)	211(40.70%)	105(20.20%)

Table 4. Features for assessment of effectiveness of cancer impact intervention at ORCI

Cancer type	Average	% incidence	Incidence	Curability	Socio-

	incidence (2005-2015)		score	score	economic score
1. Cervix	16,343	34	4	4	4
2. Breast	6,142	13	3	4	4
3. Kaposi sarcoma	5,051	11	3	3	1
4. Esophageal	4,555	10	2	1	1
5. Head & neck	3,364	7	2	3	1

For cancer victims of age below 40 years, the socio-economic were given a score of 4; a score of 3 for ages below 50 years, a score of 2 for ages below 60 years and the rest a score of 1. Using these scores, the cancer types with high negative impact in Tanzania are breast and cervical cancers and therefore should be given high priority in the cancer intervention.

3.5 Cancer types with high incidence

According to Table 1, cancer of the cervix has the highest incidence rates in Tanzania followed by breast cancer. In developed countries, cancer of the breast has the highest incidence rate while cancer of the cervix remained to be the fourth in all women cancers [5]. The reasons for this existing difference are still unclear. According to incidence alone, what is also not clearly understood are the factors responsible for overtaken of kaposi sarcoma by breast cancer from the year 2013 and above. It is useful to note that since 2005 all cancer types have been increasing with time indicating that cancer intervention has not been expanded to match with the increase of cancer incidence due to population increase. To be effective, increase of cancer treatment facilities should be given preference to cancer types with highest incidence. In this case breast and cervical cancer need to be given highest priority in Tanzania.

4. Discussion

4.1 Distribution of cervical cancer patients according to Tanzanian Zones

High incidence rate alone is not a sufficient parameter for implementation of effective cancer intervention without looking into distribution of incidence in different zones. According to Table 2, the coastal zones should be given preference to cervical cancer intervention. However, increasing number of cervical cancer in this zone might be due to increase activities of screening programmes and increasing number of cancer diagnostic centers.

4.2 Cervical cancer incidence according to FIGO stage at ORCI

Cervical cancer remains the leading cause of death for women in Tanzania because most of the patient diagnosed with this disease at an advanced stage [10, 11]. This fact is also presented in figure 2 in which 68.30% of all patients registered in 2010 were diagnosed with stage IIB and stage III while only 3.95% of the patient were at stage IB of the disease during time of diagnosis. The absence of stage IA in this year implies that the screening interventions have not been effective as desired. It has been reported that, late stages of cervical cancer is associated with low levels of knowledge on basic symptoms of cervical cancer,

fear of the disease and stigma associated with cancer diagnosis, limited awareness of prevention and early detection methods and concerns about spousal disapproval of screening, and violations of religious and cultural obligations of modesty during screening procedures [12, 13, 14, 15].

4.3 Radiotherapy treatment outcome of cervical cancer patients at ORCI

The information about cancer of the cervix which is not well known, in the sub-Saharan countries, is the cause of low curability for cancer treated at early stages of development. If we classify early detection to be associated with stage IA to IIB, according to Figure 2, about 54% of cervical cancer reported at early stage while only 46% at late stage in 2010 and 2015. However the treatment outcome for cervical cancer presented in Table 3 show that during these years, average curability of cancer of the cervix regardless of disease stage, were about 36%. Of interest is the percentage of curability of early detected cancers which could be compared to 80% curability reported in advanced countries for this cancer. From Table 3, the early detected cancers during these two years were 54%. Of the 54% detected cancer for these years, only 53% were cured as opposed to the expected 80% reported elsewhere. There are two possible causes of the decreased cancer curability in Tanzania. The first one is that, as seen in Figure 2, early detection is skewed toward stage IIB as opposed to IA observed in nations with effective screening and cancer detection intervention. Therefore curability of the cervical cancer in Tanzania can be increased if the accessibility of screening and early detection intervention is increased. The second course is as already reported in the literature is that during treatment dose delivered to this cancer is not in the specified $\pm 5\%$ deviation from prescribed dose [11]. Thus, therefore is a great need to investigate the factors responsible for decrease dose delivery accuracy on how they can be used to improve cancer treatment in Tanzania.

5. Conclusion

Several issues have to be addressed to increase effectiveness of cancer intervention in Tanzania. Accessibility of diagnostic and treatment facilities for cancer with high incidence (cervix, breast and kaposi sarcoma) should be increased throughout the country. At the same time factors that influence treatment accuracy for the most prevalent cancer must be investigated in order to improve existing treatment protocols. For these strategies to be effective, training programmes for medical physicists should be introduced and that of radiation oncologists should be strengthened to fulfill the gap observing in the cancer treatment centers.

6. Ethical consideration

This study received ethical clearance approval from the Research Ethical Committee (REC) of University of Dar es Salaam. The permission to conduct this study was given from authorities of ORCI through its research, publication and ethics committee before the commencement of this study.

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BSN Student Recruiters Significantly Increase Clinical Trial Enrollment in an Outpatient Setting

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Abstract

Background: *Insufficient enrollment is a primary determinant of premature clinical trial closure. Nursing students enrolled in research-focused honors programs may be uniquely suited to address recruitment barriers.*

Aims: *Explore the effects of BSN Honors student's face-to-face recruitment on clinical trial enrollment in an oncology clinic setting.*

Methods: *One-group pre/post design examined the efficacy face-to-face recruitment on enrollment in a nutrition-focused oncology clinical trial. Descriptive statistics summarized sample characteristics and t-tests/Man-Whitney U compared between-group differences. Enrollment percent change was calculated to determine intervention effectiveness.*

Results: *No between group differences were observed between individuals who enrolled versus those who declined. In-person BSN nursing student recruitment resulted in a 77% increase across six weeks.*

Conclusions *Nursing honors student recruitment was effective and well received by patients and clinical staff. Leveraging research application opportunities and undergraduate student nurse skill sets may provide a cost-effective strategy to reduce recruitment barriers and increase clinical trial target enrollment feasibility.*

Key words: BSN students, clinical trial recruitment, feasibility, resource leveraging

1. Introduction

Clinical trials are the gold standard to validate safety and efficacy of health interventions in humans. Efficient and effective recruitment of eligible participants is critical to successful completion of clinical trials. Likewise, inadequate study accrual may negatively influence the accuracy of research findings (i.e., lack of power, Type II error) and reduce generalizability. Unfortunately, lack of sufficient accrual for clinical trial participation is a pervasive challenge across disease and population spectrums [1, 2] and is the primary predictor of early termination of human studies [3]. In fact, approximately 50% of prematurely discontinued clinical trials are due to insufficient accrual and 75% of all clinical trials never reach a priori recruitment targets [4].

Primary barriers to recruitment are fundamentally two-fold: individual and system. Individual factors related to study non-participation include a lack of awareness of the clinical trial, reluctance/mistrust of research/scientists, dissatisfaction of randomization and control group assignment, financial barriers and logistics (i.e., driving distance for data collection) and/or lack of interest in research participation [5]. System-related barriers consist of ambivalence towards study participation from clinicians and other stakeholders, inadequate office personnel to meet the demands of maintaining a clinical practice and staff or space necessary for recruitment, poor understanding of study aims by clinicians and staff, perceived conflicts of interest between research needs and patient-related clinical decision making autonomy, as well as a lack of systematic, efficient, eligibility screening mechanisms [6, 7].

Across human research domains, cancer clinical trials are particularly challenging. Despite consistent, positive associations between healthcare provider recommendation and an individual's decision to participate in research, oncology providers are sometimes hesitant to inform patients of research participation opportunities [8, 9]. Common themes among oncology providers regarding clinical trial referral hesitation include lack of time to provide study-related information in the context of the cancer treatment plan, random group assignment misgivings, apprehension related to conceivable cancer treatment protocol interference, as well as a concern that the patient and/or family may perceive that the research recommendation is simply a last-resort maneuver in regards to the patient's cancer prognosis [6, 10, 11].

To address these recruitment barriers, innovative, efficient, and cost-effective strategies are a high priority across research institutions. One such underexplored model includes strategic learning and research partnerships within academic science centers. For example, Bachelor of Science in Nursing (BSN) honors students may be uniquely well suited for clinical trial recruitment. Nursing honors students are academically motivated, high achieving, emerging professionals. These students demonstrate medical terminology proficiency, navigate electronic medical record systems efficiently, exhibit excellent interpersonal and professional skills within healthcare settings (i.e., outpatient clinics, acute care facilities, and community centers) as well as provide clear and compassionate communication to potential study participants and their families [12]. In addition, research-focused nurse honors programs provide students with the foundational research principles needed to meaningfully contribute to a research team (i.e., ethics, human protections, protocol adherence). Lastly, research-oriented practicum experiences are generally required for honors program completion. Thus, clinical trial activities, such as study recruitment, may support application of didactic research instruction while reducing staff time burden. However, little

evidence exists related to the effectiveness of such learning/research partnerships among nursing students enrolled in research-based honors programs.

2. Purpose

The purpose of this study is to evaluate the impact of BSN Honors student recruitment on study accrual in women diagnosed with gynecological (i.e., uterine and/or endometrial) cancer (i.e. newly diagnosed or recurrent) in a gynecology oncology outpatient clinic during a six-week research practicum experience.

3. Methodology

Four BSN students enrolled in a research-focused nursing honors program in an academic science healthcare center completed the Collaborative Institutional Training Initiative (CITI) Human Subjects Research Basic and the Responsible Conduct of Research (RCR) training as well Health Insurance Portability and Accountability Act (HIPPA)/confidentiality training. Institutional Review Board (IRB) approval was obtained for the addition of the student-led in-clinic recruitment initiative.

Support for student-led recruitment for the study was obtained from the clinic's healthcare providers and administrators. Emergency and Honors Program faculty contact information were made available to the clinic's administrative staff. In addition, students completed training led by the study's research coordinator that included a review of the clinical trial's specific aims, inclusion/exclusion criteria, group randomization procedures as well as intervention and control protocols.

3.1 Protocol

Medical records of scheduled patients were screened for eligibility at the beginning of each clinic day. Eligibility criteria for the study included 1) endometrial or ovarian cancer diagnosis, 2) measurable tumor(s) *or* elevated CA-125, 3) BMI > 18.5, 4) proficient in English (i.e., speaking and reading), and 5) agreeable to randomized group assignment. Healthcare providers queried eligible patients regarding research participation interest prior to discharge. Patients that indicated participation interest were provided verbal and written study-related information by a student in a private exam room prior to clinic discharge. Lastly, the name, medical record number, and preferred contact method were obtained from women requesting additional information. This information was placed in a sealed envelope and hand delivered to the research coordinator at the conclusion of each clinic day. Potential participants were contacted by the research coordinator within seven days to provide study-related information, verify participation interest, confirm eligibility, answer additional questions and schedule baseline data collection (as appropriate). Informed consent document was obtained by research staff prior to baseline data collection for all participants.

De-identified demographic (i.e., age, race, ethnicity, marital status, occupation, type of insurance) and descriptive (i.e., type and stage of cancer, body mass index, concurrent comorbidities) data were collected from the health record of the women that were counseled about the study by an Honors student. Descriptive statistics were analyzed to identify sample characteristics. Between-group comparisons were

assessed via *t* (i.e., age, age at cancer diagnosis, and BMI) and Mann-Whitney U (i.e., cancer stage) test analyses to detect differences between the participants that enrolled in the study versus those who declined study participation. Percent change in study accrual from baseline to week 6 served as the proxy to assess effectiveness of the student-led recruitment initiative. Accrual increase of $\geq 25\%$ across the 6-week practicum was determined a priori as the benchmark for success.

4. Results

Twenty-nine eligible women were eligible to participate. Of the 29 women, eight declined, ten enrolled, and 12 were pending enrollment (i.e. awaiting one or more of the following: final eligibility screening by research coordinator, informed consent, or baseline appointment scheduled) at the conclusion of the six-week student recruitment initiative (Table 1). There were no differences observed between women that enrolled in the study versus women that declined to participate on demographic (i.e., age, marital status, race/ethnicity, type of health insurance) or descriptive (i.e., cancer type and/or stage, existence and/or number of comorbidities) indicators. Overall, the sample primarily consisted of overweight or obese midlife to older women ($M = 60.9$, $SD = 11.6$), diagnosed with at least one additional comorbidity (i.e., hypertension, obesity, hyperlipidemia, and/or hypothyroidism). Of the women that declined participation, travel for study-related visits ($n = 4$) and uncertainty regarding effects of the intervention on cancer treatment ($n = 3$) were the most commonly cited reasons.

Table 1. Sample characteristics

	Enrolled ($n = 10$) (Mean/SD)	Declined ($n = 8$) (Mean/SD)	Pending Consent ($n = 12$) (Mean/SD)
Age in years	60.9 (9.3)	62.5 (13.0)	58.8 (13.7)
Age (years) at cancer diagnosis	60.9 (7.6)	57.2 (18.6)	56.9 (15.2)
Cancer stage (I – IV)	2.2 (1.2)	2.8 (0.9)	1.7 (1.4)
BMI	36.6 (11.2)	35.0 (12.0)	59.0 (13.7)
Private Insurance	5	6	9
Two or more comorbidities	8	6	7
Race (Caucasian)	9	7	9
Married/Partnership	4	3	6

Demographic variables of eligible women with face-to-face recruitment by enrollment status

Face-to-face recruitment significantly increased study enrollment ($p < .001$). In the prior ten-months utilizing traditional recruitment approaches (i.e., flier dissemination, word of mouth, and healthcare provider referral) 13 women were enrolled. During the 6-week student recruitment initiative, study accrual increased from 13 to 23 participants, a 76.9% increase. In addition, 12 additional participants were

scheduled to complete final screen and informed consent by the project coordinator at the project's conclusion.

5. Discussion

In this study, we found that onsite recruitment by BSN Honors students increased study enrollment by 76% in 6-weeks. Prior recruitment approaches included strategic advertisement (i.e., fliers), word of mouth, and physician/nursing staff referral. To set the stage for success, the primary investigator and research coordinator collaborated throughout the protocol development (i.e., grant application) and implementation stage with the clinic's medical, administrative, and nursing staff. These longitudinal collaborative efforts were aimed to ensure clarity of the study's purpose, recruitment goals, and research protocol as well as to identify potential clinic referral barriers, establish effective methods of communication and complete recruitment-specific staff training. To minimize clinic disruption, research funds were allocated to support additional staff during the recruitment period. However, in retrospect it seems that a specific time of day or number of hours per week dedicated to nurse recruitment endeavors weren't clearly delineated. Thus, it is plausible the nurse's day-to-day clinic responsibilities were not reduced proportionate to the research salary support provided. Consequently, time for study eligibility screening or providing eligible women with study-related information may not have been feasible given the time demands of caring for often acutely ill patients in a busy oncology clinic. As such, future research/practice partnerships may consider negotiating specific time designations for staff to complete research-related activities a-priori as appropriate.

Consistent with other studies, we found that reducing provider and clinical staff recruitment burden significantly increased study enrollment. Likewise, in a study of older, cognitively impaired cancer patients, removing providers/staff from eligibility screening and informed consent procedures by having members of the research team in the clinic setting was more effective in comparison to a patient-centered approach (i.e., communication training of clinic staff members tailored to the older adult and allowing additional time for the participant to answer questions (81% versus 50% enrollment, respectively) [13]. Similarly, in a cancer trial of patient/caregiver dyads, Sygna and associates compared seven recruitment strategies: 1) on-site recruitment by research team member; 2) relying on providers at the hospital; 3) newspaper advertising; 4) internet and social media; 5) recruitment at a rehabilitation center; 6) flyers; and 7) opt-out with routine care letters in which patients who did not opt-out were contacted by telephone a few days later. The most effective recruitment method was the use of research team members to recruit at the clinic site (50%) followed by the opt-out option and follow up phone call by a member of the research team for patients that did not opt out (19.3%) [2]. Thus, human contact by a member of the research team appears to play an important role in recruitment success and may play an even greater role in cancer clinical trial recruitment. In our study, decreasing the screening burden as well as providing fundamental study-related information during the office visit to eligible, interested women resulted in more than a 75% rise in enrollment in 6-weeks.

It is well-established that physician recommendation for clinical trial participation is highly influential in research recruitment. Comis and colleagues conducted a cross-sectional study of $N = 1,027$

adults cancer survivors and/or diagnosis of another serious medical condition and found that nearly 60% relied either exclusively or primarily on their healthcare provider for all decisions impacting their health [14]. Of their sample, nine percent of cancer survivors reported that they were aware at the time of their diagnosis that they may be eligible to participate in a clinical trial. Of the ninety percent who were unaware of a clinical trial opportunity, 65% indicated they would have been receptive to learning more information about the study and/or enrollment. In this study, anecdotal observations suggested healthcare providers were willing to introduce women to the option of research participation and consistently did so for those women identified by the student team as eligible.

These observations underscore the importance of a thorough investigation of clinic resource availability when determining screening and recruitment procedures. Factors such as eligibility specificity may important to consider when determining whether screening is feasible among those providing care. Studies with more narrow requirements (e.g., nulliparous women, BMI > 24.9, prescribed at least one antidepressant, and received colposcopy with previous 12 months) may necessitate a more time-intensive, comprehensive review of the medical record, and thus less feasible in comparison to studies where the criteria is more broad (e.g., males at least 65 years). Likewise, clinical characteristics (e.g., type of practice (i.e., acute, primary, or chronic care; general versus specialty), population (i.e., age, level of overall health, and literacy of patients), and provider/clinic workload are also critical factors to consider when determining feasible provider and clinic staff participation regarding clinical trial recruitment.

5.1 Limitations

Small sample size, single-recruitment location, and a limited time frame (i.e., 6-weeks) due to the academic calendar parameters are noteworthy limitations. It is unclear as to how long a similar recruitment trend may have continued. It is also unclear whether the student's screening and identification of likely eligible participants for the healthcare providers or if the provision of basic study-related information by the student nurses was key. It is plausible that the mentioning of the clinical trial by the women's oncologists was largely responsible for the greater study enrollment. Alternatively, the inquiry by the oncologist as to whether the women may be interested in learning more about research participation followed by the onsite provision of study-related information by the nursing students worked synergistically to increase study enrollment.

6. Conclusion

Trust is a key component in clinical research. Trust between the research team and the clinic staff and more importantly trust must exist for patients and participants. Nursing students may be an ideal way to bridge the trust gap and overcome other barriers to research participation. Engaging nursing students in the process of educating clinic patients about research and providing the patients with opportunities to participate in clinical research is a win-win recruitment strategy. Patients win because they have a student devoted to thoroughly explaining the research and students win because by participating in the recruitment process they gain insight to the research process. In addition, the clinic and the research study win because student effort is of no cost within the context of a learning environment. Lastly, the students win by gaining

valuable research experience, increasing their professional network and being introduced to the academic nursing pathway, a career option often overlooked among new graduate BSN nurses.

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The Role of Learning Management Systems (LMS) in Developing Learning Skills: The Case of Blackboard

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Abstract

The current study aims at measuring the efficiency of Blackboard in developing the collaborative and individual learning skills of Taibah University students. Moreover, it has sought to unravel the differences (if any) in the effectiveness of the system in developing the above-mentioned skills according to the change of the user (student, staff member), gender (male, female), and the change of college to which the user belongs (scientific, humanitarian). The study adopted an analytical descriptive approach as it suits the nature of the study and its variables. Doing so, the researchers have built a learning tool which consists of two lists of e-learning skills; the first is for the individual e-learning skills and is divided into three main focuses including 45 statements, and the second is for the collaborative e-learning skills and is divided into three main focuses including 26 statements. The study sample consisted of members of staff, students (males and females) distributed across colleges of Taibah University (n= 17). The study came up with some results of which the most significant were: the Blackboard's efficiency in developing the individual e-learning skills and the collaborative e-learning skills for the students is statistically high. This reflects the importance of integrating the electronic systems within the learning and teaching processes and underlines its positive role in achieving the quality learning at low cost and effort. In addition, the study came up with the absence of indicative differences statistically in developing the individual and collaborative e-learning skills as per the user (student - member staff), their gender (male-female), or the college with which the user is affiliated (scientific - humanitarian). The study recommends the conduct of periodic assessment processes for the system's efficiency in developing students' various learning skills and calls for conducting similar studies to determine the necessary technological requirements for developing Blackboard on the basis of the individual and collaborative e-learning skills.

Keywords: Blackboard, Collaborative learning, E-learning, Individual learning, Learning management system.

1. Introduction

E-learning is considered one of the most significant features of the technology and information era, its field and functionality, included concepts, and characteristics. Over and above, educational institutions use such technologies to raise their level and the education quality. The presence of schemes that track the educational systems and fulfil the administrative and technical role in learning has become a basis for teaching and learning processes. There exists a tangible tendency for all Saudi universities and particularly Taibah University for using a system for the e-learning management system and the distance learning called (Blackboard) where there is no longer significance for the time and place obstacle in education and it becomes easy to deal with those obstacles through integrating the electronic systems.

By and large, e-learning depends on consistently updating the educational strategies and integrating more than one strategy in a single educational environment and that is to achieve typically the learning goals and to suit the various curricula presentation methods according to such strategies with different sorts of students and recipients of the learning systems. The use of Blackboard has gained a specific attention in both developed and developing countries, where universities in the developed countries concern about expanding its use through developing full curricula by it and that's what made the developing countries strive to catch up with the developed countries in that regard and to recognise the importance of the Blackboard in fostering the efficiency of the educational process in the higher educational institutions.

It should be noted that Taibah University has depended on individual learning strategies in teaching, activities execution, home works, tests and assignments, while designing the e-learning strategies through Blackboard; and has integrated into it the collaborative strategy to enhance the interaction and to share experiences and opinions across students and between students and their teachers. Individual e-learning strategy is one of the best learning strategies as it deals with every student according to his/her capabilities and learning potential, over and above it provides a suitable educational environment for self-study where the teacher guides, supervises the learning process and follows up the tests and the progress of each student separately. Collaborative e-learning, on the other hand, is also from the strategies that has proven its excellence and significance as a strategy for e-learning, and as one of the working groups' strategies where it provides participants with learning opportunities for learning and sharing the information sources as well as the possibility to exchange experiences. The primary objective for the collaborative learning is to acquire the capability to build knowledge in innovative and new ways, and until 2010, it has been one of the best supportive learning strategies within the group.

2. Educational Issues

E-learning has received much attention and interest all over the world in general and particularly in the Arab World. Arab World universities have commenced competing foreign universities in that field, where most of the universities have built the pillars and centres for the e-learning as well as distance learning; through which all the leaders, the staff and students are involved in the learning process to assume their responsibilities towards the learning and teaching processes, which assisted in developing the practices and

the outcomes; and that's because these centres have capability to connect between the technological and the recent interactive resources and between the e-curricula and its design and construction in a way that serves the teaching and learning process through Blackboard.

Along with that progress, the need to integrate effective strategies in the electronic learning is necessary for the success of such systems and important to invest in the desired manner. In that regard, it's worth the mention to two important electronic learning strategies which have improved their efficiency in producing better learning and more comprehensive skills which are the individual e-learning strategy and the collaborative e-learning strategy. Based on the above-mentioned, the aim of the present study is to highlight the efficiency of the Blackboard in developing the Taibah University students' individual and collaborative learning skills.

3. Significance of the Study

3.1 Theoretical Significance

The theoretical importance of the present study comes from the importance of the variables examined by the study represented in the management of Blackboard; and the individual and collaborative e-learning skills in the sample study; and these variables have importance in developing the learning skills and its outcomes in the sample study, as well as the rarity of the studies on such variables so - within the knowledge of the two researchers - there aren't any previous studies on both variables, furthermore the present study cares about connecting between Blackboard as technological inputs and between developing the intellectual, cognitive and social skills for the students using Blackboard as important requirements should be met in the learning systems to maximise the efficiency in learning and to prepare the students for the labour market to compete in the desired manner.

3.2 Empirical Significance

The practical importance of the study is to identify the strengths and weakness points of Blackboard in its capability to develop the students' individual and collaborative e-learning skills. Moreover, the results of the study may contribute to serve the designers of Blackboard and the supervisors of the e-learning management in improving the methods and practices that affect developing all the intellectual skills and particularly the individual and collaborative e-learning skills to help improving the systems and its uses.

4. Objectives of the Study

The present study aims at:

- 1- Recognising the efficiency of Blackboard in developing the Taibah University students' individual skills.
- 2- Recognising the efficiency of Blackboard in developing the Taibah University students' collaborative skills.

- 3- Revealing the differences in Blackboard's efficiency in developing the Taibah University students' individual and collaborative learning skills according to the user's change (student - member staff).
- 4- Revealing the differences in Blackboard's efficiency in developing the Taibah University students' individual and collaborative learning skills according to the user's gender (male -female).
- 5- Revealing the differences in Blackboard's efficiency in developing the Taibah University students' (individual and collaborative) learning skills according to the type of college (scientific - humanitarian).

5. Data Collection and Analysis

5.1 Survey Questions

The study responds to the main question: What's the efficiency of Blackboard in developing Taibah University students' individual and collaborative learning skills? Two sub-questions branched out from the main question:

- 1- What's the efficiency of Blackboard in developing the Taibah University students' individual learning skills?
- 2- What's the efficiency of Blackboard in developing the Taibah University students' collaborative learning skills?
- 3- Does it differ the efficiency of Blackboard in developing the Taibah University students' individual and collaborative learning skills according to the user's change (student - member staff)?
- 4- Does it differ the efficiency of Blackboard in developing the Taibah University students' individual and collaborative learning skills according to the user's gender?
- 5- Does it differ the efficiency of Blackboard in developing Taibah University students' individual and collaborative learning skills according to the type of college (scientific - humanitarian)?

5.2 Data Analysis

The questionnaire consists of two main parts: the first for individual e-learning skills, containing (3) main sub-parts of (45) points, and the second for e-learning participatory skills, containing (3) sub-parts of (26) points and the availability of the Blackboard Management System for tools, procedures or support that develop the skill of the user whether male / female, male / female, also in the humanitarian / scientific faculties according to the research variables. This is done by means of the pentagram (very high) - medium - weak - very weak) and receive the first response to five GAT, the second gets four grades, the third gets three grades, the fourth gets two degrees, the fifth gets one grade, the first response (very high) indicates the availability of skills while the fifth (very low) indicates its lack. This questionnaire was passed electronically to faculty members and students of Taibah University. The results of the statistics were divided as follows: 1) variables of the questionnaire: independent variables, variable names of parts of the questionnaire; 2) affiliate variables. The response of the study sample to the statements of the questionnaire by 71 statements. The results were analysed using the SPSS program. The Alpha test was applied to the questionnaire to measure the stability of the questionnaire. It was 99% and was analysed based on:

- frequencies and percentages;
- mean;
- standard deviation.

Third, the adoption of the balance of appreciation according to a five-point Likert scale, as shown next.

Response	Weighted Mean		General Direction
	From	To	
Strongly Disagree	1	1.8	Strongly Disagree
Disagree	1.801	2.6	Disagree
Not Sure	2.601	3.4	Not Sure
Agree	3.401	4.2	Agree
Strongly Agree	4.201	5	Strongly Agree

Table 1: Likert Scale Distribution.

We will then use the weighted average of the answers to the questions using the five-point Likert scale to determine the direction of views.

First: e-learning

The definition of e-learning:

Types and systems of e-learning:

The Second Focus/Blackboard

Definition of the Learning management systems (LMS):

Learning management system functions:

Components of the Learning management systems (LMS):

Learning management system types:

- BLACKBOARD:

The Third Focus /e-learning skills

First: Individual e-learning:

Second: Collaborative e-learning.

5.3 Procedural Concepts of the Study:

5.3.1 Learning Management Systems (LMS):

It is a set of accredited applications on the Internet used for learning planning, for its implementation, assessment, monitoring the students' participation, their interactions and for the assessment of their performance. It's equipped with communication tools and group discussions. It's controllable at any time and space without obstacles.

5.3.2 Blackboard:

It's one of e-learning platforms and accredited learning management system and e-learning content by the deanship of e-learning Taibah University in Saudi Arabia.

5.3.3 E-Learning skills:

They're the skills which enable performing the tasks and achieve perfectly the required educational goals using the available e-learning methods within (Blackboard) in Taibah University.

5.3.4 Individual Learning Skills:

They're skills which enable the student to learn individually according to his capabilities and his potential in learning to achieve independently the educational goals. Moreover, (Blackboard) enables the student to communicate constantly with his teachers through means of individual communication e.g. (E-Mail) and personal messages within Blackboard. The teacher's role is only limited to monitoring, guidance and assessment.

5.3.5 Collaborative Learning Skills:

They're the skills which enable students to learn within big or small homogeneous groups and fulfill teamwork skills to enable all the students together to learn in an appropriate manner which suits every student to achieve the educational goals and to carry out the educational tasks and activities within learning groups, where (Blackboard) links students to appropriate and different collective telecommunication, for example: forums, discussions and collective messages.

6. Study Procedures:

6.1 Study Community:

Study community consists of all students who studied e-curricula through (Blackboard) and all staff who supervises teaching e-curricula through (Blackboard); in Taibah University– Saudi Arabia.

6.2 Study Sample:

Current study sample consists of 50 members of staff, and 154 students distributed across the different faculties of Taibah University.

6.3 Approach of the Study:

The current study depended on the analytical descriptive approach as it suits the nature of the study and its variables.

6.4 Delimitation of the Study:

- **Objective Limits:** The current studying is limited to the individual and collaborative e-learning skills.
- **Space Limits:** Taibah University is in the Western region of Saudi Arabia and it covers five governorates: Madinah, Al-'Ula, Badr, Khaybar and Yanbu.
- **Time Limits:** The second term of the academic year 2017/2018.

- **Other Limits:** Blackboard users are students, members of staff and who are like them in Taibah University.

7. Study Tools:

After reviewing the literary theory, the questionnaire has been prepared to measure the efficiency of (Blackboard) in developing the individual and collaborative learning skills for students studying e-curricula through system.

7.1 Overview of the Questionnaire:

The questionnaire consists of two main parts; the first is for the individual e-Learning skills and contains (3) main focuses including (45) statements, while the second one is for the collaborative e-Learning skills and contains (3) main focuses including (26) statements. Each paragraph will be answered through determining the degree of provision and availability of (Blackboard) to the tools and procedures or support that develop the learner's skills through Liker scale (Very High- High- Medium – low- very low), the first response gets five degrees, the second gets four degrees, the third gets three degrees, the fourth gets two degrees and the fifth gets one degree, and first response indicates (Very High) that skills are available while the fifth indicates (Very low) which means lack of skills.

Way of preparing the questionnaire: To prepare the study tool, the two researchers followed the following steps:

- 1- Reviewing the previous studies and researches on the individual and collaborative e-learning skills and benefit from them.
- 2- Preparing the first vision of the questionnaire main focuses and the sub-focuses of each focus and elaborating its statements.
- 3- Presenting the questionnaire to specialists in the field of teaching techniques, curricula and teaching methodologies for judgment.
- 4- Reviewing the study arbitrators observations and suggestions and take advantage of them, and conduct processes of omissions and appropriate additions, modifying wording and then rebuilding the questionnaire in its final image as shown below in table (2).

M	Individual learning skills	Number of Statements
1	First focus/ Personal and Ethical Aspect	7
2	Second focus/ Cognitive and Educational Aspect	26
3	Third Focus /The Electronic technical Aspect	8
	Total	45
M	Collaborative Learning Skills	Number of Statements
1	First Focus/ Group Ethics	8

2	Second Focus / The study within the group	11
3	Third Focus / Group learning tools	7
	Total	26
	Questionnaire's Statements	71

Table (2): Detailed description of the questionnaire in its final image.

7.2 Validity and Reliability of the Questionnaire:

Five competent arbitrators in Information, Learning Resources and Educational Technology have reviewed the questionnaire in its primary form to judge the validity of the questionnaire's statements at measuring the availability of the individual and collaborative learning skills. The percentage of agreement on the questionnaire's statements has ranged from 90-100% which indicates an acceptable degree of trust while handling the questionnaire.

7.3 Internal Consistency of the Questionnaire:

The internal consistency coefficient of the questionnaire's focuses has been calculated collectively and with its total score, the two researchers have used the Pearson correlation coefficient's (PCC), all values were characterized by a considerable value of internal consistency as the three focuses for each section was related to the other focuses to the other section and the overall degree of the consistency coefficient was at a significance value (0,01) which indicates an acceptable degree of trust while handling the questionnaire. Table (3) shows correlation coefficient values:

Questionnaire's focuses	Personal and Ethical Aspect	Cognitive and Learning Aspect	Electronic technical aspect	Skills of individualistic learning	Group Ethics	Study within the group	Group Learning Tools	Collaborative Learning Skills	Total score
Personal and Ethical Aspect	1	**871.	**825.	**776.	**753.	**747.	**733.	**776.	**883.
Cognitive and Learning Aspect	**871.	1	**846.	**883.	**854.	**867.	**821.	**883.	**968.
Electronic technical aspect	**825.	**846.	1	**841.	**813.	**806.	**802.	**841.	**911.
Skills of individualistic learning	**776.	**883.	**841.	1	**949.	**975.	**837.	1	**962.
Group Ethics	**753.	**854.	**813.	**949.	1	**900.	**837.	**949.	**923.
Study within the group	**747.	**867.	**806.	**975.	**900.	1	**903.	**975.	**939.

Group Learning Tools	**733.	**821.	**802.	**954.	**837.	**903.	1	**954.	**906.
Collaborative Learning Skills	**776.	**883.	**841.	1	**949.	**975.	**954.	1	**962.
Total score	**883.	**968.	**911.	**962.	**923.	**939.	**906.	**962.	1

** Which means that the numbers are indicative at a significance value (0, 01)

Table (3) Correlation coefficient's Matrix between the questionnaire focuses each other and the total score of the individual and collaborative e-learning skills.

The tool's consistency has been verified using "Cronbach's alpha" for the questionnaire's focuses and for questionnaire overall. All the coefficient's consistency were very high which indicates an acceptable measure of reliability while handling the scale. Table (4) shows the coefficient's consistency of "Cronbach's alpha" questionnaire and its focuses:

Focus	Number of Statements	Coefficient's Consistency of "Cronbach's Alpha"
Part I/ Individual e-learning skills	45	0.988
The first focus/ Personal and Ethical Aspect	7	0.915
Second focus/ Cognitive and Educational Skills	27	0.985
The Third Focus /The Electronic technical aspect	11	0.957
Part II/ Collaborative e-learning skills	26	0.985
First Focus/ Group Ethics Skills	8	0.957
Second Focus / Study within the group	11	0.970
Third Focus / Group learning tools	7	0.961
Questionnaire's Overall Consistency	71	0.915

Table (4) Coefficient's Consistency - Cronbach's Alpha.

8. Results and Discussion

8.1 Interpretation of the Study Findings:

To interpret the results of the study the two researchers have identified a standard for interpreting and discussing the results according to the grades of the answers and in a mathematical manner as follow:

Range = Biggest value for answer Classes – Smallest value for answer Classes = 5-1 = 4

Class length = (Range ÷ No. of Classes) = 4 ÷ 5 = 0.80

So the standard of judgment on the arithmetic average value will be as shown below in the table:

Response criterion	Arithmetic average
Very High	From 4,20 to 5

High	From 3,40 to 4,20
Average	From 2,60 to less than 3.40
Low	From 1,80 to less than 2.60
Very Low	From 1 to less than 1.80

Table (5): Responses criterion and the arithmetic average for the five-level Liker grades.

Accordingly:

- The individual and collaborative learning skills that Blackboard contributes to develop are those that average responses of the individuals vary from (2.60 to 5) which means at a very high, high or average degree.
- The individual and collaborative learning skills that Blackboard doesn't contribute to develop are those that average responses of the individuals vary from (1 to less than 2.60) which means at a low or very low degree.

Responses to the survey questions:

First: Response to the first question

To answer the first question which is: "What's the efficiency of Blackboard in developing the Taibah University students' individual learning skills?" The two researchers have used the percentages and the frequencies to recognize the efficiency of Blackboard in developing the Taibah University students' individual learning skills. Table (6) shows the efficiency of Blackboard in developing the Taibah University students' individual learning skills in descending order in each focus according to the frequencies and the percentages.

No	Aspect	Element	Number					Weighted Mean	standard deviation	General Direction
			Strongly Disagree	Disagree	Not Sure	Agree	Agree Strongly			
1	The person al and moral aspect	The system develops the skill of decision making by giving it the freedom to choose some educational and study decisions	8	22	64	50	60	3.65	1.13	Agree

		The system contributes to the development of the student's time management skills	10	12	30	66	86	4.01	1.12	Agree
		The system helps to develop the skill of accuracy and speed of the student	6	8	52	78	60	3.87	0.98	Agree
		The system helps to enhance the value of the student's scientific trust	18	10	58	58	60	3.65	1.20	Agree
		The system encourages students to experiment and discover	6	24	46	58	70	3.79	1.13	Agree
		The system helps to develop the values of preserving the university's gains	12	24	58	58	52	3.56	1.16	Agree
		The system helps to develop students' love of learning	16	16	52	56	64	3.67	1.22	Agree

		General Weighted Mean	3.74	Agree	

Table (6) Efficiency of Blackboard in developing students' individual learning skills.

The table shows that Blackboard efficiency of developing individual learning skills of the students at Taibah University was between Very High and Very Low; and it is rational and predictable outcome. The two researchers interpret the quality of Blackboard, its relevance to the students' terminus and their understanding to its mechanism and requirements, so that was reflected in their ability to make decision to learn and manage well their time.

N o	Aspect	Element	Number					Weighted Mean	standard deviation	General Directio n
			Strongly Disagree	Disagre e	Not Sure	Agre e	Strongly Agree			
1	Knowledge and e academic skills	The student system can self-evaluate according to its level	16	12	40	78	58	3.74	1.17	Agree
		The system develops the skill of retrieving information through educational tasks and activities	18	12	32	74	68	3.79	1.22	Agree
		The system develops the skill of preparation by providing the content of the lessons before the date of to see its study .content	24	14	26	74	66	3.71	1.31	Agree
		The system takes into account the	20	30	54	48	52	3.40	1.28	Agree

	individual differences so that each student learns according to his abilities								
	The system helps to develop the skill of knowledge building on the information previously studied and employed in following the stages	6	24	46	58	70	3.50	1.19	Agree
	The system enhances the logical of rendering topics from one segment to the next	18	18	54	62	52	3.55	1.21	Agree
	The system develops the skill of logical interconnection between information and knowledge	18	18	56	68	44	3.50	1.18	Agree
	The system develops the skill of conclusion through the gradient from year to year	18	18	52	64	52	3.56	1.21	Agree

		The system helps to develop good skills planning for learning tasks and responsibilities	16	8	42	84	54	3.75	1.13	Agree
		The system develops writing skills the through tasks and activities required in courses	18	8	44	80	54	3.71	1.16	Agree
		The system provides flexibility in organizing content in the way the student wishes	16	20	32	70	66	3.74	1.23	Agree
		The system provides the student with the opportunity to discuss and express the content in question	22	20	26	64	72	3.71	1.33	Agree
		The system enables the use different of senses in the observation to promote reflection on the educational situation and to arrive at some	26	18	46	50	64	3.53	1.35	Agree

		hypotheses related to the problem and prediction								
		The system develops the skill of the analyzing content into pieces to reach logical conclusions	22	16	52	62	52	3.52	1.25	Agree
		The system includes innovative ways to stimulate student motivation towards learning	16	12	70	60	46	3.53	1.14	Agree
		The system helps to develop the student's thinking and scientific thinking skills	18	14	56	62	54	3.59	1.20	Agree
		The system helps to develop the critical thinking skills of the student	14	28	64	44	54	3.47	1.21	Agree
		The system promotes new (original) ideas about learning topics	18	32	44	56	54	3.47	1.28	Agree
		The system	16	22	64	52	50	3.48	1.20	Agree

	helps to develop 'students reasoning skills								
	The system helps to diversify ideas and alternatives as the subject of learning changes	12	20	66	56	50	3.55	1.14	Agree
	The system develops judgmental skills by providing the necessary criteria for judging different answers or solutions to the problem or issue at hand	16	12	66	48	62	3.63	1.20	Agree
	The system develops the skill of distinguishing between similar and different phenomena	14	18	60	54	58	3.61	1.18	Agree
	The system helps to develop 'students creative thinking skills	20	20	54	54	56	3.52	1.26	Agree
	The system enhances the	18	8	62	54	62	3.66	1.20	Agree

		skills of generating ideas and creating solutions for activities and duties								
		The system helps to develop the skill of experimentation through conducting applied experiments to test hypothesis validity	22	16	62	60	44	3.43	1.22	Agree
		The system helps to develop the student's communication skills	20	20	48	64	52	3.53	1.25	Agree
		The system helps to develop the student's dialogue skills	18	26	44	58	58	3.55	1.27	Agree
		General Weighted Mean						3.58	Agree	

Table (7) Second focus for the individual e-learning skills.

In the Second Focus /Cognitive and learning aspect, the presence of average and low percentages in achieving the efficiency of some skills can be interpreted that Blackboard didn't focus in developing the methods of developing the cognitive and learning aspects and relied on fixed methods and imposed them on the students. It didn't even permit the student to choose the method that suits him and it primary relied on how the lecturer performed through the audio attached to the e-curriculum by only the lecturer without the interactions of students.

N	Aspect	Element	Number	Weighted	standard	General

o			Strongly Disagree	Disagre e	Not Sure	Agre e	Strongly Agree	Mean	deviatio n	Direction
3	Electronic Technical Skills	The system helps to develop skills in dealing with electronic devices and .programs	10	2	24	56	112	4.26	1.04	Strongly Agree
		The system provides a special password for each student to save privacy and .security	10	4	10	50	130	4.40	1.02	Strongly Agree
		The system provides access to the texts of presentations and can be read at any .time	10	4	32	58	100	4.15	1.07	Agree
		The system provides the teacher with to tools manage the learning process and guide each student .electronically	16	8	44	56	80	3.91	1.18	Agree

		The system provides tools for monitoring interactions within the system for each individual student to contribute to continuous effective .evaluation	16	8	44	56	80	3.86	1.21	Agree
		The system promotes effective communicatio n skills between the student and the teacher through the communicatio n tools available to .him	16	4	56	48	80	3.84	1.20	Agree
		System tools enable the student to determine the appropriate time schedule to achieve learning tasks and .objectives	18	12	32	58	84	3.87	1.26	Agree

		The system provides technical support and appropriate channels to ask questions .and queries	16	12	30	58	88	3.93	1.23	Agree
		The student system can navigate the net and follow the new in his .specialty	20	28	32	62	62	3.58	1.31	Agree
		The system diversifies into e-learning resources so that the student can choose the appropriate resources	18	22	48	50	66	3.61	1.28	Agree
		The system enables students to create their own stores to save their desired educational .files	20	18	40	50	76	3.71	1.31	Agree
		General Weighted Mean						3.92	Agree	

Table (8): Third focus for the individual e-learning skills.

In the Third Focus /The electronic technical aspect. To supplement the two researchers have reached an average of efficiency of each aspect from the three aspects and the average of the individual skills in general as shown below in table (9).

No	Aspect	Element	Number					Weighted Mean	standard deviation	General Direction
			Strongly Disagree	Disagree	Not Sure	Agree	Agree Strongly			
1	Group ethics skills	The system develops a responsible attitude in learning for .students	14	4	26	70	90	4.07	1.13	Agree
		The system helps to develop the of qualities commitment and respect rules or follow .instructions	12	0	32	72	88	4.10	1.06	Agree
		The system helps to develop the skills of cooperation between students to achieve .common goals	18	4	40	62	80	3.89	1.21	Agree
		The system helps instill the principles of meaningful dialogue among .students	18	8	46	64	68	3.76	1.21	Agree
		The system helps to develop 'students leadership .skills	14	12	40	66	72	3.83	1.18	Agree

		The system helps to develop the value of accepting criticism and respecting .others	18	14	60	54	58	3.59	1.22	Agree
		The system helps to develop Shura .skills	18	20	46	64	56	3.59	1.23	Agree
		The system helps overcome isolation and individual action problems	20	16	40	56	72	3.71	1.29	Agree
		General Weighted Mean						3.82	Agree	

Table (9) Efficiency arithmetic average of Blackboard in developing the individual learning skills.

Second: To answer the following question which is what's the efficiency of (Blackboard) in developing the Taibah University students' collaborative learning skills. Table 10 below shows for First focus the collaborative e-learning skills.

N o	Aspec t	Element	Number					Weighted Mean	Standard Deviation	General Directio n
			Strongly Disagree	Disagre e	Not Sure	Agre e	Strongly Agree			
2	Study skills within the group	System tools allow for synchronizatio n in discussion and commentary on others' .publications	14	10	44	66	70	3.82	1.16	Agree
		The system provides tools for monitoring	16	14	54	50	70	3.71	1.23	Agree

	the shares of .each group								
	The system allows all members of the to group participate in all tasks equally and balance among .themselves	18	10	46	68	62	3.72	1.20	Agree
	The system allows brainstorming in parallel with other .online learners	16	16	52	48	72	3.71	1.24	Agree
	The system provides opportunities to and tools support and support group decision .making	12	20	46	62	64	3.72	1.18	Agree
	The system allows students to participate in building and organizing content .collaboratively	18	14	52	58	62	3.65	1.23	Agree
	The system encourages creative thinking and creative solutions to problems in a	18	8	62	54	62	3.66	1.20	Agree

	group interactive manner								
	The system supports drawing and entering mental maps for the process of thinking, starting from presenting the to the problem solution in .common	20	22	50	54	58	3.53	1.28	Agree
	The system allows each group to create own its schedule to accomplish common tasks .and activities	14	20	54	54	62	3.64	1.21	Agree
	The system provides the possibility of mutual evaluation between different groups and members of a .group	18	16	60	60	50	3.53	1.20	Agree
	The system allows for the exchange of in the roles leadership of group .members	12	16	60	58	58	3.66	1.14	Agree

		General Weighted Mean	3.67	Agree	

Table 10: First focus the collaborative e-learning skills.

The above-mentioned table shows that the degree of Blackboard's efficiency in developing the Taibah University students' (collaborative) skills ranged from very high to very low and it makes sense. The results of the First Focus/ Group Ethics Skills were the highest efficiency degree was for the skill of Overall at the focus level, the focus arithmetic average has reached ... and the researchers interpret that Blackboard has succeeded in distributing the tasks.

No	Aspect	Element	Number					Weighted Mean	standard deviation	General Direction
			Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree			
3	Group learning skills	The tools within the system enable a group of people to edit same the document at .one time	18	12	56	52	66	3.67	1.23	Agree
		The system provides synchronizati for on tools discussion and dialogue between groups and within a .group	16	6	64	58	60	3.69	1.16	Agree
		The system provides tools for group communication between members of one group and between	22	6	60	56	60	3.62	1.24	Agree

		different .groups								
		The interaction tools vary to deal with each group with the appropriate .tools	14	4	56	70	60	3.77	1.10	Agree
		The system helps keep notes related meetings to so that they can be referenced and used .later	14	8	58	54	70	3.77	1.17	Agree
		The group system can create their online own space to save their own content- specific educational .files	14	12	68	50	60	3.64	1.16	Agree
		Stimulates the system to create and your manage favorite sites and share them with others over	16	12	56	64	56	3.65	1.17	Agree

		.the Internet								
		General Weighted Mean						3.69	Agree	

Table (11): Second focus for the collaborative e-learning skills.

In the Second Focus/The Study within the group the highest efficiency degree was for the skill of. Which means that Blackboard develops highly these skills. Although the lowest efficiency was in the skill. Which means that Blackboard develops at a low level these skills. Overall at the focus level, the focus arithmetic average has reached, and the researchers interpret that Blackboard.

No	Aspect	Element	Number					Weighted Mean	standard deviation	General Direction
			Strongly Disagree	Disagree	Not Sure	Agree	Agree Strongly			
Part I Individual e-learning skills										
1	The personal and moral aspect	The system develops the skill of decision making by giving it the freedom to choose some educational and study decisions	8	22	64	50	60	3.65	1.13	Agree
		The system contributes to the development of the student's time management skills	10	12	30	66	86	4.01	1.12	Agree
		The system helps to develop the skill of accuracy and speed of the student	6	8	52	78	60	3.87	0.98	Agree

		The system helps to enhance the value of the student's scientific trust	18	10	58	58	60	3.65	1.20	Agree
		The system encourages students to experiment and discover	6	24	46	58	70	3.79	1.13	Agree
		The system helps to develop the values of preserving the university's gains	12	24	58	58	52	3.56	1.16	Agree
		The system helps to develop students' love of learning	16	16	52	56	64	3.67	1.22	Agree
2	Knowledge and academic skills	The student system can self-evaluate according to its level	16	12	40	78	58	3.74	1.17	Agree
		The system develops the skill of retrieving information through educational tasks and activities	18	12	32	74	68	3.79	1.22	Agree

		The system develops the skill of preparation by providing the content of the lessons before the date of to see its study .content	24	14	26	74	66	3.71	1.31	Agree
		The system takes into account the individual differences so that each student learns according to his abilities	20	30	54	48	52	3.40	1.28	Agree
		The system helps to develop the skill of knowledge building on the information previously studied and employed in the following stages	6	24	46	58	70	3.50	1.19	Agree
		The system enhances the logical of rendering topics from one segment to the next	18	18	54	62	52	3.55	1.21	Agree
		The system develops the skill of logical interconnection	18	18	56	68	44	3.50	1.18	Agree

		between information and knowledge								
		The system develops the skill of conclusion through the gradient from year to year	18	18	52	64	52	3.56	1.21	Agree
		The system helps to develop good planning skills for learning tasks and responsibilities	16	8	42	84	54	3.75	1.13	Agree
		The system develops writing skills the through tasks and activities required in courses	18	8	44	80	54	3.71	1.16	Agree
		The system provides flexibility in organizing content in the way the student wishes	16	20	32	70	66	3.74	1.23	Agree
		The system provides the student with the opportunity to discuss and express the content in	22	20	26	64	72	3.71	1.33	Agree

		question								
		The system enables the use different of senses in the observation to promote reflection on the educational situation and to arrive at some hypotheses related to the problem and prediction	26	18	46	50	64	3.53	1.35	Agree
		The system develops the skill of the analyzing content into pieces to reach logical conclusions	22	16	52	62	52	3.52	1.25	Agree
		The system includes innovative ways stimulate to student motivation towards learning	16	12	70	60	46	3.53	1.14	Agree
		The system helps to develop the student's thinking and scientific thinking skills	18	14	56	62	54	3.59	1.20	Agree

		The system helps to develop the critical thinking skills of the student	14	28	64	44	54	3.47	1.21	Agree
		The system promotes new (original) ideas about learning topics	18	32	44	56	54	3.47	1.28	Agree
		The system helps to develop 'students reasoning skills	16	22	64	52	50	3.48	1.20	Agree
		The system helps to diversify ideas and alternatives as the subject of learning changes	12	20	66	56	50	3.55	1.14	Agree
		The system develops judgmental skills by providing the necessary criteria for judging different answers or solutions to the problem or issue at hand	16	12	66	48	62	3.63	1.20	Agree
		The system develops the skill of distinguishing between similar	14	18	60	54	58	3.61	1.18	Agree

		and different phenomena								
		The system helps to develop 'students creative thinking skills	20	20	54	54	56	3.52	1.26	Agree
		The system enhances the skills of generating ideas and creating solutions for activities and duties	18	8	62	54	62	3.66	1.20	Agree
		The system helps to develop the skill of experimentation through conducting applied experiments to test hypothesis validity	22	16	62	60	44	3.43	1.22	Agree
		The system helps to develop the student's communication skills	20	20	48	64	52	3.53	1.25	Agree
		The system helps to develop the student's dialogue skills	18	26	44	58	58	3.55	1.27	Agree
3	Electronic Technical Skills	The system helps to develop skills in dealing with electronic	10	2	24	56	112	4.26	1.04	Agree Strongly

		devices and .programs								
		The system provides a special password for each student to save privacy .and security	10	4	10	50	130	4.40	1.02	Agree Strongly
		The system provides access to the texts of presentations and can be read .at any time	10	4	32	58	100	4.15	1.07	Agree
		The system provides the teacher with to manage tools the learning process and guide each student .electronically	16	8	44	56	80	3.91	1.18	Agree
		The system provides tools for monitoring interactions within the system for each individual student to contribute to continuous effective .evaluation	16	8	44	56	80	3.86	1.21	Agree

		The system promotes effective communication skills between the student and the teacher through the communication available tools .to him	16	4	56	48	80	3.84	1.20	Agree
		System tools enable the student to determine the appropriate time schedule to achieve learning tasks and .objectives	18	12	32	58	84	3.87	1.26	Agree
		The system provides technical support and appropriate channels to ask questions and .queries	16	12	30	58	88	3.93	1.23	Agree
		The student system can navigate the net follow the and new in his .specialty	20	28	32	62	62	3.58	1.31	Agree
		The system diversifies into e-learning resources so that the student can choose the	18	22	48	50	66	3.61	1.28	Agree

		appropriate resources								
		The system enables students to create their own stores to save their desired educational .files	20	18	40	50	76	3.71	1.31	Agree
Part 2: Participatory e-learning skills										
1	Group ethics skills	The system develops a responsible attitude in learning for .students	14	4	26	70	90	4.07	1.13	Agree
		The system helps to develop of the qualities commitment and respect rules or follow .instructions	12	0	32	72	88	4.10	1.06	Agree
		The system helps to develop the skills of cooperation between students to achieve .common goals	18	4	40	62	80	3.89	1.21	Agree
		The system helps instill the principles of meaningful dialogue among	18	8	46	64	68	3.76	1.21	Agree

		.students								
		The system helps to develop 'students leadership .skills	14	12	40	66	72	3.83	1.18	Agree
		The system helps to develop the value of accepting criticism and respecting .others	18	14	60	54	58	3.59	1.22	Agree
		The system helps to develop .Shura skills	18	20	46	64	56	3.59	1.23	Agree
		The system helps overcome isolation and individual action problems	20	16	40	56	72	3.71	1.29	Agree
2	Study skills within the group	System tools allow for synchronization in discussion and commentary on others' .publications	14	10	44	66	70	3.82	1.16	Agree
		The system provides tools for monitoring the shares of .each group	16	14	54	50	70	3.71	1.23	Agree

		The system allows all members of the to group participate in all tasks equally and balance among .themselves	18	10	46	68	62	3.72	1.20	Agree
		The system allows brainstorming with in parallel other online .learners	16	16	52	48	72	3.71	1.24	Agree
		The system provides opportunities to and tools support and support group decision .making	12	20	46	62	64	3.72	1.18	Agree
		The system allows students to participate in building and organizing content .collaboratively	18	14	52	58	62	3.65	1.23	Agree
		The system encourages creative thinking and creative solutions to problems in a group interactive manner	18	8	62	54	62	3.66	1.20	Agree

		The system supports drawing and mental entering maps for the process of thinking, starting from presenting the to the problem solution in .common	20	22	50	54	58	3.53	1.28	Agree
		The system allows each group to create own its schedule to accomplish common tasks .and activities	14	20	54	54	62	3.64	1.21	Agree
		The system provides the possibility of mutual evaluation between different groups and members of .a group	18	16	60	60	50	3.53	1.20	Agree
		The system allows for the exchange of in the roles leadership of .group members	12	16	60	58	58	3.66	1.14	Agree
3	Group learning skills	The tools within the system enable a group of people to edit same the	18	12	56	52	66	3.67	1.23	Agree

		document at .one time								
		The system provides synchronization for tools discussion and dialogue between groups and within a .group	16	6	64	58	60	3.69	1.16	Agree
		The system provides tools for group communication between members of one group and between different .groups	22	6	60	56	60	3.62	1.24	Agree
		The interaction tools vary to each deal with group with the appropriate .tools	14	4	56	70	60	3.77	1.10	Agree
		The system helps keep notes related to meetings so that they can be referenced and .used later	14	8	58	54	70	3.77	1.17	Agree

		The group system can create their own online space to save their own content-specific educational .files	14	12	68	50	60	3.64	1.16	Agree
		Stimulates the system to create and manage your favorite sites and share them with others over the .Internet	16	12	56	64	56	3.65	1.17	Agree
		General Weighted Mean						3.70	Agree	

Table (12): Third focus for the collaborative e-learning skills.

In the Third Focus/Group Learning Tools the highest efficiency degree was for the skill. Overall at the focus level, the focus arithmetic average has reached, and the researchers interpret that Blackboard. To supplement, the two researchers have reached an average of efficiency of each aspect from the three aspects and the average of the individual skills in general as shown below. Through the previous table, the general average for the system's efficiency in developing the individual learning skills.

Third: To answer the following question which is Does it differ the efficiency of (Blackboard) in developing the Taibah University students' individual and collaborative learning skills according to the user's profile change (student - member staff). The two researchers have used a test for two independent sample tests (T-Test); to determine the differences and their directions and it revealed the quality of (v) and its statistical significance in determining Blackboard's efficiency in developing the Taibah University students' individual and collaborative learning skills according to the user's profile change (student - member staff).

Fourth: To answer the fourth question which is “Does it differ the efficiency of Blackboard in developing the Taibah University students' individual and collaborative learning skills according to the user's gender (male -female). The two researchers have used a test for two independent sample tests (T-Test); to determine the differences and their directions and it showed the value of (w) and its statistical value in determining the (Blackboard's) efficiency in developing the Taibah University students' individual and collaborative learning skills according to the user's gender male -female).

Fifth: To answer the fifth question which is does it differ the efficiency of Blackboard in developing the Taibah University students' individual and collaborative learning skills according to the type of college (scientific - humanitarian). The two researchers have used a test for two independent sample tests (T-Test); to determine the differences and their directions, as shown below in table (15) which reveals the quality of (w) and its statistical significance in determining the (Blackboard's) efficiency in developing the Taibah University students' individual and collaborative learning skills according to the type of college (scientific - humanitarian).

9. Recommendations:

According to the results of the present study the two researchers recommend the following:

- 1- The periodic assessment for the Blackboard's efficiency in developing the learning and thinking skills for various students by the deanship of e-learning university.
- 2- Direct the employees working on developing the system to the results of the study so that Blackboard can assess the individual and collaborative e-learning skills, to overcome the weakness points and to support the points of strength and to improve them.
- 3- Train the students and inform them about the different components of the system and its mechanism so they can use it effectively.
- 4- Train the staff, who are responsible for supervising the e-curricula, on the individual and collaborative learning skills strategies via (Blackboard).
- 5- Modifying the (Blackboard) system in consistent with developing the individual and collaborative learning skills to achieve the University's higher goals.

10. Suggestions for Future Practice

In order to develop Blackboard's systems, and according to what the researchers have reached, they propose the following:

- 1- Determining the technological requirements to improve (Blackboard's) system on the basis of the individual e-learning skills.
- 2- Determining the technological requirements to improve (Blackboard's) system on the basis of the collaborative e-learning skills.
- 3- Blackboard's efficiency to develop Taibah University students creative and critical thinking.
- 4- Staff turning to developing the student skills by e-learning.

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Poultry and Construction of Adolescent Identity in Social Vulnerability

Situation Senator Pompey – Ce

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1. INTRODUCTION

Social vulnerability is a condition that affects many people: elderly, adults, children and adolescents, especially from lower social classes and groups such as blacks, women, and homosexuals, among others. It is still common to find people with low socioeconomic status who are often meaningless in life or are excluded by various members of society, as the richest and ruling classes, although that term does not relate only to socio-economic issues, but also the fragility of ties and access to service goods.

Social vulnerability can cause negative consequences physical, psychic and as can occur, especially if there are no public policies on education, welfare, health and safety. Sawaia (2001) talks about exclusion that comes against the concept of vulnerability. According to this author, this term has a broad meaning, socio-historical, and refers not only to socioeconomic but is configured in all dimensions material, political, relational and subjective. It relates also to the care that the state has before that individual deleted.

Studies have indicated that encourage the practice of art in its many manifestations can bring several benefits to the subject. Given the Brazilian cultural wealth arising from, especially the mixing of people from different regions, has resulted in a significant variety of unique artistic expression. Added to this, the artistic manifestations can enable an experience for the physical and mental well-being of those who practice it. These can be one of the means used by some institutions- as Non-Governmental Organizations (NGOs) - to reduce aspects related to social vulnerability.

Before the benefits proven in studies on the use of art (VILLAÇA 2014 Rhyne, 2000), the question arises whether this can be effective with adolescents in socially vulnerable, particularly poultry, which was the artistic expression used in this investigation. Art is neglected by some governing bodies, which deal with minor, allocating limited financial resources, projects and programs, although there is proof of their effectiveness. Moreover, as already mentioned, there are many negative consequences that can lead to social vulnerability, particularly when it is in adolescence, as a life transition period biopsychosocial changes. Therefore, the question arises:

Interest in this topic emerged from restlessness to understand the possibilities that art can bring to the individual in social vulnerability. Capoeira was chosen to be a wide artistic expression, involving several expressions such as dance, music, fighting, among others; It is also one of the largest and oldest art forms in Brazil, as well as having marked traces of the black community that was enslaved in colonial and imperial Brazil, then being a resistance of expression through the social inequality.

Justified interest in adolescence to be a stage where various biopsychosocial changes are happening to the individual. When performing integrative literature review on crawlers SCIELO, PEPSIC and Index Psi with "capoeira" descriptors and "social vulnerability", it was identified that there are no studies. Therefore, there is no way to understand the individuals who use it, the poultry may allow benefits when related to social vulnerability and then influence the construction of identity.

was elected as general objective to understand how to participate in capoeira group of Santa Terezinha Foundation in Pompey-EC Senator interfere in the construction of identity of adolescents in socially vulnerable; and as specific, check the social vulnerability of teenagers participating in this group of capoeira and analyse aspects in personal and group levels of these adolescents in socially vulnerable situation before and after the same group participation.

❖ THEORETICAL

2.1 ART AND ARTISTIC EXPRESSIONS

Art was one of the first manifestations of society seeking to express their own way of getting in touch with the world and a presence on it, sending to other feelings, thoughts and ideas. This happens since the construction of religious temples, cave paintings, among others. The artistic expression can be a symbolic representation of the human world, that is, the individual vision, not a representation of things as they really are (JUNIOR, 2007).

For Kings (2014), artistic activities are a way to put the subject forward their issues through creative expression, as well as enabling you to reconfigure new meanings. The art provides access to the emotional content and the development of skills. According to Oliveira and Stoltz (2010), they stimulate regions of the brain, some possible social interaction, also working affective, cognitive and motor.

To Vilaca (2014), all in the art is replaced meanings, is a chord of a song, a picture, a painting. Sometimes these artistic expressions communicate as much as a word or a phrase, having a different meaning for each individual, according to his subjectivity and perception about things, combined with their culture, feelings, among others.

According to Rhyne (2000), when an individual performs an artistic activity it is in experience to him, as this has a lot to do with how you think, feel, see and realize. So the artistic expressions require attention. So draw freely in childhood, dancing and singing can express yourself.

a. POULTRY

Capoeira is an art form that has marked traits of enslaved black community in colonial and imperial Brazil. It combines aspects of this and other cultures, making this art quite representative (ARAÚJO; JAQUEIRA, 2006). Capoeira was a way that the black that time found to manifest itself and respond to the slave system (AMARAL; SANTOS, 2015). In addition to black, it also has traces of Indian and Portuguese culture (VIEIRA, 2004).

Regarding the origin of capoeira still no conclusive evidence, generating several different ways. Still do not know whether it is native to Africa or Brazil, but today essentially presents Brazilian characteristics. It has aspects of religion, play, fight, dance, and you can explore them. Because of this,

capoeira has been gaining more and more ground against prejudice and members of various social classes in Brazil and the world (ARAÚJO; FONSECA, 2017). To Menezes (2005), it has evolved over time, leaving the marginality for use in schools, clubs, and gyms, among others.

It is a comprehensive art, able to explore cognitive, motor and affective of its participants, and can be an educational resource used for body activity, music, socializing, Brazil's history and culture in general. However, due to the lack of professionals has been little used in physical education content (ARAÚJO; FONSECA, 2017).

2.3 socially vulnerable

The concept of social vulnerability was built historically, possessing strong relationship with this factor and the situation of inequality that has always been present in the history of Brazil. Before it was related solely to poverty, facing the individual and not to the context that led to this situation. However, with time, this concept has expanded, going to be related to situations that put the individual at risk, leaving him vulnerable and deprived of his fundamental rights, not necessarily linked only to economic issues, but factors such as health, education, leisure, culture, among others. There are several circumstances that consider an individual in social vulnerability, such as violence, unemployment, difficulties in social insertion, etc. (Monteiro, 2016). That is, the concept goes further.

2.3.1 Social Vulnerability in Adolescence

In Brazil, the violation of rights in relation to children and adolescents, while indicating falling levels, it is still high (FONSECA et.al., 2017). To Pessalacia, Menezes and Massuia (2010), there are a number of people who do not have access to housing, health, sanitation, food and living wage so they can ensure their basic needs. Thus, there are many teenagers who start work early and unprepared, end up in situations of exploitation and underemployment, entering the world of crime, prostitution, use of illicit drugs or alcohol, stop going to school, go through any type of violence or move in the streets.

For the Child and Adolescent (ECA), adolescence will 12-18 years old (BRAZIL, 1990). This phase is marked by numerous changes in individual biopsychosocial- transient -he ceases to be a child, but has not yet become an adult. That is when the teenager goes through the physical transformations of puberty, builds his personality, especially with regard to self-concept, self-esteem and identity, in addition to passing the social charges. All this interferes with their interpersonal relationships (SANTOS; XAVIER; NUNES, 2009).

Risk situations that many teenagers are in addition to those mentioned above, can also be related to abuse, neglect, sexual exploitation, prostitution, unplanned pregnancy, abortion, early and unprotected sex, among others (PESSALACIA; Menezes; MASSUIA, 2010). for Fonseca et.al., (2017), in some cases, the vulnerability can affect health, even in the absence of disease, affecting the psychological state, mental or social. Teenagers are in constant search of personality construction.

Pessalacia, Menezes and Massuia (2010) report on the importance of having places in public health where teenagers can feel welcomed to share your questions and what they already know, besides being means as information exchange bridges between them and professionals acting through liberating practices, using dialogue and can promote adolescent autonomy.

According to Miller (2016), the vulnerability could be related to a set of characteristics of individuals or groups may be unsuitable for the use of opportunities that are in society. These characteristics can be material or symbolic resources, and inherent human abilities; and suggests the possibility of coping through individual empowerment, strengthening of their potential and develop their skills. In addition to the reduction of social vulnerability levels precisely suggests the strengthening of the subjects so that they can get access goods and services, thus emphasizing the importance of public policies on this issue.

a. IDENTITY

According to Faria e Souza (2011), Antonio da Costa Ciampa is important to the study of identity, becoming reference on the subject. Ciampa related identity as part of social psychology, using the Dialectical Materialism history as a theoretical basis. According Ciampa (1987), answering the question of who a particular person is, refers to tell their identity, this is a building that is not immutable but rather seen as a metamorphosis, always turning and moving. The identity reflects the social, just as also acts on it, turning it or keeping it. Thus, studying the individual's identity also means studying the characteristics of the society, it is impossible to man ceases to be a social being and history.

Ciampa (1987) says that the family is the first social group that the individual is part and it is this group that begins the process of identification and differentiation, initially by name. Thus, the name makes it different from them and surname makes equal. As the individual is part of various social groups, it will also make this movement of differentiation and identification with them.

According Cascapera (2007), there may be the dualism of people to build their identity, because some may take into account their own wills and other no longer have this freedom, thus living an identity imposed by others, and one who has just stereotyping and stigmatized. Because of this, in some cases the fear of going against what the other feels right is greater than the favour of their own desires and opinions. According Ciampa (1987), the other can affect what a particular individual is, as well as their choices, which can sometimes be connected that are in socially acceptable. This movement takes place throughout life, since the identity is always changing and rebuilding.

4. METHODOLOGY

This study is configured as field research and qualitative. As for his goals it is descriptive and exploratory, using case study. Data were collected in Santa Terezinha Foundation, a Non-Governmental Organization (NGO), non-profit, founded on April 27, 2006, based on the former Senator Train Station Pompey in the Hinterland Central Cearense (SENATOR POMPEY, 2007). It carried out activities Art and Culture through dance, music, theatre and capoeira.

Data collection was conducted from March to May 2019, after approval by the Ethics Committee and Research of the Catholic University Center of Quixadá, with sound 3,176,347. Data were collected with 3 teenagers in social vulnerability, however, the third participant data were not considered, because it was very synthetic in their responses, it is not possible to achieve the research objectives, leaving then two teenagers, aged 13 and 17. They were selected through a questionnaire created by the researcher and that

sought to identify the situation of social vulnerability of the same. The questions included socioeconomic, personal and social criteria, according to the reference found.

The first contact with all the teenagers of the Santa Terezinha Foundation capoeira group was to explain the research and the ethical issues involved. Soon after, the consent form was presented and Informed (IC) and explained that it was necessary to join their parents sign this document, as they are minors. Later was presented the Consent Term of Free and Informed (TALE) in which adolescents who wished to participate signed.

The researcher returned to the institution and continued the search with those who brought all signed terms. It was initially applied the questionnaire and after identifying vulnerable situation took place then a semi-structured interview with each, individually and in a reserved location of the institution itself. issues were explored regarding the perception of self, others and about the changes caused by participating in the capoeira group. It was also used non-participant observation model to complement the information provided. Soon after, the interviews were transcribed and the data were processed through Bardin's Content Analysis (2009) by selecting three categories from the similarities in the speeches of respondents.

4 RESULTS AND DISCUSSION

Table 1 - Characterization of adolescents

	Age	Sex	time participation in the group	Social vulnerability
capoeira practitioner 1	13	Male	1 year	YES
Capoeira practitioner 2	17	Male	6 months	YES

Source: Author, 2019.

After transcription of the data it was possible to list three themes present in the speeches of the two teenagers: "Capoeira and its personal meaning", "capoeira teacher Meaning" and "Identity and (m) metamorphosis."

Capoeira and its personal meaning

By analysing the speeches of the two teenagers was revealed that both quoted the roost with importance and possibilities that go beyond artistic expression. The capoeira practitioner 1 brings the group members not only as people who train together, but maintain relevance to it. When asked what the members meant, responds:

"My second family" (C.1)

This speech comes against what shows Menezes (2005), the capoeira practitioner can develop a sense of team, based on humility and demonstration of affection for companions. That is, these relationships can be so strong as to consider each other as family members. The capoeira practitioner 2 also talks about the importance of these relationships, and the impression that the researcher had was that social interaction between members had a greater meaning for him.

"And those who have no friend, find friend in capoeira, but that person has to be careful that may have bad or good friends. But capoeira has 'many friends' good ... You can tell he has "(C.2)

"[...] to me those 'person' who have depression, these diseases as well column is ... is so obese, [...] I think ... for them to roost. That capoeira it can solve your 'problem' health and also to take the ... the ... depression, has many 'case' where I've seen people die and kill because they do not care and nor friend "(C.2)

Second Campaign (2014), capoeira can be an alternative for health promotion and can also enable social development. The capoeira is an example of socializing and equality, where all members play an important role. This capoeira practitioner during their speeches, showed how this art was important to him in this regard. He can realize in such a way that when talking about the possibilities, goes further, citing possible to help people with depression. It also shows how the relationship between the members is strengthened.

Both spoke that art contributes so they can feel good, get rid of the difficulties and also to indicate to others. That is, they consider it as effective as to believe that others should practice it. When they asked how they feel and how to consider the roost these were the responses:

"Capoeira for me I see it as a sport, dance. It is ... a fun sport and also help me to defend myself of things "(C.2)

"I feel a person (pause) [...] so happy because a kind unique sports such as capoeira, no one does not notice and all, but I think good to do capoeira" (C.2)

"Lighter" (C.1)

"When I'm alone I'll train alone. For me, it is all too "(C.1)

"Capoeira is an art to me that everyone was to attend [...]" (C.1)

"It's ... [...] Find new friends, joy" (C.1)

For Meneses (2005) the poultry-related benefits are present. When the body is in motion various emotions may be involved, the individual feels his lighter body, loose and these sensations may also be taken for behaviour day to day. It may feel good about yourself, going to have greater confidence in accomplishing your goals. In addition, it can cause it to deal with limitations in your body going to know better.

It is clear how much the eyes of these teenagers glowed when talking about capoeira. After the search, they spoke they liked a lot of work, demonstrating that express about what is good practice and may not yet have the need to look at society as it should. The capoeira practitioner 1, in addition to indicating the participation to the other members also went on to have a fondness for the figure of the researcher. It is understood that for him, this research has given him a sense of recognition. And despite all this positive perception, he says he still hears negative comments about capoeira and says feel it as an insult.

"Today, the 'person' thinks capoeira are thief, these things [...]" (C.1)

"For me it is an offense" (C.1)

This comes from encounter with the history of this art form, in which the first capoeira practitioner were seen as criminals to be a form of resistance runaway black, free and marginalized by those who enslaved. Although there were several laws against them, causing them to be monitored and to receive

punishment (VIEIRA, 2004). You can see then that even with the changes concerning the poultry, it is still perceived that look marginalized and prejudice on the part of society. We need to change this reality.

Meaning capoeira teacher

During the interviews it was revealed that teenagers express enough respect and considered the figure of the teacher of capoeira as inspiration. Second Geeverghese (2013), the capoeira master is a leader who plays an important role for their students as well as being a person who is admiration. The same plays an important role in that ethics is indispensable because their students have it as a model to be followed. He conveys his knowledge through speech.

"For me he is my inspiration. When I'm sad I go there pa his house, we train [...] Like a brother" (C.1)

"[...] a guy that I see how he is, he's kind of like my idol in capoeira mermo is my teacher; then I see something in it that you know, I try to do ... and try to be " (C.2)

When I asked if there was anyone they mirrored the capoeira practitioner one soon answered yes and that would be the teacher of capoeira. Also, both have only been to the group when the same teacher was also. Thus demonstrating that it is important your master is there for your presence make sense.

According Ciampa (1987), to build their identity, the individual can use the process of identification with the other, or differentiation. For teenagers, it is clear that this process of identification with the teacher is so strong that the capoeira practitioner 2 says that seeks to be like him. In addition, the teachings that even in the pass their classes, young people seeking to take their lives, even causing changes in the way they act and relate. When asked how he gave some changes, they brought:

"It was training with my teacher, he spoke well of me" (C.1)

"[...] It is the education that the teacher give, understand? Type, such as lecture, then he talks like that, you have to be patient about it, what, then so, the course of life so, the problems we solve only the head " (C.2)

According Villaça (2014) art still maintains a strong connection with education, resulting in the individual's transformation process. They can be found in various places such as villages and unions, separating them so formal education. Cultures maintained by their masters are a great example of this because the art educator does not concern only one licensee, but also to those people. This type of education is called art education. Thus, it is clear that formal education can also have great influences on the transformation of the individual.

Identity and (m) morph

The more present during the research aspect was about the changes with those individuals, whether they be in behaviour, perception of self, in dealing with difficulties in social relations, among others. These changes are related to the teachings of their masters and these interactions with members of the group, as we have previously spoken, but also concerns the act of practicing capoeira, the changes in identity from that art.

To Ciampa (1987), identity is a building always on the move and how it calls, in metamorphosis, therefore, constantly changing. It can be influenced social relations, since man is a social being, but also, the same individual can transform society from this interaction, constituting, as a dialectical relationship and exchanges. That is, according to the statements of the adolescents when capoeira comes into contact with poultry and with members who are part of it, there might be a change in the construction of their identity.

"As I consider myself? A better person" (C.1)

"Previously I was very maleducado, answered my mother, my father. Now the 'ta' capoeira making me better" (C.1)

"I saw so much maleducado now me I see a boy well, good" (C.1)

"I was, I repented" (C.1)

"[...] once I was on the street mei playing alone, now capoeira 'ta' making me more 'pa' dento house [...]" (C.1)

Realize with these lines to practice capoeira can influence how the individual relates to outside that context, bringing changes in the daily lives of ourselves and in the way they interact with others. For Campaign (2014), capoeira can enable an intellectual and behavioral development, promoting self-knowledge and critical analysis on the limits and possibilities. To ask what has learned from the experience of capoeira, capoeira practitioner responds the same positives.

"To be honest, be a friend, mate" (C.1)

When this teenager is talking about how it was before the group's participation and how it is today, it is clear that behavioural change was significant. According to him, capoeira is the turning into someone better. Therefore, believes that before the behaviour was not appropriate and that in practice this art learned that should change. In relation to the second capoeira, the answers were:

"Change so I was very rebellious, I was such a person means isolated from some people, there capoeira made me I go back to being someone else" (C.2)

"Changed ... The way the people be. It is, as I was. As I said, I was a very sad person, so when you are sad and find something that will do him good as capoeira" (C.2)

"I learned to be humble, to be ... a person with head, a person who thinks. And ... A normal person, have a behaviour as normal people, you know?" (C.2)

Throughout the interview, this teenager has made it clear how he felt sad, isolated from the people, and that capoeira had managed to change that. When training, it can feel good and say that this interaction happened spontaneously, failing to explain in words. This was the same teenager who said that capoeira can help people with depression. The researcher had the impression that he meant something with these answers because they were present in several questions.

This comes against what shows Menezes (2005), physical activity can bring psychological benefits to its practitioners, such as improved self-esteem and mood. Capoeira benefits besides enabling the physical part, is also effective in psychological aspects. These factors are important both to practice it, and for a better quality of life of the subject.

It is felt that this change in teen 2 was strong, so maybe he bring that answer several times. Also proves that the body in motion, interaction with people capoeira group, the feelings involved in this,

master's teachings, among others, can bring psychological benefits for the individual, as it is proven that art can bring. This aspect was also present in overcoming conflicts of other capoeira practitioner, proving that it can be effective.

"Yeah, when I was sad that my uncle died, then I used the capoeira as a way to forget" (C.1)

Another psychological factor involved in capoeira is in relation to persistence in the face of difficulties. To Menezes (2005), the capoeira practitioner acquires self-esteem when it starts to have security in their movements, overcoming fears of making mistakes or getting hurt by not having enough technique, moreover, when you overcome feelings of inferiority, by feel weaker than the to be too inefficient.

"It is, yes there is difficulty and everything. The difficulties we will trying until it works" (C.2)

So he can take this way of thinking and the way we will deal with the difficulties that may arise in your life. Both are in a situation of social vulnerability, where violence is present and if they do not participate in the capoeira group, realizing the importance it has had on their identity constructions, perhaps the reality would be another. The capoeira practitioner 1 presented as not respecting parents, playing in the street alone; already the second reported that it was sad, it was isolated. Thus, both could be influenced by bad company, which unfortunately is a present reality in contexts as well.

Being part of a group that encourages humility, respect, teaching values, it was able to generate changes in these adolescents, allowing to have a better understanding of themselves and more than that, be able to build this identity in a positive way. To Menezes (2005), the philosophy of capoeira is marked by ethical and human values, having as pillars, respect, socialization and freedom.

Ciampa (1987) says he has no way of releasing the individual from society, to study the aspects of it, one must understand the context in which it is inserted. An unfavourable context, can have negative influences on the subject. But if the individual who is in a vulnerable situation can be part of another context that encourages you to be a better person, such as the capoeira group, makes it possible to realize all of these benefits and changes in self-perception, as the case of these teenagers.

"My life was like, it was not busy, I like my busy life, like, have something to do and such, then because of capoeira, I have something to do every night of day, which is to poultry" (C.2)

To ask how they are described today as individuals, responses were very positive. And despite this influence the social construction of identity in both spoke ever pretended to be someone else to please anyone, thus proving that it's not something deterministic, will according to the subjectivity of each.

"Alegre, loving, affectionate" (C.1)

"I would describe myself I am a good person, do not move with .. nothing wrong, and just ..." (C.2)

Balmant (2004) suggests that allow for society, practices and experiences that stimulate creativity and imagination, then generates a society in constant development. Both at the social level, which causes it to expand, such as on a personal level, aimed at resolving issues and problems. Thus, the author realizes the need of society to create spaces that can stimulate these issues.

6 CONCLUSIONS

We conclude that the objectives of this research were obtained as from the collected data was possible to see the influence that capoeira can manifest in the lives of adolescents in situations of social vulnerability and the importance it had in the building of the same. It is noticed also the need for more studies that seek to investigate the possibilities of artistic expression for individuals, especially inserted in this reality.

This research can guide more targeted intervention practices for this audience, and proves the need for public policies that encourage and enhance the roost, particularly at-risk places, after all, it is a measure capable of changing a bit this reality social inequality present in Brazil.

Teenagers showed feelings of recognition and belonging to participate in the investigation, it is necessary that people start to see them as the future and treat them with empowerment, for the most part, are still seen through the eyes of prejudice and marginalization. It is not because they are in an unfavourable context, social vulnerability, which should be forgotten or treated unimportant, on the contrary, there should be measures that benefit.

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The Body as Object of Historical Research: Bibliographic Review

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Abstract

This study aimed at describing, by means of a literature review, some possible meanings of the body through history. This study was conducted by collected bibliographic data of published books in Portuguese in the last 10 years, from known authors, mentioned in articles of anthropology, sociology and psychology. The articles found were organized as research and review articles and later categorized according to the theme. We discussed the possible understanding the meaning of body according with time, looking for its modification and impact.

Introduction

What is a body, in the singular sense? What or whom does it represent as isolated and separate from others? Is it possible to dissociate the subject from its collective, and call it the body? The term is widely used in the Portuguese language necessarily evokes an image. This is not always associated or linked to a specific meaning. This has always varied in the most diverse phases of history, from the oldest to the most contemporary. The body assumes various forms of social representation allowing to explain and understand the functioning of certain social groups, through films, plays, books, articles, among others. There are so many possible representations that arouse curiosity in all of us. Through these we can understand a little more about the society in which we are inserted or historically study a certain moment in the history of society. Corroborating with Becker (2009), he further reinforces that in these representations we identify what types of attitudes, thoughts and behaviors we should have. In addition to scientific means, we can rely on art in general to contribute to the description of societies. These various ways of gathering and analyzing

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content are defined by users, after all, the end product is intended for "something" or "someone." Thus limiting the focus on organized activity, the medium and its limitations dictating how to use it. Each rendering tool targets a different audience, but is purposefully limited to its purpose, leaving aside concepts, terms, scenes, that do not interest its users, or that are not accessible for a variety of reasons, from budgets to the data collection. (Becker, 2009)

A body that goes through the construction of a subject, a biological set that sustains a human being, even a representative of ideals and cultural values. A lot has been attributed to the body throughout history and through it we can understand various moments of Western civilization. Object that belongs to the subject, to the social, to the State. Body source of desire, anguishes, social representations and even mechanized, culminating with its scanning in pixels. The stage of diverse personal, social and cultural conflicts, reflects a time and a dominant ideology in each period of the history of the humanity. The vision of the body in history changes, and the body / image relationship accompanies these changes, from the experience of the body as a means of actions until the explosion of senses. As Sennett (1994) proposes in one hand the body as a natural datum, and on the other a totally manageable and controllable body, which presents this body as "one plurality", at the mercy of interior and exterior factors, of nature and culture, the individual and social. To understand this body as an object of investigation, body as the singular of the collective, is to take a look at it as an object of research, through a review of the literature and how the researchers of the most varied areas of human knowledge understood it. The main objective of this work was to understand the symbolism that this body brought to the sciences, through transdisciplinary authors, becoming an object of historical investigation since its representation brings in its range several aspects consistent with the period in which it was so defined. A work that involves from the medical, social and psychological sciences, since this object is at the center of a transdisciplinary complex. Nowadays, as a result of globalization, beyond the knowledge of our society, we need to understand the dynamics of others.

Methodology

A bibliographical survey of works published in books in Portuguese in the last 10 years was carried out by renowned authors mentioned in anthropology, sociology and psychology articles. The publications found were organized as a source of research and revision, recorded and later categorized according to the theme. The possibilities of understanding the body were then grouped in a linear / temporal way, seeking the understanding of the term and its modifications.

History

The possibility of studying the body as an object of historical investigation from Cartesianism to the nineteenth century, when body and spirit were still indissoluble, is central to the work of Courtine (2006). Already Ortega (1967) affirms that the duality of asceticism, being that of body and soul, comes from a remote time of the old schools and Christian practices what confronts with the bioascese contemporary that is solely corporal. In antiquity the body was seen as permeable, where they made exchanges with the environment and the cosmos. A body without borders, called a grotesque body. This is

replaced by the total body at the end of the eighteenth century, which is equivalent to the natural body of medicine and the beautiful body of aesthetics. It is seen in a fragmented way, only if we adopt the spectator's point of view. And truth is the sum of several limbs, a unified body (Ortega, 1967). An example is Athens, an open city, where the exposed body was regarded as an object of admiration, and nakedness as a symbol of citizenship. The temperature of the body was the key to Greek physiology, so whoever had a high body temperature did not need clothing, and as words and deeds were had with unified, when reading, speaking or hearing that temperature rose. Women and slaves were seen as cold bodies and therefore did not exhibit themselves naked, the heat of the body decreed rules of subordination and domination. (Sennett, 1997)

Even historically, women's cults of honor were adapted, allowing them to have their body dignified (Tesmoforia) and gave it the power of speech and desire (Adonia). In Tesmoforia fertility was ritualized through the myth of Demeter, where there was a representation of death, mourning and fertility, fertility that affirmed its dignity. Where the cold, dark body came to have a new civic value, and was covered by a new 'mantle'. In Adonia the myth of Adones is rescued, this god that pleased women, the hedone, celebrated the sexual appetite of women. Also based on the agricultural rituals, the women planted seeds of lettuce and when they sprouted they let it die young and then celebrate the death of the god, as happened to Adones. The mourning was celebrated with dances, songs and drunkenness for an entire night, even assuming a party of illicit sexual character. It occurred generally in places with low enlightenment and visibility that gave women the power to speak and to expose their desires. Logos and Mythos, reason and ritual, in the Logos the speaker is identified by his words, he is responsible for them. In myth, the speaker is not responsible for what he says, he only reproduces 'what he heard about'. (Sennett, 1997)

For the Greeks the ascetic practice dignified man, having a virtuous life and consequently being a free man. Dietetics also being an important part of Greco-Latin ascesis is subordinated to the principle of the aesthetics of existence, where body balance is needed for balance in the polis. Thus dietetics represents concern for the Hellenes, since the reflection of themselves and of their body is the foundation of political life, of freedom of action (Ortega, 1967). Dietetics is still in contrast to the excessive worship of the body, because it claims that this produces idle and useless men for society. He practices freedom and always refers to the other and to the city, there is a reciprocity, where the vision of others that take care of oneself, this that intensifies social relations, according to Foucault (1984, apud Ortega, 1967). The individual involved in the practice in the Hellenistic and Roman epoch will know how to behave and fulfill his duties as a member of society. And this dimension also reaches Christian asceticism, where divine and supernatural forces were represented on the earth by 'chosen men' and that provoked the desire to imitate their 'model of life', thus assuming a sign of prestige. Thus bodily asceticism is bound up with spiritual asceticism, so the body has a symbolic value in the creation of the self. For Weber (APUD Ortega, 1967) in the ascetic Protestantism will realize the 'disenchantment of the world' because it has an impersonal character. The capitalist spirit was constituted by Christian ascesis and all its rationalization and bureaucracy. Foucault (APUD Ortega, 1967) points out that ascesis is an option for discipline, but it allows production of subjectivity and of self. A bodily and spiritual asceticism is necessary to have freedom, autonomy and power over self and others.

Already in the twentieth century, the body then appears dismembered and "existing." From studies, such as Freudian psychoanalysis, the body gains a fundamental role in the constitution of the subject, bringing the concept of "I skin". Courtine (2006) states that in Husserl the body is presented as the original cradle and for Maurice Merleau-Ponty as its incarnation of consciousness. Courtine (2006). At the beginning of the twentieth century, the Kraepelian strand lost its force for a dynamic psychiatry influenced by psychoanalysis; the body / mind or somatic / psychic duality returned to the center of attention. In the early 1980s, the predominance of physicist interpretation in the treatment of mental disorders and the loss of relevance of the family context and the psycho-sociocultural aspects of the patient were observed. (Russo et al, 2004) Arriving at Mauss, the body went from being an unconscious participant, a constituent of the subject and a reflection of social and cultural forms. To whom does this body belong? It becomes a crucial point in social historical debates and goes on to represent not only gender but also classes. A path with no return. (Courtine, 2006). Rabelo et al (2004) argue that the body has always been the object of exploitation of society over time but, unlike the time of the great philosophers, the body today seems to be in a secondary position in Western thought. In opposition to the dissociation of the body and spirit, there arises the civilizing paradigm, which has a communitarian dimension in the thinking of the body, based on those values that arose the conception that nature is a source of art and that the body is a sculpture shaped by the own subject, in the form of dance, dramatization. (Pimenta et al, 2009)

Rescuing these representations in battles, Pimenta et al (2009) report that on the eve of a world conflict (first war), the world ceased to be organized by exact laws, mathematical and universal, now the body was considered as a source of culture, a bearer of subjectivity. The body as a source of memory, because through it we feel, know and apprehend the stimuli around us. At the same time the word war directly evokes images of bodies. It is through them that the battles are presented and this body, of the soldiers, becomes the message vehicle of conflicting ideologies. What suffers the violence of war is this body. Not only of the soldier who goes to fight, but of those who also remain civilians. From deprivation of all kinds to constant displacement efforts. War directly affects the body of all. (Audoin-Rouzeau, 2006) The most current and western wars lost their strength after the two great wars. In the early days the posture of the standing soldier, intimidating, was modified by a lying posture, hidden and collected, elongated in the field of patalha. Technological and warlike advances change the posture of pectoral imposition for recollection and strategism. This body does not only suffer mutilations, but also suppressions, whether of sleep or rest, ending with residual psychological aspects. Not only those who have been able to return, with mutilated or intact but psychologically affected bodies, to the symbolism that the body of the downtrodden soldier receives in this new journey. The war heroes have had their body lost on the battlefield, idealized by a society and seen as a hero. (Audoin-Rouzeau, 2006)

Describing this body and its meanings is no easy task. It seeks not only the concept itself but also moral issues, for example: when a historian describes a battle, users also want to know if it was really necessary if it brought some benefit. Social representations only exist if someone has an interest and uses them. (Becke, 2009) Historically, we have never thought so much about the body and its possible

interpretations, mainly because of the great changes and possibilities that new technologies and digital media have brought to these, with a social recontextualization. (Garcia, 2005)

Body Medication

In antiquity, the notion of body and self have become archaic. In bioasceses there is the embodiment of the subject. There ceases to exist the old dichotomies like body-soul, mind-brain, interiority-exteriority, they unite (Ortega, 1967). In classical ascesis the body is then seen as the symbolic, in modern bioasceses this is dispensed with, the body is not the basis of self-care, the self exists only to take care of the body, all subjectivity and individuality are transferred to the body. body. This body, my appearance and what people see is what I am, there is no longer the 'self' alone, it is exposed along with the body. Which becomes at the same time vulnerable to the gaze of the other and appreciated by this, for this is the reason for its existence. (Ortega, 1967). In Galen's studies of medicine, they said that body heat was divided into four fluids or "humors" such as blood, mucus, yellow bile and black bile. And the combination of body heat and fluid would result in 'temperaments': sanguine (public man), choleric (the soldier), phlegmatic (scientist) and melancholic (religious). Mondeville called the syncope the act that when performed a surgery the other organs supplement the injured organ. And he wanted to show that it went beyond the pain, which reached the bodies. Medieval medicine allied to 'Imitation of Christ' wanted to challenge the social barriers that marked Christian behavior, especially the barrier between the sexes. It begins to question the sex of Christ, this being seen as mother (Pimenta et al, 2009).

The belief of ancient medical science that revolved around body heat was changed when Harvey discovered about blood circulation and breathing, thus changing all understanding of what the body is. The subject is seen as mobile and individual. And what was believed to be the source of life was the soul was abolished. The term impurity begins to be used as 'dirt', a dirty body was an unclean body, hygiene issues begin to change here, urban cleaning begins to be revised as well. Public health laws emerge in Paris, 'artery' and 'vein' turn to terms of urban vocabulary, blood circulation was used as a model for traffic (Pimenta et al, 2009). For Ortega (1967), many of these changes begin to occur in 1543, with Versalius and the birth of modern scientific anatomy, with criticisms of every form of anterior dissection. From this it is clear to Western medicine that the truth of the body and disease lies in the visualization of the interior, of the invisible. The 'culture of dissection' and 'fascination with anatomy' are glaring in the seventeenth century.

Theologians are also enthusiastic about this new anatomy, where there is an attenuation of the belief that a deity has direct contact with the inner body. The dissection of corpses as a production of knowledge has a long history. Seen in the time of Homer in Greece as a set of members and not as a unit. Soma was the corpse-body designation that possessed an individuality and an organization. After relating Homer and Hippocratic tradition has become the notion of unified body. The dead body itself has dignity, and Hippocrates condemned dissection for this cause. When Plato in the fourth century BCE separates the soul from the body in his studies, the impediment to the study of the corpse ends. Recalling that there were no

significant studies or significant development between the third and thirteenth centuries in anatomy studies. This vision is rescued and the body is seen only as an image also in medicine, the real is what is visible. Only what is seen in the X-rays determines the body disorders, the physical and tactile contact of the doctor with the patient were scarce (Ortega, 1967). The twentieth century triumphed by the medicalization of this body, brought by the conceptions of Western medicine. The conception of disease undergoes changes, since with advances in some areas of human knowledge they brought a biologist vision and the reduction of diseases that until then caused great amounts of deaths by the world (Moulin, 2006). Going back to the last century, we noticed that the most common diseases in the period of childhood begin to be combated and disease gains an outline not only contrary to health. This new conception of broad health, including psychological and social well-being (WHO) brings a utopian concept, however, health does not become more absence of illnesses. (Moulin, 2006).

The exaggeration given to bodily, medical, hygienic and aesthetic care has built up a somatic identity, bioidentity. Then there is a change in the concepts of health-disease, normal-pathology, medical discourse-practice and in that subjectivity and new philosophy of life (Ortega, 1967). The sooner doctors who became controllers of the body and responsible for their health, move to a concept of body as a place. This change brings aesthetic aspects, because the diseased body, then, would denounce in the aesthetic. Healthy thinking comes into the picture. Soon we have the so-called preventive medicine, which brings the possibility of revealing secrets hidden in a body that appears to be healthy (Moulin, 2006).

Epidemiological studies present us with probabilities, which bring us back to control. Necessary control for maintenance of a so-called collective health, where the state has the power over these bodies. The reduction of epidemics with the early works of the twentieth century brings in its aspects both positive and negative. While greatly reducing the classic causes of infant mortality, infectious diseases contagious, also extends the longevity of social subjects. And this later longevity will bring about the appearance of diseases that were hitherto existing but not so visible.

Moulin (2006) Pimenta et al. (2009) point out that the naturalistic view initially served to differentiate and discriminate race, sex and the stages of aging, but with the advent of new technology and the idea of being old without aging, people began to correct small defects by means of surgeries, with a speech of health, the subject takes care of the body, more to show that he can keep it well and youthful, than to be healthy. Foucault (apud Pimenta et al, 2009) is cited for having placed in one of his works that the body becomes malleable and unstable through the various cultural connotations, socially constructed around this ideal body. This biology was not entirely discarded in the history of health.

Russo et al. (2004) point to the tendency within psychiatry to always find answers within genetics and neurochemistry and increasingly to dissociate from what is said as "moral sciences", this behavior is intensified by new classification systems outside the clinical setting. Cardoso et al. (2004) corroborate this idea contrary to biologicism when they demonstrate that it should diagnose a disease taking into account all the social, cultural and affective aspects that the patient brings in explaining their complaint. They

emphasize English medical anthropology and the anthropology of French disease. The first with a naturalistic explanation, which only gives importance to the natural order of the facts, excluding the psycho-sociocultural questions of the patient and the second, which shows a personalistic explanation, which uses religious, supernatural and magical dimensions

Pimenta et al. (1999) report that in African traditions the body is seen as an advent of nature, so they experience with nature the conceptions of the cosmos. As their ideas differ from those of Europeans, they have been trivialized and demoralized. Being inferiorized, enslaved, losing voice, images and memories. In Brazil through stringers, xylographers and editors, they have gained a voice again, having their stories and memories of Africa passed through the mouth / ear, giving continuity to their perceptions and context. Death then gains a closer connotation with the aging and death of a child or adolescent is no longer seen so naturally. Aging then brings chronic diseases that also become the focus of scientific attention (Moulin, 2006). Another important aspect is that the disease gains a social connotation. The access to health services was not always the same for all classes and the eradication of some diseases required the State to take care of this body, since it was part of a whole social context that could be affected by it (Moulin (2006)

Genetics and Technologies

Le Breton (1999) states that the body changes its shape and is now seen as a transmitter of messages and information, which will result in the acquisition of knowledge. Biology becomes the science of this information; genes gain relevance in opposition to philosophical humanism; it would be a science without barriers to the circulation of the messages, leaving the bodies behind. To corroborate this idea, Keck and Paul (2006) argue that a previously dualistic body, which contained the physical and the "spiritual", gains a new shape with the evolution of genetics. The genetic code then becomes a new possibility of representing this body. Codes that would be more universal or even individual time. Codes that link familiar features of isolated bodies but also denounce possible problems. A duality in the new way of representing this body.

A body then represented by genes, drawn, minimized, and simply exposed. Molecular biology and hence the genome project publicly expose the structure of this body that was previously only seen in phenotypic manifestation or through imaging systems through medical technologies. The invisibility of the body is lost by mapping it (Keck and Paul, 2006). For Ortega (1967), the curiosity and excitement of knowing the 'invisible' is the evil of this century, of identifying and unifying the interior and exterior, giving the whole an identity. In somatic culture one has the total visibility of the soul-body, it seeks equality in the form of appearances.

LeBreton (1999) complements that along with the rise of biology, the Genome Project arises, with the purpose of decoding the human DNA chain, having much of its location unknown, this research would result in a vast knowledge stored for the sake of hereditary information . This search for the genome raises a curiosity, since the idea that the behavior could also be hereditary begins to be considered when, in fact,

it does not have relation with the other; behavior would be a consequence of culture. The same project is mentioned by Keck and Paul (2006), stating that this has brought, then important legal debates on to whom this data belongs, and consequently this body. The genome would be nothing more than a translation of what this body would present as visible and social. And it comes to be regarded as the patrimony of humanity. Our body again gains a sense of collective property, and slave to that genetic code passed on to us by the ancestors. A little bit of individuality is lost, and a collective aspect of who I am - directly linked to the originator - is gained

This issue of the heredity of some disorders and diseases is also cited by Keck and Paul (2006), and gains strength, since the possibility of a disease occurring in a body modifies the patient physician relationship, where both can together delay a manifestation . Probability gains aspects of certainty and risks come to be regarded as certain. Managing this body for prevention, and not so much for healing. LeBreton (1999) further reports that the exaltation of genetics within the American context is evident in the media, as in movies and novels, the genes would come to solve any existing question, male and female, as well as racial. Biologists then appropriated these questions by promising their answers, engaging with a lot of mysticism and stereotype, genes were labeled as justifying actions such as violence and depressive features, for example. Genetic fundamentalism then emerges, subjugating the races and classes. Blacks were seen as beings of inferior intelligence as opposed to whites, who would be favored intellectually, the latter group became a frequent target of the polls while blacks would not be worthy of dedication because they were inferior; any negative attitude taken by blacks would come from their less developed genes. Social inequalities would be justified by genetics, and anything that brought delay should be abandoned, as children with difficulty, because they would not be able to alter their genome, having no solution; would prevent people with reduced IQ from breeding and consequently would increase the intelligence of the country.

Unemployment was also seen as a hereditary characteristic, everything was biologically correct; society should only fit into this vision, thus assuming a position compared to the religious. Our body would be perfect thanks to genetics, which would come to remedy all the faulty characteristics of individuals. This starts a stealthy race in search of genomes and the exclusivity of patents, thus delaying knowledge, which is not shared; fragmented patents of humans are used by companies in the name of their own interest. Knowledge of possible negative, yet remote, traits lead people to take hasty actions such as breast cancer by cutting their breasts, resulting in a psychological problem and the loss of their identity. Genetic engineering would be triggered to provide parents with a child in the form of assembled product. The thought that the human body could be replaced by a bionic body is shared; the cyborg would be more present, thus increasing the life span of the human being, who would have transferred his interior to a new machine. We came to speak of the clone, which would arise as a projection of the human being, but would only be similar in the physical part, the other characteristics would be the result of the education received. The transgenesis of the animal would increase its potential in food production and defense against external aggressors, if there was a new threat, the alteration of its genes would have to be modified to fight against

new external agents, this process is considered dangerous, because in contact with nature, a prognosis of the effect can not be obtained. Biotechnology is an important area within this contemporary context.

For Ortega (1967), the appearance of the X-ray in cultural and scientific contexts brings with it new meanings and changes to the body image that is of itself and of its body, giving us a new vision about this body. Soon after the X-ray came more advanced technologies like: ultrasonography, computed tomography, magnetic resonance, PET, etc. These new technologies have provided a vision that goes beyond the internality of the body, which reaches the brain. Reducing one more view the individual to a part, to a fragment and decontextualizing it. The brain is seen without the body and the body without the environment. Science eventually produces scientific facts that define who we are, but the individual forms his model of self from the popularization of science, the role of the media. Moulin (2006) retakes that X-ray techniques, anatomical images and many other exams based on images bring a representation of this body as an object, absent from person. It is studied, photographed, pierced by ions to have an image of it. Its first manifestations in images arise for educational and diagnostic purposes. With ultrasound, the body also gains another aspect. The fetus in gestation passes from a merely psychological aspect, from an abstract existence to a physical one, with an image, even if produced by a machine, of existence. It is the existence of the body before the existence of being. Ortega (1967) emphasizes that the enthusiasm to know the inside of the body, beyond medical issues, is a way of giving it the ambivalence of the unknown-unknown that permeates us, causes anxiety, which I can not control and that lives inside

The advances of genetics in the twentieth century also present us with a unique body with unique characteristics. This body becomes the property of the one who possesses it, thus, with its rights and duties on it. Plastic surgeries and sexual adequacy are proof that the subject can build and recreate from a body that belongs to him. An autonomy over one's own body (Moulin, 2006). The body then has an image in a world formed by innumerable images that receive and return movements continuously, but which chooses the movement that will return, being the center of the world in movement causes the other images to fit around it, changing everything to the around it, but it remains unchanged. It is constructed, and this construction occurs in different planes, first it becomes plastic and malleable as can be seen through plastic surgeries, both aesthetic and for health issues (Ortega, 1967). Moulin (2006) remembers that later transplants and possibilities for solving problems through other bodies bring to the surface questions of immortality. If the body fails in some respect, we can then remove and replace this part, according to the current medical possibilities. Ortega (1967) retakes the second aspect, the bionic bodies, through pacemakers, electronic eyes, titanium hips, etc., in this field we still have organ transplants, those from various origins. And finally, we have the virtualization of bodies in modern technobiomedicine and surgeries performed by robots or tele-surgeries, the virtual appears as an amplification of the real, this virtual reality brings back the body-mind dualism, where the body stands still and mind travels through the 'network'.

The Aesthetic Body

From the symmetry and balance of the body that the Romans thought they had discovered, it was then used to order the world they ruled. The architectural structures obeyed the regular dispositions of the body. Geometry united the body and the city. In Rome everything was based on images, the repetition of images: body, house, cities, empire, etc., this desire for an exact orientation and a perfect geometry, tried to give Rome an eternal and essential air, but that was not fiction (Sennett, 1997). Historically the body gains different aspects in the aesthetic aspect. A previously malleable body incorporates an important psychological aspect. Physical practices historically add the ideal of harmony and beauty and competitions generate bodily perfection. Training then was accurate. Schools in the inter-war period encourage sports as well as competitiveness. There is a great period where competitions and body care gain fans and sports become representative of this. (Vigarello, 2006). This man of the twentieth century has, then, a body rooted in cosmetics, in plastic and all the transformations possible and permitted by this new area of science. The large industrial conglomerates of cosmetics and body modification practices gained weight in the twentieth century and transformed not only people but also values (Ory, 2006).

These data refer historically to issues related to competitions, disguised as perceptions of self-confidence. Shortly after World War I, developed musculature ceases to be characteristic of the manual workers to gain a look of beauty and healthy, for it would mobilize an investment of time to obtain, showing healthiness, emotional. The weight becomes controlled and considered adequate, as well as its excess symbolism of disease or risk. (Vigarello, 2006). They are not only small hair or appearance care, but also lifestyle, diet, vitamins and even special care to maintain this hegemonic aesthetic, culminating with the recent apogee of the female model of anorexic beauty (Ory, 2006). These were the major twists in the conceptions of the body, which gain this autonomy, beyond the feminization of the male body that also becomes the object of these new plastic possibilities, without necessarily affecting its masculinity (Ory, 2006). A mechanized and already industrialized society would also have to mechanize its body, adapting itself to biomechanics. The pattern of male beauty then becomes the one with the open chest, wide, projected forward, and naked, the so-called "thoracic type." (Vigarello, 2006, p. The culture of today has a dictatorship of good form, demonstrated through the pedagogy of exercises where the central theme is always the body. This assumes the role of postmodern cultural identity (Garcia, 2005). This new body that can now be stripped and shown, and its appearance represents this self. New technologies provide a representation of the subject. The one who previously only saw himself in the mirror today can see himself in photographs, and most recently alter his digitalized images (Ory, 2006). Body beauty takes on the meaning of well being beyond self-confidence, giving this body the experience of self-knowledge beyond the exploration of one's own identity (Vigarello, 2006). In the 1960s and 1970s, the ideology of a libertarian and authentic body contributes to the conception of a pure body, directed to physical and everyday experiences. Not only as an instrument of art, but as a support of artistic language.(Pimenta et al, 2009)

A body that gains aspects of modification, which can be altered the skin color, according to fashion, change with tattoos or receive more varied earrings, according to the current culture. A body that has

autonomy to modify itself culturally as well (Ory, 2006). The psychological aspect of this body is to claim for itself the domain of the same, reaching a supposed balance. Vigarello (2006) - Full cast and crew Pimenta et al. (2009) in counterpart to the idealized body, exposed by the nude, the literal body arises, in the second half of the twentieth century the crisis between ways of seeing and understanding the body reappears, the body happens to be seen differently, it now seeks forms of freedom and questions the artistic conventions, opening space for new artists, their experiences are lived as they are. The piercings are seen as the body marks of the new generations, whether sexual or to provide pleasure, serve as a complement to a body seen as incomplete. There is also the fluctuation of signs, when there is a mixture between aesthetics of different contexts in order to only generate satisfaction in well being. Body marks are chosen by the subjects to represent who they are at that moment and the desire to be noticed (Le Breton, 1999). In another view, Ortega (1967) affirms that corporal modifications can not be considered as only elements of the consumer society, without meaning and also as a pathology, and only a mental health problem, a 'self-mutilation', as some say reductionist approaches. It is known that there are a number of phenomena, reasons and motivations for modifying the body. The culture of appearance and body brand seeks individual authenticity, however much these changes cause pain, losing the classification of mere sign.

Bioasces require discipline, and place hedonism in the background. The ideology of fitness has changed the vision of work and leisure, confusing them, or rather by fusing them. Bodybuilding is the best example of discipline to achieve the perfect body, where what counts is more appearance than actually health. Becoming hostage to good looks and sacrificing feeling good. Ortega (1967). Le Breton (1999) countered that the body bulder has the need to get rid of the doubt and uncertainty in which it finds itself and uses its hypertrophied muscles to provide this certainty. The machines are seen as companions for bodybuilders, as they help in the construction of this body. The most important thing is not the strength conquered with the exercises, but the identity modified to supply the will of this subject. Body art is the transformation of the body into an object, to express what it feels; is a critique of the environment in which the human being lives, made to shock and provoke; overflowing drama, sexuality, disgust or horror. "The notion of body assumes subjectivity as something virtual, which will only become tangible when it is incorporated into a work" (Pimenta et al 2009 p.94)

According to Ortega (1967), personal value is found in beauty, health, strength and youth, which seek is free of risks, thus becoming responsible individuals, fit and provide good example. The person called 'good' is one who will be independent and take care of himself, the 'bad' person will depend on others and is unable to take care of himself. Diseases will be like a personal failure in the ideology of healthism. So does prejudice against people who flee from the ideal body pattern, producing and reinforcing diseases today. However reinforcing these diseases we are also producing new bioidentities on top of them, changing the concept of disability disease - these to be compensated and untreated, and these claims arise from the biopolitically organized groups, as a reaction to the ideological imposition that despises them In order to attain and maintain the ideals of healthism it is necessary to care for, watch over, and maintain the imperative of asceticism, for in a society that seeks pleasure through consumption, it has been added to it to have discipline and bodily control, which causes anxiety and ambivalence. This ambivalence is seen in

the contrast of exaggerated self-care and absurd carelessness. Where in the same culture one sees obsession with the piebald body, healthy eating, fitness and beauty objects and the other side generates sedentary lifestyle, fast-foods and obesity. They share the same space and are in a difficult balance, witness psychiatrists, psychoanalysts and psychotherapists.

In the somatic culture, the other ceases to exist, seeking in the body an affirmation about our identity and about ourselves, which society does not grant. Not wanting to be seen only as an image and product of vision, but restoring tactile and sensory experiences (Ortega, 1967). This perfect body comes with artificial features, with a health pseudogenesis. Having a perfect body is fundamental to today's social relationships. Thus we have a great current search for good form because it will be the regulator of the sociability of this modern subject (Garcia, 2005). It maintains self-control and discipline solely for the control of the body, "the body becomes the place of morality" (Ortega, 1967 p. 40) that gives rise to personal identity.

The Body and Sexuality

In antiquity, body heat passes to identify the sex of future babies, smart hot male sex, strong, cold female sperm, fragile. Male and female were like poles. (Sennett, 1997). Sex and gender are still confused, but the body starts to have a certain aspect of sexuality In Athens young people were taken to the gym by the older brothers to learn to behave naked through physical activities and in the use of words (oratory). On the other hand the Spartans only trained the body, to maximize the physical capacity. In the gymnasium of Athens he was taught to use the body so that he could desire and be desired, as an honor, being desired by men and women. For those men who were in the intermediate heat zone, the term "effeminacy" was termed, and they submitted to men, acquiring sexually-speaking 'female' roles. (Sennet, 1997)

The body represents not only health and disease or just a mechanism of action of doctors. It also gains a connotation of sexuality and desire, but this path was not short (Sohn, 2006). It is the constant mechanism of action of a desire policy (Garcia, 2005). Eroticism is portrayed as a unique moment in which nakedness, as it becomes more accentuated, represents exploitation in the body of others, but with technological resources the presence is no longer essential; through fantasy, the body is left behind to give wings to the imagination of the one who looks for the sexual satisfaction, making the machine preferential (LeBreton, 1999). In order for bodies to assume the symbology of desire, much has happened in the last 100 years. Religious morality had to be overcome gradually, and the history of fashion and dress reminds us of the sexual dimension that this body was absorbing (Sohn, 2006).

With the progressive naturalization of nudity, which goes through the creation of pieces of beach, like May and bikini, until the suppression of one of them, the topless, that nudity has been gaining space and bodies are increasingly shown. Once this body can be displayed, it must then be worked. The muscles then gain an important aspect, directly linked to sexuality. Subsequently, plastic / cosmetic surgery gains strength so that this body conforms to this predominant desire model. Sohn (2006). There is also the figure of the prostitute, whose importance was evidenced in several literary works, being a piece of modern

sensitization in Brazil. It is possible to link this figure to such words as denunciation, lust and suffering. The first reports bring these figures as victims, in a tone of denunciation. But Jose Maria de Toledo Malta under the pseudonym Hilario Tacitus brings us another type of prostitute, another look at this character when he wrote *Madame Pommery*. Where it joins the famous names of world-known prostitutes: Bovary and Pompadour, to give a more comical tone. His heroine is the junction of Bovary's immorality and the debauchery of Pommery (lover of Louis XV). In order to point out the false morality of the bourgeoisie, since during this period a modernization of prostitution was happening in São Paulo and Rio de Janeiro. Thus giving another profile to the prostitutes, they were now enveloped in a mythical power of seduction and mastery of the rules of etiquette, they were elegant, well-dressed, and made up. Her maids were true diplomats, successful businesswomen, and admirable managers of a very complex business (Pimenta et al, 2009).

Great importance in this process is also due to the cinema and the media in general, as propagating and breaking barriers. They were the first to show the body as a form of representation of desire, even suggesting issues of affection and sexuality. A love that then leaves the just feeling for a bodily act itself. The sexuality body then becomes an object of commercialization, as much of the commercial industry, as of the cinema. The so-called erotic films were no different. With them what was once considered as something totally private or often "dirty" gets a new representation. Sexual practices previously considered impure or forbidden are represented by images and satisfy the desires of those who consume these products, while the young and virile body gains strength and the woman subjected to the pleasures of these, but also endowed with desire. Visual questions aid in the retreat of the taboo of acceptance that the body is a representative of sexuality and consequently of desire (Sohn, 2006). Sexuality then becomes an object of study and not just that body that imprisons it. Initially there were attributions of roles and expressions of sexuality considered normal for each of the genders (Sohn, 2006). Freud creates a rupture when he presents libido and sexual pleasure as the original source of the psyche and shows the presence of desire in both sexes for the purpose of pleasure and not just of reproduction. Even so the figure of the woman is in the background.

The theoretical developments continue in a feminine / masculine gender line with universal standards. Some post-Freudians have relativized the issue of female libido and its vaginal pleasure, and over the years sexuality loses some of its taboo and becomes a subject to be debated without the characteristic of shameful subject matter (Sohn, 2006). The Kinsey report has great importance in the creation of the term scientific sexology when it treats the pleasure, masturbation and homosexual experiences as nonpathological acts. An opinion poll that had a great impact on the collective understanding of the subject. Subsequently female magazines, radio programs and various European societies make sexuality, especially female sexuality, a necessary public debate item, as well as questions of human need for a healthy sexual life, pervaded by satisfaction (Sohn, 2006) Human sexuality possesses diverse spectra, from sexual scripts, representations to their medicalization and medical control. For many years the female body was seen by medicine as a host of a new being and necessarily treated and controlled for this purpose. A way to protect both the woman and the future child (Sohn, 2006)

Already in the twentieth century questions considered hitherto deviant gain new proportions. The body that belongs to the one who carries it can be modified by its desire. The first sexual reassignment surgeries date back to the beginning of the twentieth century, giving the owner of the body the right to "choose" it. The different treatments then arise, from surgical procedures to hormonal treatments (Sohn, 2006). Garcia (2005) Quotes LeBreton on the unbearable limit of the desire contained in this body, with the search for perfection and the artifice. We need to be careful, even if it means wear. Mentions Santos (2001) on the queer body that intermedia space and the corporal representation of this desire, eroticism and gender, reconfiguring the senses. Totally malleable and flaccid.

Lacan (apud Pimenta et al, 2009) designates the stage of the mirror to explain the constant discontent and problematic relationship with the image itself, a problem that accompanies us and makes us use resources such as: makeup, cosmetics, tattoos, aesthetic surgeries . Bodily restlessness he poses as biological and symbolic, for at birth we need another skin to clothe us, to protect us. Already male sexuality had another aspect of care in this twentieth century. Leaving aside many authors and researchers, it gains a new perspective with the creation of remedies for sexual impotence, culminating in 1997 with the invention of viagra. Sohn (2006). The hitherto preserved and thematic masculinity with taboo bias gains a strong ally, where a single possible organic cause could be reversed with the use of a miraculous blue pill. The masculine body and its sexuality gain a mechanical aspect again (Sohn, 2006). Body does not dimension gender. The body is part of the politics of desire, or quoting Freire, with its two possibilities, either within the animal body, of species, or in the meaning of image or representation, invested with aesthetic eroticism (Garcia, 2005).

Historically we see a dissociation between sexuality and reproduction, which has a long temporal tracing. From the advances in contraceptive methods, to social issues of separation cons concepts of sexual act and marriage. Sexuality marriage are no longer synonymous and open spaces for juvenile sexuality other more modern topics such as vouerismo and exchange of couples. Add to this the change in social perception about homosexuality as well as debates about rejection of sexual violence. From social ties to medicalization to the perception of a body endowed with desire, expressing values (Sohn, 2006). AIDS sets a new stage, especially in public health. So important epidemiologists at the beginning of the century return to their work. Immediacy (hedonistic) sexual pleasure needs to be controlled and sanitized. Jobs around the world are made to understand and control the AIDS epidemic, little known. Sexuality and sex gain a connotation of danger, to the latest treatments and discoveries, when it goes from the category of a fatal disease to a chronic disease (Sohn, 2006)

AIDS

Rabelo et al. (2004) Regarding the disease as to its concept of experience, two questions must be considered by the anthropologist, the subjective question about each person's culture and how he will deal with the disease by its ingrained concepts. The reduction of social and cultural values linked to pre-reflexive experiences is challenged, since we would have an objectification of culture which would practically

undermine human creativity at this juncture. Theorizing the disease alone may not be enough and when there is no such knowledge; consequently other practical issues should be considered and subsequently used. After a period of perception of the power of medicine, for the control and eradication of some diseases, where the State was able to control the subjects' bodies for vaccines and preventive work, there is a turnaround in the late twentieth century.

This turnaround arises in the form of a ghost that brings out the impotence of this science and the fragility of these bodies we inhabit. Urban diseases and more specifically the emergence of AIDS show the social side of diseases as well as behavioral ones. At the same time, "new diseases" such as cancers and the return of some infectious diseases end up causing great public health concern about the place that this body occupies, as well as the rights and duties of the State in treating it (Moulin, 2006)

Perhaps the greatest blow has been the emergence of AIDS, which has brought in its historical social contexts, such as the possible origins in Africa, to bring up the top issues about sexuality guilt for sexual freedom. It appears to show that science at such a prepotent and self-assured hour, capable of counting, predicting and treating everyone, has its limitations and areas that it could not explain. It was then necessary to medicalize this society to control something that could not be explained. Immunology gains great strength in this period and the subjective aspect of this body gains publicity. Social mobilization around AIDS takes over the world. Firstly, with an image of the thin patient, in the process of languishing, and then in a more salubrious manner, since it would be something impossible to be seen with the naked eye.

The Deviant Body

The abnormal body historically has always been a stage for spectacles, as a personification of a monster, and always exerted fascination in humans. It is a projection of great collective anguish and brings in its bulge the curiosity for the bizarre and diferente (Coutine, 2006b). For some time the bodily physiognomy was linked to behavioral issues. Much has been researched on criminal morphology relating to body and crime (Coutine and Vigarello, 2006).

This monster model presents itself as the counter-model of what the social legitimacy of Coutine (2006b). The eclectic style deals with several opinions, from those who find it tasteful, to those who have it the aberration and perversion. Its decorative exaggeration was seen as a factor of impoverishment of aesthetic value. With this the author makes mention of the figure of Frankenstein, character of the literature that is the creation of a scientist from several parts of different bodies, being the final result to strange, grotesque body, that is left to the own luck, for being so horrendous But the author compensates her with the capacity of intelligence and feelings, and there arises ambivalence between good and evil, beautiful and ugly, all in one body. It begins in the nineteenth century study of physiognomy and phrenology, which seeks to classify through body image, normal and abnormal. Ortega (1967). From anthropometric research to the appearance of fingerprints, the body went through a period of beyond representative, a weapon of

police investigation. This unique body can be identified through DNA or data that would lead to the alleged aggressors. A new view of the body and its peculiarities as a possibility of investigation (Coutine and Vigarello, 2006)

The ideology of the body as 'something you have' and not 'something that is' is also confirmed in the anatomical tradition, we saw the body as a machine, image and corpse. The image is worth more than the 'content' and the ideal is virtual (Ortega, 1967). This modern body transgresses, attacks and challenges the dominant system, whether through piercings, silicones or tattoos (Garcia, 2005). Le Breton (1999) The transsexual, dissatisfied with the body itself, is altered by technology, using hormones and surgeries, embracing this new one; moved by the strong feeling of freedom and externalize who really is. Already in social marks, hatred felt by the subject is externalized through his body, his instrument of revolt and projection of his feelings. Before, tattoos were related to delinquency, but over time, prejudice, lack of knowledge of what they represented and contempt were diminishing.

The Social Body

During the revolution he sought to establish a society that was in pieces, and for that it was necessary to discover how a citizen should be. Then the image of the Greek goddess Marianne, who symbolized equal attention to all, was generous and productive. The revolution attempted to create a city where citizens could have freedom and express it, "freedom, equality and fraternity" was what they sought, no matter how much freedom in space conflicted in the freedom of the body. Space freedom liberated the revolutionary body (Sennet, 1997). The body is an object of communication. This body has broad meanings, especially in our Brazilian culture, with the political opening that we had in the last century. Body is consumption, it is image. And in this contemporary context the concept of beautiful and healthy is valued (Garcia, 2005). Our actions are habits, and these habits will shape our future actions. The action of the subject does not reflect in its action, since the action is based on pre-reflexive and preconscious body action (Ortega, 1967).

In the most recent publications the body has been considered not only as matter but as a generator of sensory stimuli, producing forms of knowledge and interfering with the environment in which it is found. The debate about nature and culture is part of the discussion about the new vision regarding body and experience within the context of socio-anthropological thinking (Rabelo et al, 2004). Constructivists use the term resistance where the individual reacts indifferently to the invasions of the world, rather than action, a creative view of the individual on the environment. Seeing the body passively. When speaking of the phenomenological body, the influence of the environment on the body constitution is emphasized and not only the anatomo-physiological question. There is an intentional link between the self and the environment, and this can not be seen separately. The 'phenomenological body' where the subject gives meaning to the world and the 'I' through experiences with the environment (Ortega, 1967) .

We all have / are a body and whatever that being / being is distant if we come to an agreement. On the one hand there is the constructivism that sees the body social constructor of another the vision of a material and essentialist body. Foucault (apud Ortega, 1967) directs the idea that social constructivism is directly connected to the body. It is still extremely nominalistic and heterogeneous, which does not allow a notion of 'us' to be considered and produces consequences, where the identification based on biological criteria or ends up provoking the valorization of ethnic or sexual minorities or exclusion from them. For Rabelo et al (2004) the body, within the process of experience would be seen as only an instrument in function of consciousness. Faced with this, our body elaborates several analyzes based on the fact that it has a perspective of itself and how it is situated in the environment. This body would be a synthesis of experiences previously lived taking into account its tradition, syntheses that are formed naturally. When you come into contact with a new situation, the first reaction would be what is felt by it.

It is difficult to explain the process of how the body is constructed, but Ortega (1967) defends the phenomenological idea of the construction of this body, by experience and its materiality. But this materiality and body are seen as a social construction. For Foucault (apud Ortega, 1967) the body and soul are manufactured through discipline, experience is not taken into account, only pleasure and desire are felt by the body. The body is seen only as a symbolic construction (Ortega, 1967). Becker (2009) uses Jane Austen's classic book *Pride and Prejudice* to exemplify how literature contributes to social representations, for in her books Austen describes in detail customs and social conventions of her day. What expectations about marriage, and especially the purpose of this marriage? It emphasizes that until today our definition of marriage is full of historical connotations. But he points out that in the time of Austen the condition of single to married married a short way, being today a path full of instances, such as dating, living together, the engagement. Even the wedding itself took other ideas, different from the Austen period, where marriage was for life, even if you did not share the same interests or feelings of the spouse. In addition to the economic issues described in his books, an issue that is always very marked, because his characters, even though they did not have such a dissimilar economic difference, still became weighty issues to prevent a union.

To overcome the dualism of Foucault who sees body and mind as separate units have new notions of corporeity, as in phenomenology that the physical and mental bodies are manifestations of the same body in different environments (Ortega, 1967) also mentions Michael Foucault when he reinforces the questions of biopower, disrupting the politics of desire and identity, through the socio-cultural control exercised by the state. Corroborating with Butler that the body is not something static but extended, in the notion of performance and not limited to the visual field (Garcia, 2005). Aesthetic surgery comes to bring symbolism to the human being who does not want to or is able to waste time with a possible transformation, called postmodern medicine. Technology reappears in this subtopic by showing that it can take the place of its original biological functions, transforming the human being into cyborg, it would be the phase of post-evolutionism, where man is freed from evolution. Man, by isolating himself more and more from the collective structure, finds in his body a great friend and ally in overcoming obstacles, develops a passion that aims to supply him, especially in relation to the narcissism impregnated within himself. When the

preoccupation with the body disappears, the subject will be free (Ortega, 1967). The phenomenological body is then invoked so that this body becomes understood as the basis of action and experience (Ortega, 1967).

The Body Today

Ortega (1967) mentions that In our society we suppress with images what is needed in real existence, recovering the meaning of real life through virtual events. Where the encounter of the real with the fiction is what spreads most today, as can be seen in novels, newspapers, etc. It seeks to sustain fiction in reality and vice versa. The 'passion for the real' emerges, for the virtualized real as seen on reality shows today, the real is promised, but the characters are playing fictional roles (Le Breton, 1999). The body represents the moment, which is fashionable, being the subject of constant transformations, is disposable according to necessity, losing its importance as a whole, becomes a servant of the subject, who can not change his feelings, uses the body as an escape valve; outsourcing is necessary. Changing the body, your life changes as well as your identity. This modified object is seen as visiting card, the subject's judgment will be based on the body, the subject then will always model it according to his needs, seen as a source of acquisition, material or emotional. The twentieth century is also marked by experiments with humans. What was previously experienced in other animals, needed to be tested. Several legal issues were raised and partially resolved until human research was possible. Then comes the informed consent term and the body becomes object in the hands of the researchers. Objective searches require objects (Moulin, 2006). Thus, in this twentieth century the body gains proportions of instruments of social practices and of great importance to understand the relation of the subject with its contemporary body, since today, in the XXI century, we still have the virtual bodies, focused on the "image of this body (Courtine, 2006).

At the end of the twentieth century also arise the so-called chronic diseases. They have always existed but the successes in disease eradication and prolongation of life have made them more frequent. These patients then assume a new positioning in front of their body, their illness and their possibilities of treatment. They are also responsible for them and not just objects of medical intervention. The patient gains some autonomy by being able to control some of his or her internal signs and even to monitor his condition, working in partnership with health professionals. (Moulin, 2006) This was only possible thanks to the entry of a new professional, who until then had nothing to do with health: the engineer. This is responsible for the creation, maintenance and evolution of technologies that will help this body to stay as close to normal, and extend life. These inventions leave the hospital units and increasingly enter the patients' homes, as well as the body itself (Moulin, 2006). However, this body that has already become the object of research and testing of medications and procedures, now presents something that needs to be controlled: pain. Then the techniques of anesthesia and even asepsis arise, bringing loss of consciousness to this being that becomes the object of science. Pain is then trivialized and countered with the most diverse forms of restraint. The relationship between pain and disease changes in this century (Moulin, 2006).

The body is not only mine, but a society. Numerous medications are needed so that this body weakened by a virus that can not be destroyed by medicine, looks or approaches the maximum of normality (Moulin, 2006). The search for the dominance of humor is well present in the contemporary context, the aversion to any negative feeling has led the subject to anchor in the psychotropics, seeking the assurance of control over their emotions, even being able to choose how they want to feel at a given moment, having an ample amount of medicines. The power that man desires to have and consequently to get rid of any nuisance quickly and effectively has made psychotropics replace any form of struggle and challenges in the face of difficulties; in search of a life in which the human being takes the medicine to be himself without tortuous paths, it occurs until the simulation of a symptom, even when there is no pathology at all (Le Breton, 1999). Even within family contexts, children are subjected to medications even when therapy through listening may be able to remedy the existing problem; parents exempt themselves from the education they gave their children of any responsibility for what might happen to the child. Psychotropics are sold as if they were ordinary remedies, like vitamins and aspirins in several countries, like France; their use becomes banal and often the side effects do not get the attention they should. The immediacy of daily problem solving means that the subject does not have the patience to discipline himself; the ease of having the medication regardless of the time is tempting; the lack of confidence in their own ability to solve their own problems is always greater because there is no achievement. The effects brought about by these medicines also give the doctor a false sense of autonomy about themselves as if they had not used any chemical components. Cyborgization comes into play by removing any barrier that the emotional can impose on the subject. The example of the anti-depressant Prozac is described, by bringing a sense of happiness and carrying a myth that, if well dosed, will not cause relevant side effects; which further encourages addicts of mood-inhibiting medications (Le Breton, 1999)

The body is seen as an object that transmits information, in this there is a similarity or even an equivalence with the machines, defended by several authors including. A supposedly created machine could not be differentiated from the model it was molded into. The question body and body becomes more pronounced when we say that we can have our organism outside the body so that it experiences a full life, the body is the only difficulty for the diffusion of the message that the spirit transmits. A device similar to the brain would be idealized by man, who would gain this human connotation. The spirit, when transferred to a machine, would have no impediments, but the computer would not have the capacity to signify the information it possesses, it is not flexible enough to perform various activities performed by the spirit. The relation between intelligence and matter comes immediately afterwards, the former occupying a primary place, for man should be detached from his body so that he could act as spirit; is seen as a form outside the body that could also be separated from the subject. The machine would never possess an intelligence equivalent to that of the human being because it is limited by not possessing knowledge and sensitivity. The body once again would be a restriction for Artificial Intelligence to derive human thought. Hackers, computer enthusiasts, have a close connection to their machines, assigning names to them, having feelings aroused by them; feelings that may one day be felt by computers. Subsequently, the term cyborg is invented to portray the man in conjunction with the machine, the cyborg appears inside hospitals and is used by medicine, as the mother own rent. The cyborg is described as salvation, for it comes to perfect and supply

the needs of men; would be an effective remedy for mankind. With this the human body would lose space so that the technological advances could be realized, taking advantage of only the spirit. Within the virtual world, this spirit would finally free itself, far from any disease; ultimately exercising its full potential in eternal life. The spirit would still have the option of choosing another body if it was interested, from the cloning, having its DNA reconstituted (Le Breton, 1999).

The appearance changes, but the personality does not change. When the body is altered, it does not always alter the body image itself, and this perception can be lost where the body assumes a form of public desire and not personal (Garcia, 2005).

The Body in Pictures

Garcia (2005) analyzes the contemporary media culture and how this body is represented in the media, in its so-called representational maxim. A body that starts to have objective and subjective aspects that adds aspects to the identification of a consumer group and product. The current media seek to enhance the appearance of this body, reinforcing the hegemony of hedonism. This body would then be seen as a work of art, a relation between subject and object, as well as the perception of our senses, thus being volatile and artificial, as well as superficial. This body that awakens, through image, perception and human sensory cognition.

Pimenta et al. (2009) cite the works of Nietzsche, Freud and Henri Bergson, where they began to place the body at the center of their instigations, questions pertaining to dreams, subconsciousness took strength out of obscurity and being integrated into the routine, and visual effects. At that moment the language ceases to be exclusively descriptive and becomes an agent of perception. And the body gains new functions, now it is a tool of language, as for example through dance, where the body is both paper and pen, it illustrates a poem, a story, only with its movements and expressions. In addition to dancing, the body and its many forms gave life to several paintings, where artists attempted to immortalize movements and expressions. The great graphic Alphonse Mucha, 1900, showed a naked ballet dancer in various dance moves, so she can be represented as she really was, without the garment costumes. His works were very marked by the ambiguity of the condition of the naked. Where he represented the profane and the sacred, tradition and modernity. Another work that draws attention is the portrait of the painter Gaughin, photographed dressed only from the waist up sitting at the piano, with a grave expression on his face, which contrasts with his partial nudity.

Cinema has always had to deal with our various sides: the animal, the mechanical side and now with the programmable. This earned him a fine laboratory of experiments on cognitive capitalism (Pimenta, 2009). Already Baecque (2006) tells us that the corporal expressions of the big screen evoke not only the imaginary but also the fears, identifications and representations of an era. The bodies presented must be exceptional and consistent with the values currently in force. Hollywood promotes a domestication or standardization of these bodies, passing to an ideal beauty, to fatal feminine behavior, to the seducer of the pin ups until the dominating ones and of triumphant beauty. Also arise the villains, symbolizing death and

destruction, even the good guy, healthy and with a concern. Transpositions of values and character traits in body images Becker (2009) analyzes the work of Walker Evans in his book: "American Photographs", some photographs are shown and analyzed as statistical comparative tables. He discusses the fact of the three photos showing three women, one white in the street in New York, one black in the same situation and one peasant woman. In the first two photographs the two women look serious, serious, which raises the hypothesis that in this period was a woman in New York made them hardened, while the peasant woman only appeared discomfort, perhaps ashamed. The author follows in this comparative between photographs and tables, where he argues that the tables are useful, easy and applicable in some aspects, as in the census, but very limited in interpretations. Documentary photographs, on the other hand, give a greater margin to many possibilities of interpretation about this social representation. The photographs are interpreted and codified from the pre-conceptualization of the users, that is, the photographer focuses on stereotyped images, but some have opted for images that escape this stereotype, trying to innovate, in order to make the user to analyze more closely, to do it reflect and think without stereotypes the artistic social representation.

In several films such as Matrix 2001, a Space Odyssey, Blade Runner and A.I. Artificial Intelligence, we see a computerized world where machines gain individuality and sensitivity, after all they simulate thoughts, intelligence, behaviors and learning. So what sets us apart from these machines? This brings us to the problematic of the distinction between the physical and mental spheres of bodies, which appears in the transition from the industrial model to the biotechnological models (Pimenta, 2009). Today's man, and his nature, converge every so often for so-called digital culture. The physically displaced body for images, or training, creates an aesthetic of the figural with contemporary values (Garcia, 2005). Today we focus more on the image, the outer body, until our subjectivity is focused on discussing the appearance, the image, the performance, our aesthetic presentation. The body is evolving along with technology, using it to "perfect", calibrate some imperfections, or fit the dictates of fashion, culture, society and groups (Pimenta, 2009).

The Cyber Body

Bihel (2004) states that the articulation of technoscience in relation to self-knowledge goes beyond how subjectivity of the subject is reconstructed by coming into contact with practices and ideas. Today we have the so-called digital culture that associates technologies and biotechnologies ranging from silicon to cyberculture, incorporate experiences to the imaginary and subjectivity of these subjects (Garcia, 2005). Ortega (1967) mentions in our 'somatic culture of obsession with the body' the art of Hagens offers an unparalleled self-knowledge, where the interior appears with a sense of replacing lost interiority. This possibility of 'seeing' within the body gives us new ways of making sense of the construction of personal identity. " (p.154) .Le Breton (1999) is a specialist and reference in the study of the body and warns us that the body, seen as a work of art, is in danger, because it considers the body as a machine to be disturbing, with no feelings at all; He asserts that the full body would be a target of contemporaneity. The body would cease to be main and would be considered only an accessory, with no relevant value; we have as an example

plastic surgery, in which loose organs are worth more than the body itself. Going to the virtual world, the cybercrime is in cybersexuality, which becomes reference; the body of the other, virtualized, becomes just a place to visit, like a page on the Internet and sex between them is ideal. Scientific knowledge can be equated with a source of youth, in which all will have their desires fulfilled. The body, which transcends the physical, is lost within itself, in a labyrinth in which it itself will define the directions in which to follow. David says that body and soul are closely connected, disagreeing with the dichotomy between the two, and also highlights the search for the first sense of his object of study, the body itself.

The cyber world encompasses the real and the fanciful, free from our bodies, we come into contact with beings who are distant, our spirit travels, transcends the plane of corporeality; gives a chance to people who have disabilities to travel this world in a full way, without concern for physical barriers. We give vent to our feelings, positive and negative, sensations that we live in reality. The contact with this world allows us to play with our identity, we can assume numerous roles without inspection or any concern; definitely or temporarily. We give wings to the other selves that exist within us, that we do not have the opportunity or confidence to show in the real world, the absence of responsibility can be compared to a dream. Distances come from getting in touch with other countries, cultures and people; we create stronger bonds than the real ones, ties based on the mystery, without caring about the sex or the pseudonym that the netizens use. This world can be compared to drugs, addiction that can provoke those who seek it as a source of happiness and comfort and contrast with the troubles of everyday life. This cyber space also has its own language, with many terms derived from virology, medicine or pharmacy due to the use of biology within its structuring, along with computer science. Robots are cited in this chapter as fabricated beings who, on one occasion, would gain emotions that they would not control and revolt against humans, other virtual beings also come to life, such as viruses. The creation of an *in silico* being is sought by biologists as well as physicians performed *in vitro*. There is a deification of the machine, which becomes the priority of humans, motivated by the desire to merge with it, leaving in the background conflicts of the real society. There is still a tendency of man, not to be alone enough, to mix with computer science; the opposite of this, as the humanization of it would be a misguided attitude of man (Le Breton, 1999). The anatomical norm and this identification with it is a hiding place for me, since the appearance in the present day is what dictates the essential of the body. Being equal seems to protect us and hide us (Ortega, 1967).

Ortega (1967) analyzes *The Bodyworlds of Hagens*, being an imitation of the representation of the body, of fused object and representation. The first notion of virtual body was experimented with the creation of the Visible Human Project, where a human body was meticulously virtualized with the help of magnetic resonance and tomographic scanners, to end the view of a morbid anatomy and facilitate the study of the body. The virtual becomes an extension of the real. Becoming visible and accessible everywhere. Having even a resemblance to the present day, where the virtual exhibition by webcams, fotologs, blogs, etc., ends up corresponding to the visceral interior of Visible Human, visually accessible in any part of the planet connected to the internet. The virtual model does not break with the real anatomical model, the body remains the same, an object without subjectivity. And that only comes to reality when seen on the computer screen. The virtual experiences bring new possibilities of expansion of the articulations on the

representations of the body. Even if they are provisional, incomplete or only partial, the cybernetic space becomes the abode of a new body, this time, technological. With the aesthetic valorization in these environments, we have a hegemony of valorization of images and representations of body, full of values. Cyberculture removes the traditional regularities of analysis and allows a virtual enchantment for what is only represented by an image. This displaced body then becomes the only discursive strategy in this interaction. Seeing and interacting with a "body" from its image provides a conceptual de-dilution of perspectives where the skin turns into pixels. They thus open space for imagination and the virtual allows us to overcome boundaries and limits imposed by reality (Garcia, 2005).

The love for the human, without artifacts and differentials, becomes more irrelevant when the machine absorbs its characteristics, brings improvements and establishes an own identity capable of enchanting the subject, who seeks perfection beyond the barriers of the flesh, of the sin. Seduction is ennobled by discarding physical contact, and desire will only be considered when the body, temporary and deadly, has already been left behind. In virtual sex we find a range of possibilities for the imagination to flow; living their fantasies, playing roles, playing with identity and sex, which is only mental, giving place to the text; full of metaphors. In these relationships some conflicts may occur and the curiosity to know a remnant of this hidden body will appear. Virtual adulteries and even rape by coercion of the subject that dominates and controls the other is likely to happen. The atmospheric cybernetics will develop like the mouse and the keyboard that will inherit the ability to receive stimuli from the body of the subject, more in the future the body will get rid of the touch in the machine through the touch in itself, provoking the same sensations in the virtual companion, besides a possible stock of fantasies and fictitious partners for several occasions, the body loses more and more its importance; will lose sexuality, compared to acts practiced by animals, and will be disease free. Virtual interaction will be closer and closer to the real world (Le Breton, 1999).

Conclusions

Within the various works we had the opportunity to know various ideas, fantasies and theories against the body and that he represents for many researchers. Whether he wants to or not, the human finds its essence in his body and without it, surely we would not enjoy the flavor that it gives us. Biologists, physicians, and other professionals dream of manipulating human genes to create perfect beings, generating even more discrimination and exclusion to those judged by society differently. The human being feels repulsed by his own body for feeling in relation to himself, as Le Breton (1999) states. Mankind would have its definition reconstructed if the body were extinguished; this condition, which preaches the end of the body is driven by contemporary society, desires to get rid of all difficulties, without taking into account the good characteristics that it provides, such as the individuality of each. This object body that today can not feel pain, gains a new aspect of not being able to "suffer" psychologically. Anxiety should be fought as well as grief or mourning for a relative. We are creating a society that lives in an artificial world, generated by drugs that alter, revert and modify their bodies and sensations. "The representational worlds differ according to the dominant set of interests." (Becker, 2009, p.37). Users are not totally static to the

end result of a representational product, whenever necessary they modify this product, so that they meet their needs and desires.

Each community and society organizes and divides their work, their representations and how they will be worked, so the producers use "standardized" means to report their considerations, means that are intelligible to the users. Becker (2009) puts the truths in discussion, because how to know if the facts quoted in the representations are true? There are social agreements, as the result of the representation has achieved the combined goal. And there is still support in what is publicly available, being at the mercy of deeper investigations, you will not risk publishing inconsistent facts. Another point is the insidious depictions, which with the help of tricks passes information that is deceptive, but so subtly that it leads the spectators to believe that it is true. What is expected today is that sociologists use images and figures to clarify or portray conceptual entities. With the purpose of presenting different data of the conceptions extracted from a social reality so that the user can handle them in an easy and intelligible way. Thus, it supports all forms of representing societies, whether by photographs, tables, films, books, mathematical models or ethnographies, what matters is that these products can explain and answer questions to their users, who also play a decisive role, since from them that producers can make their products.

The body will always be the challenge of many researchers and artists, who from different languages try to express and interpret human conditions. Pimenta et al (2009) proposes to analyze the body in a perspective of relations of sociability and mutual interdependence. The artists perceived in the instability of the body a strategic support, since it is capable of uniquely dramatizing the impacts that modern life brought with it. Pimenta et al (2009) Through the body we communicate and make ourselves present. We experience various experiences in relation to the body itself, the world and culture, but the body is an incomplete work, full of possibilities, being transformed through history. Pimenta (2009) quotes Fayga Ostrower, who brilliantly understood the body as an assumption of experiences, after all, through it we experience our existence. She believed in the free transit between art and social reality, but before the work "The Retirantes", she realized the impotence of art in relation to the problems of society.

We agree with Sennett (1997) that if the individual was stimulated by the crowd now he is seen as protected by it. The act of being able to move in urban spaces was a true social revolution, whether through streets or subways. Comfort begins to be sought, accompanied by an individualistic character. If he is able to lower the level of stimulation of a person can also work to push it away from the others. Then comfort in sitting, in traveling, alone, and privacy has been established. To the extent that new inventions (electric light, elevator, ventilation system) were gaining space, people were increasingly led to individualism and bodily experiences are specific to each people, and there must be understanding about the body in order that in cities multicultural people to care for each other. In historical terms the role of civilization is to confront us, in our fragility, with wrong experiences and feel incomplete. And it is there that the subject concentrates on being more critical, dedicated, searching for new discoveries, in the realm where the totality of pleasure is inevitable. The pleasure provided by comfort was a way to compensate for fatigue, but rest reduced the sensitivity of the body, becoming more and more solitary and passive.

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Endangered languages, social subjects and mediatization: the case of *Wikitongues*

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Abstract

This paper discusses possible roles of media/mediatization in the face of processes of linguistic changes and/in endangered languages in contemporary society. It is grounded on a social and historical approach to language and it finds support in Bakhtinian propositions about discourse, subjects and chronotopes. It assumes a sociolinguistic perspective to the interface between linguistic landscape, digital media and discursive agency. The study adopts the digital ethnography as a methodological procedure that grants the investigation of human actions and interactions in digital contexts. In order to explore the target theme, it presents a brief analysis of the case of Wikitongues – a non-profit organization that offers several digital platforms/media for individuals to share, divulge and comment on endangered language and cultural diversity. The analysis suggests that, by resorting to free online digital spaces and their affordances, spontaneous and activist video communities were created, showing that mediatization processes supported by the internet might help promote language diversity, discursive agency and cultural awareness.

Keywords: mediatization; digital ethnography; digital landscape; subjects; discourse; agency.

1. Introduction

Language change is certainly neither new nor strange to those who have been working in the field of anthropological and linguistic studies. However, in face of a digitally mobilized society in which the boundaries between online and offline universes have been steadily blurred (Blommaert & May, 2019), there is still a pressing need for the study of the relations between media/mediatization and their relations to language changes.

It is also opportune to favor studies that try and go beyond pre-established notions such as the ones that only tackle “effects” and “influences” of digital media in language configurations (Androutsopoulos, 2014).

Having said that, this paper discusses possible roles of media and/or mediatization processes in the visibility of endangered language changes. Based on a recent preoccupation, exposed by several segments of contemporary society, concerning endangered languages, this study presents the case of *Wikitongues*⁶, a non-profit organization that offers digital platforms as mediatic space-times for individuals and/or any

⁶ Available from: <https://wikitongues.org/about/>. Access on Aug 08, 2019.

endangered language-speaking communities to voice their own conflicts, perceptions and claims in relation to their own mother language changes. All in all, people who join the *Wikitongues* media want to keep some kind of register and/or advert endangered and/or already extinguished languages.

Methodological support is found in digital ethnography (Pink and all, 2016), and the discussion is grounded on literature review (Bakhtin, 1973, 1981, Shohamy & Waksman, 2009, Blommaert & May, 2019, Androutsopoulos, 2014 and Medina, 2006).

The discussion suggests that, by engaging in such mediatization processes concerning the need to voice narratives about endangered languages, contemporary subjects establish online “active responses” (Bakhtin, 1981) to (other) socially and historically constructed discourses/acts that come from the offline universe, thus exercising discursive agency whilst taking part in language video communities set in the cyberspace.

2. Literature review

Language is a social practice, a dialogic construction materialized in discursive communication (Bakhtin, 1981). Dialoguing, humans create themselves, learn new things, share previous constructed knowledge and represent their views of the world. Discursive communication is always established in and referent to specific times and spaces in which social and historical conditions and events are both affected by as well affect the language-in-action. Bakhtin (1973, p. 201) explains that, by observing discursive communications, one may notice that the subjects involved in the “act” “[...] find one’s voice [and] orient it among other voices, to combine it with some of them and to counterpose it to others, or to separate one’s voice from another voice, with which it is inseparably merged”. Thus, while language emerges from dialogued discursive communications, in everyday social practices, it is both created and modified by the language speakers who, simultaneously, are also affected by it. As Bostad (2004) acknowledges, those “communications” are not merely an exchange of words, as they evoke and construct discourses. Moreover, according to Bakhtin (*apud* Bostad, 2004, p. 169), discourse is “[...] language in its concrete living totality”.

Any dialogic discourse, *i.e.*; one in which there is addressivity and responsivity between past, present and future discourses, everything is uttered within a time-space situated context. The Bakhtinian perspective informs that time and space are inseparable elements of life, to which Bakhtin refers as chronotopes (Bostad, 2004, p. 172).

Utterances, addressed and/or responded by interlocutors within discursive communications, are therefore constructed within chronotopes – which are defined as intrinsically temporal and spatial relations, a metaphor connected to the concepts of meeting, distance and proximity, belonging to all sorts of cultural contexts. Language interaction between social subjects is, therefore, an act of speech which mobilizes discursive agency in specific chronotopes.

Medina (2006, p. 141), explains that “[o]ur discursive agency should be conceived first and foremost as a process of negotiation. When we speak we are implicitly negotiating legacies of use with our interlocutors as well as with possible communication partners from the past and from the future”.

But what happens to a society (and its cultures) when the language code, the underlying structure of signs which are mutually shared and negotiated by a certain community of speakers (Bakhtin, 1981) gets endangered? What are implications of less and less people resorting to a particular language-code and its specifics? If humans constitute themselves and find ways out of their “unfinalizeability” (Bakhtin, 1973, p. 53) by dialoguing, what are the implicit effects of no longer being able to find someone else to engage in a dialogue within such language code boundaries and specifics?

That seems to be the case of several endangered (minority) languages which, due to sociolinguistic changes, face eminent death. Androutsopoulos (2014, p. 2) informs that sociolinguistic changes, apart from language death and loss, and other aspects related to variables, might refer to several different processes, namely “[...] linguistic obsolescence, minority language revitalization, pidginization and creolization”, amongst others. Additionally, according to Androutsopoulos (2014, p. 6), the study of sociolinguistic change in the present days has been also driven to the examination of linguistic innovations as well as discourse circulation in mediatized social environments.

The investigation of language relations in mediatized contexts might allow one to observe how, when and why endangered languages have been occupying mediated spots in the cyberspace, thus performing social acts.

Subjects who seek dialogue in discursive interactions engage on social actions. Proposing an accurate view of the concept within the research field of Linguistic Landscape, Blommaert and May (2019, pp. 1-2) suggest that “social action” needs to be redefined in terms of the “*locus*” of the action as well as who is interacting within it. Therefore, resorting to Rawls (2002, p. 60), Blommaert and May (2019, p. 4) quote: “[a] population is constituted not by a set of individuals with something in common but by a set of practices common to particular situations or events”. The authors also reinforce that, due to the digital immersion most societies have been through, in order to exam linguistic landscapes, sociolinguistic changes and, therefore, social actions (i.e.; where they happen, who is involved in them and what they imply), it is paramount to address that offline areas, and communities (and therefore, their languages) are now somehow inextricably connected to digital culture.

Applying to the ideas proposed by Shohamy & Waksman (2009), this study accepts that discourse materializations, in all sorts of texts (oral, visual, written and/or multimodal texts), that are contrued and/or shared in public landscapes (either be it urban public walls or the public digital “chronotopes” in the cyberspace), are “[...] embedded in history, culture, ideology” (Shohamy & Waksman, 2009, p. 314).

Overlapping private and public affairs, the cyberspace poses a challenge to those engrossed in studying social changes by the means of investigating linguistic landscapes, which certainly includes, though is not limited to, the understanding of the mediatization processes in which subjects submerge/emerge from in the current days. Offering a large repertoire of text varieties, modes and types, the digital arena, situated within the domains of internet, caters for socialinguistic inquires and expands the means by which societies, subjects and their discourses might be better known and represented nowadays.

Therefore, bearing in mind those theoretical appreciations, the inquiry presented in this paper resorts to a methodological approach that contemplates the investigation of social actions in the cyberspace.

3. Methodology and Results

In order to study social actions by examining language, discursive agency and the engagement in digital and mediatic communities, digital ethnography has been mobilized. According to Pink et al. (2016), ethnography is a broad term that encompasses research practices that are usually linked to various theoretical paradigms and, as a consequence, it has been defined in several different ways. The authors suggest that it is an inductive kind of research in which the investigation design change and evolve throughout the study development (Pink et al, 2016, n/p). It is set within the field of qualitative research, and it is usually driven to examine human actions and look into productions in digital environments. These might involve, but not only, issues related to: social media interactions, digital and technological affordances; digital resources and social iniquities; digital spaces and discourses; sociocultural manifestations in digitally oriented environments, and so forth.

According to Pink et al. (2016, n/p), to perform a digital ethnography-oriented research entails adopting five main principles: multiplicity, “non-digital-centric-ness”, openness, reflexivity and unorthodox. Multiplicity refers to the idea of multiple ways of performing this type of research, which is usually instructed by the theoretical(s) framework(s) in which the investigation is grounded. It also means that there is an interdependent type of relation amongst digital technologies, media and the people involved in it (what they do/can do with the media, what is made of them and what it all might represent, from a critical perspective, for instance).

De-centralizing media, under this orientation, means that the social actions and subjects involved in the investigation are not seen separately.

Moreover, digital ethnography is seen as an “open event” (Pink et al, 2016), which means that the researchers accept that this methodology is open to other influences. It is also a reflexive practice, as it is understood that a digital ethnographer produces knowledge as he/she encounters with others. It is drawn by rather ethical and collaborative ways of performing research.

Finally, Pink et al. (2016) point that digital ethnography requires that researchers keep an open mind, meanwhile being attentive to non-mainstream, alternative ways of establishing communication in the present days.

Therefore, supported by digital ethnography, as it is presented by the aforementioned bibliographic reference, an investigation has been performed in the cyberspace, aiming to better understand contemporary relations established by social subjects, digital media and languages.

The object chosen to be focused on in this paper is the case of *Wikitongues*, which has been found as part of the data of a *Google* search “dying languages”, that yielded about 61,900,000 results (including repetitions), performed early in July, 2019.

The *Wikitongues* organization was reached after following the hyperlink presented within an article retrieved from: <https://www.nationalgeographic.com/news/2018/04/saving-dying-disappearing-languages-wikitongues-culture/>, which discusses *Wikitongues*’s efforts to join the race to save several languages that keep on disappearing, all over the world, at the rate of one language dying every two weeks. After exploring the article, the *Wikitongues* site was visited (Fig. 1).



Figure 1. Wikitongues.

Screenshot of the initial WEB page of the non-profit organization. Retrieved from <https://wikitongues.org>. Access on Aug 08, 2019.

The following section presents a discussion of the targeted object in the light of the theoretical perspectives broached in the literature review.

4. Discussion

The *Wikitongues* WEB page (partially represented by the screenshot portrayed by Fig. 1) informs that “[a]t the turn of the twenty-first century, as many as half of all languages were in danger of disappearing, a canary in the coal mine of humanity”. It also states that the non-profit organization was created to build a network of language speakers who are bound to participate in a worldwide movement to save endangered languages.

In addition, the representatives of the non-profit organization explain that their networking efforts have already mobilized people from more than seventy countries and, although it might “take time to save a language”, their activism seems to have been kept on motion due to volunteering and donations.

The *Wikitongues* main page also presents the readers with hyperlinks to other digital media in which the organization create networking time-spaces for those who are interested in their activist movement: *Youtube, Facebook, Twitter and Instagram*⁷. This reinforces the idea that the relations between mediatization and language is not only one of “effect” and “influences” on style configurations, as affirmed by Androutsopoulos, 2014. Much on the contrary, it is clear to notice that Wikitongues resorts to digital media to foster opportunities for raising global awareness to an *offline* universe problem at hand, by the means of internet (online universe), thus establishing the dialogue between both worlds, as informed by Blommaert & May (2019).

At the same time, the activist organization WEB site provides the speaker of any endangered, dying or dead language with opportunities to “find their voices amongst others”, as suggested by Bakhtin (1973). It invites anyone to freely and willingly upload videos produced by themselves, in which they pose their personal endangered language narratives (Fig. 3).

In the section named “language seedbank” (Fig. 2), speakers of any languages (usually minority or, as the organization page states, “marginalized” ones) are allowed to join the initiative.

⁷ Available at: <https://wikitongues.org/>. Access on: Aug 08, 2019.

The screenshot portrayed by Fig. 2, reads: “all initiatives to sustain marginalized languages have one thing in common: media, so their language can be shared and taught”. This utterance characterizes a responsive act (Bakhtin, 1981) to other (past) uttered discourses (the “all initiatives”). It also exemplifies the dialogic nature of discursive communications, informing the addressee (subjects that wish to join the endangered languages network squad) that he/she is expected to engage in a dialogue, what can be done by clicking on the link “add a language”. Thus, the digital media (internet platform / site; digital video, etc.) become part of a process in which subjects engage, mediatizing their discourses and interacting with other social subjects alike by contributing with the video archives the organization claims to be “collecting”.

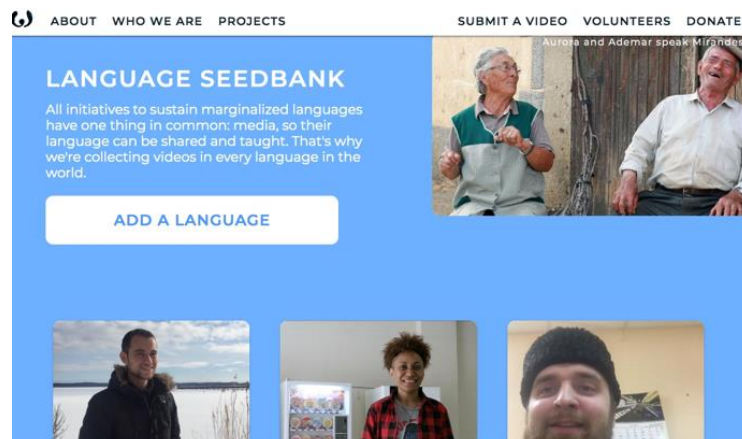


Figure 2. Wikitongues seedbank.

Screenshot of the WEB page. Retrieved from <https://wikitongues.org>. Access on Aug 08, 2019.

Figure 3. Invitation for speakers to contribute.

Screenshot of the WEB page. Retrieved from: <https://wikitongues.org/submit-a-video/>. Access on Aug 08, 2019.

Figure 3 illustrates a screenshot that converges toward the assumption that the different digital media at hand are seen as viable means for subjects to exercise their “discursive agency” (Medina, 2006).

When joining in the *Wikitongues* network, by sharing videos and personal narratives, subjects find themselves a chronotope (Bostad, 2004) in which social action (Blommaert and May, 2019) is in-motion.

In addition, when someone uploads their videos, they register the responsive and responsible act (Bakhtin, 1973) of speakers who are interested in participating in “the race to save” endangered languages.

That act, which has the digital arena as *locus*, solidifies that contemporary subjects have a wish to mediatize their discourses, so that they make it possible for other interlocutors – who choose to dialogue with their shared videos, throughout the domains of the internet – to engage in “a set of practices common to particular situations or events” (Blommaert & May, 2019).

Figure 4 portrays a screenshot collected from the *YouTube*⁸ page, hyperlinked from the *Wikitongues* site initial page, that holds the channel in which videos uploaded from several speakers of endangered, dying or dead languages, from all over the world, are archived, identified and shared.

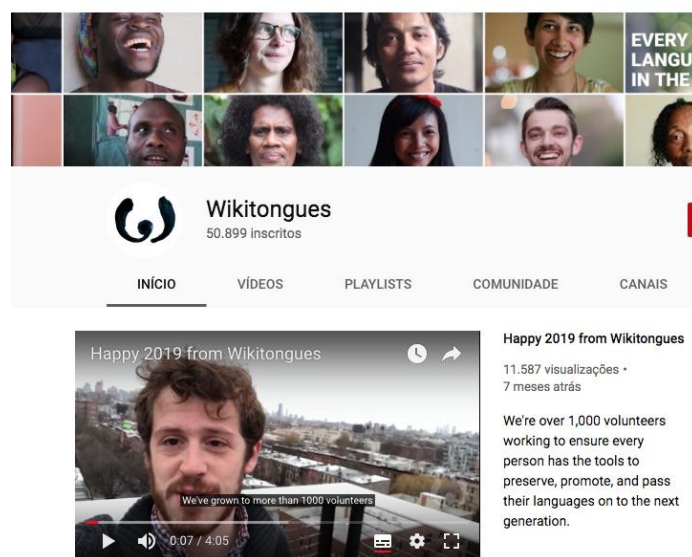


Figure 4. Wikitongues video channel.

Screenshot retrieved from: <https://www.youtube.com/wikitongues>. Access on Aug 08, 2019.

The channel administrators inform⁹ that, when interacting with the posted videos, “constructive comments only” are accepted, showing there is a moderation of sorts that is meant to maintain the positive tone that the activist network aims to create. This establishes boundaries to the mediatized discourses expected by the enunciator of the utterance (the *Wikitongues* page administrators), placing the addressee within a set chronotope (Bakhtin, 1973; 1981; Bostad, 2004). The uttered “comments policy” goes further to state that “[...] Wikitongues is a community for cultural exchange and mutual respect”¹⁰. The statement reinforces the concept of language as a form of “cultural exchange”, justifying the efforts to establish and maintain a race to save those particular languages at risk and/or to keep some sort of registration of the already dead ones.

⁸ Available at: <https://www.youtube.com/wikitongues>. Access on Aug 08, 2019.

⁹ Available at: <https://www.youtube.com/user/WikiTongues/about>. Access on Aug 08, 2019.

¹⁰ Available at: <https://www.youtube.com/user/WikiTongues/about>. Access on Aug 08, 2019.

The power and scope of mediatized discourses that, in this case, favor the perception of language as a means to construct, represent and share cultures and preserve/construe social identities, is confirmed by the number of views registered in the channel page: 11,512,019 views (Fig. 5).

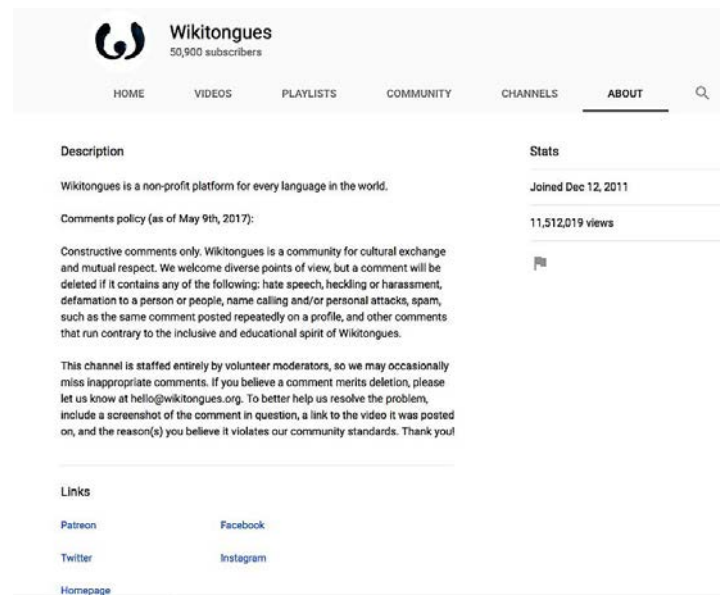


Figure 5. Wikitongues video channel information page.

Screenshot retrieved from: <https://www.youtube.com/wikitongues>. Access on Aug 08, 2019.

5. Conclusion

In this paper, possible relations among social subjects, endangered languages and mediatization were investigated with a study developed with the help of digital ethnography.

The cyberspace has been adopted as a public arena in which subjects establish discursive communication whilst interacting with and through digital media. It is an investigation context in which contemporary chronotopes present subjects with a locus for social action.

In order to pursue the study objectives, a research was performed and the *Wikitongues* non-profit organization digital media was brought to the center of the discussion, in the light of social-historic view of languages, grounded on Bakhtinian discussions, sided by sociolinguistic approaches to language changes, media and cultural practices.

The results suggest that, by engaging in discursive communication mediated by digital resources and spaces, contemporary subjects find ways to voice themselves, exercise discursive agency and establish dialogic interactions with others. It also demonstrates that language is intrinsically related to cultural representations and identity construction. The subjects who resort to digitally mediated chronotopes such as *Wikitongues* as a means to keep their particular language-code and its specifics somehow alive, corroborate the assumption that humans constitute themselves and find ways out of their “unfinalizeability” (Bakhtin, 1973, p. 53) by participating in dialogic discursive interactions.

Making use of the affordances which characterize digital media and cyberspace, such as online interaction, participation and community construction, social mediatized subjects have proved that, when

it comes to language and media relations, there are more than just linguistic modifications and renewed modes of constructing meaning involved.

The discussion of the object focused by this study has showed that, given the chance and with a certain amount of will, digital media might become resourceful and powerful means to stimulate socially relevant dialogues concerning the past, present and (a possible) future for languages, communities and their cultures. Hopefully, it may even help human beings renew a sense of perpetual humanity – which seems to have somehow been fading away from some of the members of the contemporary digitalized society.

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"Barbershops Encouraging Black Boys to Read"

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Abstract

This research project involved interviewing Title I personnel in Charles County Public Schools and visiting six barbershop owners in Charles County Maryland who are a part of the Barbershop Books project. The visit to these barbershops included interviewing the owners of the barbershops as well as reviewing the books used in the project. These barbershops display a variety of books for young black boys to read while they are waiting to get their hair cut. These books are located on a small bookcase in the corner of the barbershops' waiting area. The idea of books in the barbershops was to help improve reading skills for Black boys in elementary school. The project was purposed and funded by the Charles County Public Schools Title I Program. The literacy project began in August 2018. Mr. Alvin Irby, who is a former kindergarten teacher in New York City, is the founder of Barbershop Books.

Keywords: Barbershop Books, Mr. Alvin Irby, urban, Charles County Public Schools Title I

Introduction

Across the United States, various literacy programs are being implemented in barbershops that are located in urban neighborhoods. The main purpose of these programs is to demonstrate to black boys the importance of reading. According to the US Department of Education 85% of American's black males in fourth-grade are not proficient in reading.

As a result, there are various programs in different states that have developed literacy programs in barbershops. For example, in Cleveland, Ohio January 28, 2017, a report discussed how Claudette Cole heads a project called Outliners Barbershop whereby barbers provide books for black boys to read when they come in for haircuts. Ms. Cole receives no funding for the program, it is strictly done on a voluntary basis. Twenty-one (21) barbershops are involved in this project. One barbershop Urban Kutz Barbershop has two rules before a customer can view television in the shop, he must read a book. The second rule is that the customer may take a book and upon completion of the book, it must be given to a friend.

In the Houston, Texas area, the Razor Sharp Barbershop is one of dozens of barbershops that has partnered with the Houston Public Library, the Barbara Bush Literacy Project and a Book Foundation to provide books for black boys who visit their barbershops.

Mr. Alvin Irby, a former kindergarten teacher in New York City, is the founder of Barbershop Books. The Barbershops Books is a nonprofit organization that provides a small bookcase in the waiting area of barbershops in the urban communities across the country. The mission is two-fold: to inspire black boys

between the ages of 4 and 8 years-old to identify as readers in a male-centered space and to involve Black men in the boys early reading experiences. There are fifty (50) barbershops in twenty (20) cities and twelve (12) states that are involved with the Barbershop Books Program. An example of Barbershop Books project is in Wilmington, Delaware, where the Wilmington Library sponsors twenty (20) barbershops who have been participating in the project since April 2018. The project has become a fixture in these barbershops and have become another avenue that is expected to benefit black boys.

Materials and Methods

This research project that commenced in August 2018 involved interviewing the Title I coordinator and Title I parent liaison in Charles County Public Schools, in addition, to specifically visiting six Charles County Maryland barbershops that are part of the Barbershops Books project. The visit to these barbershops included interviewing the owners of the barbershops and reviewing the books in the barbershops. These barbershops have a variety of books for their young boys to read. The books are also located on a bookstand in the corner of the barbershops' waiting area.

Table 1 identifies the interview questions that were asked to the barbers and their responses.

Table I -Interview Questions and responses

Length of Time in Business	What makes the literacy project effective?	Are you happy your involved in the program?	What advice would you give other businesses, if they were interested in the literacy project?	How would you rate the literacy project on a Scale from 1-5- 5 being the highest score?
Barber 1 26 years	The boys and their siblings grab the books to read. He tells them they can take the books if they like.	Yes.	Make the project fun, interesting and challenging,	5
Barber 2 16 years	It not only supports the boys who come in for a haircut but the boys and girls (generally their siblings) that come in with them.	Yes. The program makes a difference.	Promote reading.	5
Barber 3 13 years	More children are interested in the books than the parents. This barber will tell the parents to read to their children. He tells them they can take the books but	Yes.	Develop project every place there is a small Black business.	4

	they usually bring the books back when they have finished reading them.			
Barber 4 8 years *	Children enjoy the books both boys and girls and they know how to read the books.	Yes. It is positive for kids	Make sure every child engaged with a book!	5
Barber 5 6.5 years	The kids come in and read the books.	Oh, yes. Wants to continue this project in an additional shop that he will open.	Absolutely!	5
Barber 6 2 years	Intentionally, this barber has no television in his shop, so immediately the boys and girls pick up the books to read.	Yes, I can make a difference.	Basketball coaches. Double-AA coaches need to know.	5

Results and Discussion

The barbers' length of time as owners of their barbershops varied from two (2) years to twenty-six (26) years. The barber who had been in business for eight (8) years was in the present barbershop for three (3) years. Overall, the barbers expressed how not only the boys would read the books but their siblings would read the books as well. The books are not only benefitting the clients but the other children, both boys and girls who come into the barbershop and are waiting for their sibling or parent.

Table I reflects that all the barbers were happy to be involved in the literacy project. In addition, the statements in the table reflects the barbers' positive attitudes regarding the project. Only one barber has attended board meetings. He was invited by the Title I personnel.

When asked about parents encouraging their children to read in the barbershop, all the barbers agreed that parents do encourage their child to read, in addition to some parents reading to their child and other parents instructing their child to get a book, whereas the child would get books on his own.

All of the barbers would recommend the literacy project to other businesses. The barbers like the idea of expanding the literacy project to other barbershops and businesses. One barber recommended the idea of the expansion of the literacy project to any small Black business wherever, there is a waiting room. The barber felt this expansion would be beneficial to the whole community.

On a scale of one (1) to five (5), five (5) being the highest, the barbers were asked, “how would you rate the literacy project.” All of the barbers scored the literacy project with a five (5), except one barber who scored the literacy project with a four (4) because he believed there was always room for improvement. One of the barbers who scored the literacy project with a five (5) said, “I give the project a six (6), I love it.”

When asked if the barbers encouraged the boys to read the books while they wait, the majority of barbers responded “yes”. The barbers discussed that many boys will automatically gravitate to the books, while some of the barbers will tell the boys to read a book while they are waiting. One of the barbers mentioned in the past he would verbally encourage the boys to read a book, but now the boys automatically walk over to the bookcase and select a book to read.

When asked of the barbers, if they needed any special training to be involved in the literacy project, the barbers overall answered “no”. The general response was the Title I Personnel came to their barbershops explained the literacy project and asked if they would like to be involved. Only, one of the barbers attended an initial meeting at the Charles County Board of Education. At this particular meeting the literacy project was introduced by Mr. Alvin Irby, the initiator of the Barbershop Books Project.

The barbers were not interested in changing anything about the literacy project. The barbers made a few suggestions that could enhance the project. The program has been developed so all barbers have extra books and the children are allowed to keep the books. There was also a suggestion to have more books for younger children. In addition, they hoped that more barbers would become involved in order to expand the project. Another suggestion included having a banner posted in every school to advertise the project. One barber said he was going to put a sign up on his bookcase that says you can take the books. The last suggestion was to have a literacy night, with snacks, that introduces the project to the community.

When asked how and why the barbers got involved in the project, the barbers expressed their interest in promoting education in their community and how fundamental reading is in being competent in all the other educational disciplines. One barber made this profound statement, “I promised that I would do something positive in life to help black men.” Others statements were “I have been where these boys are” and “anything to help kids.” The last two quotes were, “It would give kids a better opportunity,” and “you can’t learn, if you can’t read.”

In terms of how the barbers got involved in the project, Title I Personnel from Charles County Public Schools came to their barbershops and asked the barbers if they would like to be involved in the project. However, one barber said, parents from one of the schools told him about the project and another barber said one of the schools asked him to become involved in the project.

The barbers discussed getting feedback from the boys on reading the books, all the barbers expressed the boys give them feedback, except one barber replied that he did not get feedback from the boys. Some

barbers replied that some of the boys will continue reading while they are getting their hair cut and another barber mentioned that some of the boys will discuss the books while they are in the barber's chair getting their haircut.

The project was developed so that the boys could take the book if they so desire.

Since this is almost the completion of the first year of the program, the assessment of the project is in process by the Title I administrators of Charles County Public Schools. The administrators are monitoring the project and they do make sure the barbers have extra books to replenish their bookcase. In closure one of the barbers mentioned,

“the program is doing what it is supposed to do.”

Reviewing Books on the Bookcase

In reviewing the books on the shelves, the books varied from seven (7) to forty-six (46). The books were attractive and varied in age from prekindergarten to second (2nd) grade. The topics of the books ranged from adventure, realism, sports, science-fiction and transportation. There were a few books that would interest upper elementary students such as Greek mythology, graphic novels, and young engineer information. There were even books on ninjas, the Wimpey kids and building towers. These books with such a variety of topics would appeal to boys and girls. A suggestion for additional books would be to include more books for upper elementary students and some culturally-based books. The barbers agreed with this recommendation. The book display appeared to be utilized. It appeared children had taken books and some books had been placed in various directions on the shelves. Some of the barbers mentioned that the other barbers encouraged the boys and girls to read and to take the book if they were not finished reading it.

Overview from Title I Personnel

The major goals of the program are to increase children's home library; to give children a love for reading and to find reading to be fun; and to encourage parents to support their children in reading. The Title I personnel selected the books probably from the curated list of books that Mr. Irby developed from speaking with black boys with respect to their topics of interests.

The Title I personnel generally come to the barbershops monthly to see how the Project is going. When they visit, they give the barbers a backpack of books to replenish the books that have been taken. Also, the personnel inquire of the barbers whether they have questions or if they need anything to help with the project.

The Title I personnel of the Barbershop Book project in Charles County shared that there are ten (10) barber shops in the county involved in the project. The personnel gave the barbers a one (1) day training to share

the project. The personnel shared that some of the barbers have cheat sheets stuck on their mirrors to give them suggestions on how to engage with the boys regarding the books.

As the project grows, the Family Engagement component of Title I personnel intends to assess the effectiveness of the project.

Conclusion

The Barbershop Books project would be an asset to all urban communities. This is a strategy to help bridge the achievement gap. It would be instrumental to develop a partnership with the schools in the community and the barbershops. The idea of expanding the Barbershop Books to other small business as suggested by one of the barbers could be another real asset in promoting literacy. In education, there should be a link among the school, the community and the parent. This is a perfect example of that link. Mr. Irby is to be commended on developing and implementing Barbershop Books. As he said, “research suggest that between the ages of four years-old and eight years-old, it is a critical period for developing literacy.” in addition, Charles County Public Schools Title I Program is an example for the other school districts in the metropolitan area as well as the states that are not involved in the project. This idea is moving the inequities out of education and building on the strengths of black boys.

Acknowledgments & Disclosures

My deepest gratitude to the dedication of the barbers that participated in this research project and to the Charles County Public School Title I Personnel. In addition, the project would not have come to fruition without the assistance of Madlynn Anglin, M.A., CCC-SLP, Speech-Language Pathologist, who was instrumental in reviewing the books and collecting the data.

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Wave Propagation Technology in Non-destructive assays for Wood Qualifying in Tropical Amazon

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Abstract

Non-destructive tests use techniques which allow a body to be evaluated without changing its physical, mechanical and dimensional features and without compromising its future use. Impulse tomography analysis is a non-destructive method which allows a piece of wood to be analyzed by passing mechanical waves through it, allowing researchers to evaluate its qualities in advance and detect the presence of defects. This research reports the assessment of the efficiency of impulse tomography as a technique for identifying defects and the in situ evaluation of tree wood from Amazonian timber species. The data were collected at INPA's Tropical Forestry Experimental Station (ZF-2), located at BR 174, Manaus/AM, in a plot 1 (one) hectare in size, where 7 species were chosen at random. For evaluation, the ARBOTOM pulse tomograph at DAP (diameter at breast height) was used to rapidly capture cross sectional images of the wood. Next, the trees were cut to evaluate cross sections of the wood by eye and samples were taken to determine the density of the wood. The results enabled researchers to detect the presence of distinct zones in the wood by varying the mechanical wave speed indicated by various colour zones revealed in the X-ray. These colour differences are attributable to variations in density related to the different wood substances in the tree. It was found that the wood density and mechanical wave velocity correlated with R^2 0.647. The dynamic elastic modulus of the species studied was satisfactory, showing a good degree of resistance. Impulse tomography technique provides complete information and can assist forest managers to make a decision about tree felling that is guided by the assessment of the internal quality of the wood.

Keywords: *Non-destructive Testing. Pulse tomography. Tree tomography. Wood quality. Amazonian Wood varieties*

1. INTRODUCTION

Non-destructive tests were first devised in response to the need to evaluate material properties without affecting the object undergoing evaluation. They are performed on materials to check whether or not lesions or defects are present, and run on defined physical principles, without changing any physical, chemical, mechanical or dimensional characteristics of the materials being tested, thus leaving the ability

in these materials to operate or perform their role uncompromised or altered for later use, as reported by Candian (2007).

In the forestry industry, the non-destructive (END) test has also been applied using various techniques. Impulse tomography in particular has emerged as an advantageous technique for evaluating the inside of trees. In medicine, tomographic tests are mostly used for medical diagnosis. Timber tomography works on identical principles. By means of mechanical wave emissions, internal images of the wood of any tree under scrutiny can be projected.

Wood tomography has two major objectives, namely the analysis of internal defects and dimensional characterization. From the images that it generates, information of various kinds can be obtained, such as the ratio of heartwood to sapwood, reaction wood and the presence of knots, internal defects and wood rot, among other things, according to Rinntech (2005). Amodei et al. (2010) also confirms the application of the technique in the logging industry, allowing the interior of the logs to be visualized and optimizing the location and orientation of the cutting of planks.

In this context, using techniques that preserve the integrity of the standing tree signals an evolution in research, which adds value to the evaluated product and reduces costs, making assay more economical. Barros (2016) commented on the assays that destructive methodology is more expensive due to the time consumed in the various stages of obtaining samples and resources; this methodology also prevents the subsequent use of so many samples, which are required for the mechanical and physical tests.

Because it is a new technique, few studies using pulse tomography have so far been described, especially on a living tree. Thus, the aim of this research is to attract subsidies for the development of new methodologies of non-destructive testing of live trees in the Amazon, using the impulse tomography technique; this would assist in the characterization of the internal quality of the wood and decision making about any arboreal individual in loco. If possible, it should provide mechanisms that aid forest management in the end, through a "quality inventory" using impulse tomography?

2. CONCEPTUAL-THEORETICAL REVIEW

In Brazil, the use of non-destructive tests on wood is still in its infancy. However, according to Oliveira (2005), it has been gaining ground in recent years, constituting a valuable tool for the forest sector, especially in the selection of individuals still in the field.

In the view of Ferreira (2009), non-destructive evaluation in the forestry area has been used for a number of purposes. In urban forests this kind of analysis makes it possible to detect internal defects in trees, and thus establish appropriate management measures for treating them, increasing their longevity and biological health. In forest plantations, Pereira (2009) maintains that such techniques allow us to evaluate the quality of timber and to characterize it as suitable for use in products made of solid wood and also in the management and selection of trees in sustainable forests, as aspects of forest improvement.

Non-destructive testing (NDT) with the application of wave propagation techniques for the evaluation of material properties became possible only with the development of elasticity theory and measuring equipment (Gonçalves & Trinca, 2011).

It was Jayne (1959) who initiated the fundamental hypothesis for the non-destructive assessment of wood. She proposed that energy storage and wood dissipation properties are controlled by the mechanisms that determine the static behavior of this material, and can be measured non-destructively.

In the case of wood, Gonçalves & Trinca (2011) claimed that applications previously devoted to determining the longitudinal modulus of elasticity, would also allow the global elastic constants to be determined and would allow characteristics to be evaluated directly in/on the tree. This tree assessment may focus on determining properties and/or the assessment of integrity.

The first research with mechanical waves to evaluate the interior of timber trees according to Bucur (1983) was done in the 1980s, in order to verify the elastic constant in wood increments and compare it with X-ray densitometry.

Cardian (2011) reports several non-destructive ways of classifying wood, including visual classification, ultrasound, *stress wave timers*, transverse vibration and the use of resistographs and structural lumber sorting machines (MSR).

Impulse tomography, used to evaluate tree trunk injuries, is characterized as a less invasive technique, capable of providing evaluations of whole cross-sections of individuals in a single measurement (Nicolotti et al., 2003), through information provided by passing mechanical waves through the wood. Pereira (2007) confirms this observation, noting that until then no instruments had so quickly and conveniently revealed whole sections of trees; this suggests how revolutionary tomography was for this task. An added advantage was that very few signs of its use were left behind.

For Rinntech (2005), impulse tomography is based on the principle of mechanical wave timing, where the impulse velocity inside the tree is closely correlated with tissue density, the modulus of elasticity and moisture; the purpose is to reconstruct cross sections of trees, generating a mechanical wave velocity graph, also called a tomographic image.

Studies of impulse tomography by Nicolotti et al. (2003) join those of Martinis et al. (2004), Gilbert and Smiley (2004), Pereira (2009), Rollo (2009), Amodei et al. (2010) and Uliana (2010) in registering good results in comparison with other techniques. It has proved to be an important way of advancing the characterization of wood quality.

According to Bucur (2006), the propagation velocity of mechanical waves tends to increase with as humidity declines, occurring more intensely below the Fibre Saturation Point, precisely because of the greater intensity caused by the modulus of elasticity than is apparent. Thus, the highest wave propagation velocities are generally achieved in wood species of higher density and lower water content.

Of the physical properties, Panshin & De Zeeuw (1980) affirm that the density is the attribute most often used in characterizing wood. It is defined as the ratio between dry mass and saturated volume (g/cm^3 or kg/m^3), which gradually decreases in the medulla direction. Specific density or mass is one of the main indicators of wood quality, because it relates to the physical and mechanical properties of this material in industrial use and is easily determined. Generally, the density increases as the mechanical strength and natural durability of the wood increases.

Cardian (2011) notes that the determination of the mechanical properties of wood using wave propagation is based on the relationship between the speed of sound, the modulus of elasticity and the density, allowing aspects of wood quality to be verified, such as knots, and marrow, among other things.

3. MATERIAL AND METHODS

3.1 Characterization of the study area

The study area is located in the municipality of Manaus, in the state of Amazonast, the Experimental Station of Tropical Forestry of the National Institute of Amazonian Research (EEST //INPA), km 50 of Highway BR-174, Manaus/AM, with the geographical coordinates of latitude 2°38'14.60" S and longitude 60°9'22.37" W (Figure 1). This area is covered by humid tropical forest on firm ground in the Amazon, or Dense Tropical Forest, according to the classification of RADAMBRASIL (PELD, 2015).

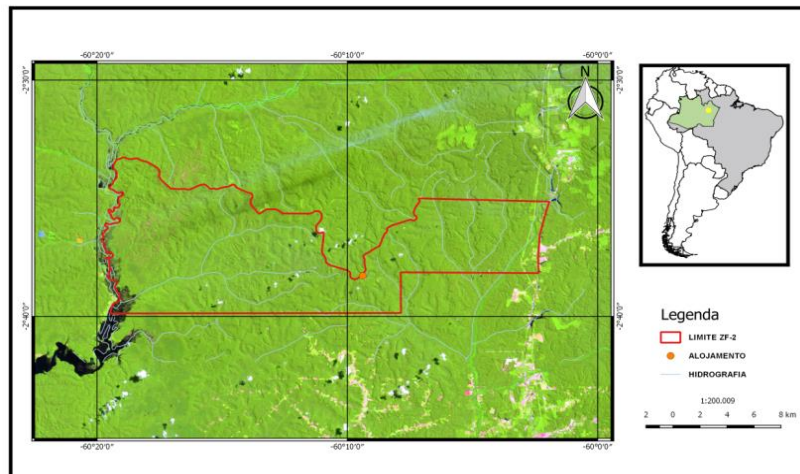


Figure 1: Location map of the study area: Tropical Forestry Experimental Station - ZF2 /INPA, Manaus/AM.

In a plot of 01 (one) hectare, of secondary forest the visual analysis of each selected tree was performed, recording information about the presence or absence of visible hollows, attacks by insects such as beetles, termites or the presence of fungi.

Seven species of wood from the Amazon were studied: Ingazeira or Ingá xixi (*Ingá alba*), Ingarana (*Inga paraensis*), Ingá-red (*Inga sp.*), Red-pitched (*Protium puncticulatum*), Maparajuba (*Manilkara amazônica*), Abiurana (*Pouteria guynensis*) and Muiragiboya (*Swartzia recurva*). The selection of these species was based on their frequent occurrence in the study plot. The species were identified at INPA's Wood Anatomy Laboratory. The species are native to the Amazon region and have differentiated wood material (heterogeneous), with heartwood and well-defined sapwood.

Regarding the experimental design, each tree analyzed was considered as a single sampling unit in a total of 7 individual trees.

3.2 Internal Analysis

A non-destructive test by the impulse tomography technique was made for the internal evaluation of the tree wood with a RINNTECH model pulse tomograph device (from a German company). The handset

consists of 24 sensors, a special hammer, battery, charger, connecting cables, Panasonic brand CF-52 notebook and *software* installed from ARBOTOM.

To obtain the X-ray images of the species, the DAP height of each tree was fixed to be equidistant and sensors (numbered and arranged clockwise) were connected to each other by cable, with the battery connected to a laptop. Each sensor received 5 hammer blows that produced mechanical waves in the stem wood of the trees; the number increased until the percentage of error reached the range of 0-10% that was acceptable, following the Arbotom Software Delta % Table. This signal was transmitted and received by sensors installed around the circumference of the trunk and varied according to the density of the wood. The waves took some time, called the wave propagation time, to run through the wood of each tree and reach the sensors. The time that this took was automatically measured by the equipment *software* and its speed was calculated. In this way a colour-coded X-ray image of a cross-section of the tree trunk was formatted (Figure 02).



Figure 2: Application of the pulse tomograph to the tree stem.

The X-ray image is always accompanied by a colour palette, which represents the variation in the impulse velocities that traverse the cross-section. Rinntech (2005) observes that the higher the speed of the wave travelling through the wood, that is, the shorter the propagation time between two points of the tree, the greater its resistance. In other words, if the wood is in good condition the wave can travel at high speed, but if it encounters rotten wood, a hollow or a crack, it will have to slow down.

Having obtained the velocity values, it was possible to calculate the dynamic elasticity modulus (MOE_d), by applying Equation (1).

$$(1) \quad MOE_d = V^2 \times \delta \times \left(\frac{1}{g}\right) \quad \text{where } MOE_d = \text{dynamic elasticity modulus (MPa)}$$

δ = specific material mass (g/cm^3)

V = wave propagation speed (m/s)

g = acceleration of gravity ($9,804 \text{ m/s}^2$)

To evaluate the data obtained in this non-destructive technique of wave emission, the trees to which it had been applied were felled and cut into logs so that the visual evaluation of the wood could be compared with the X-ray images.

3.3 Wood Density

The density was determined from specimens (samples) of 5 cm-thick discs cut from each tree. The samples were cut and properly oriented, with dimensions of 2 cm x 2 cm x 3 cm. The samples were saturated in water for 20 days to obtain a saturated mass and volume. The bulk density was determined by the stereometric method, with the aid of a digital caliper, measuring the width, thickness and length of the sample; for the saturated mass, a digital scale with 0.01g precision was used. The density was calculation by means of Equation 2.

$$(2) \rho_b = \frac{P}{V} \quad \text{where } \rho_b = \text{Density (g/cm}^3 \text{ ou kg/m}^3\text{)}$$

P = wood mass (g)

V = wood volume (cm³)

Statistical analyses of the technological characteristics of the species were performed according to a single factor design (treatment = individuals), with unbalanced data. The data were analyzed to yield descriptive statistics, observing the variation of wave velocity between the trees.

4. RESULTS AND DISCUSSION

4.1 X-ray Imagery

The application of the impulse tomograph to the wood of the trees produced the tomographic images presented in Figure 3, which show the alterations in the properties of the wood that could be observed from the patterns of coloration which are shown in the varying propagation velocities of the mechanical waves. This may be observed in the colour scale next to the X-ray images, which indicates the speed of the mechanical wave propagation (meters //second) as it passed through the wood.

According to Rinntech (2005), the red, orange and yellow tones indicate a slower speed of mechanical wave propagation, while the blue and green tones indicate higher velocity zones.

The colour scale reveals, then, that the blue portions present higher wave velocity values and the reddish portions present lower wave velocity values. In addition, it was possible to identify that each image displayed a specific pattern in the varying colours related to the velocities, which made it difficult to compare the images.

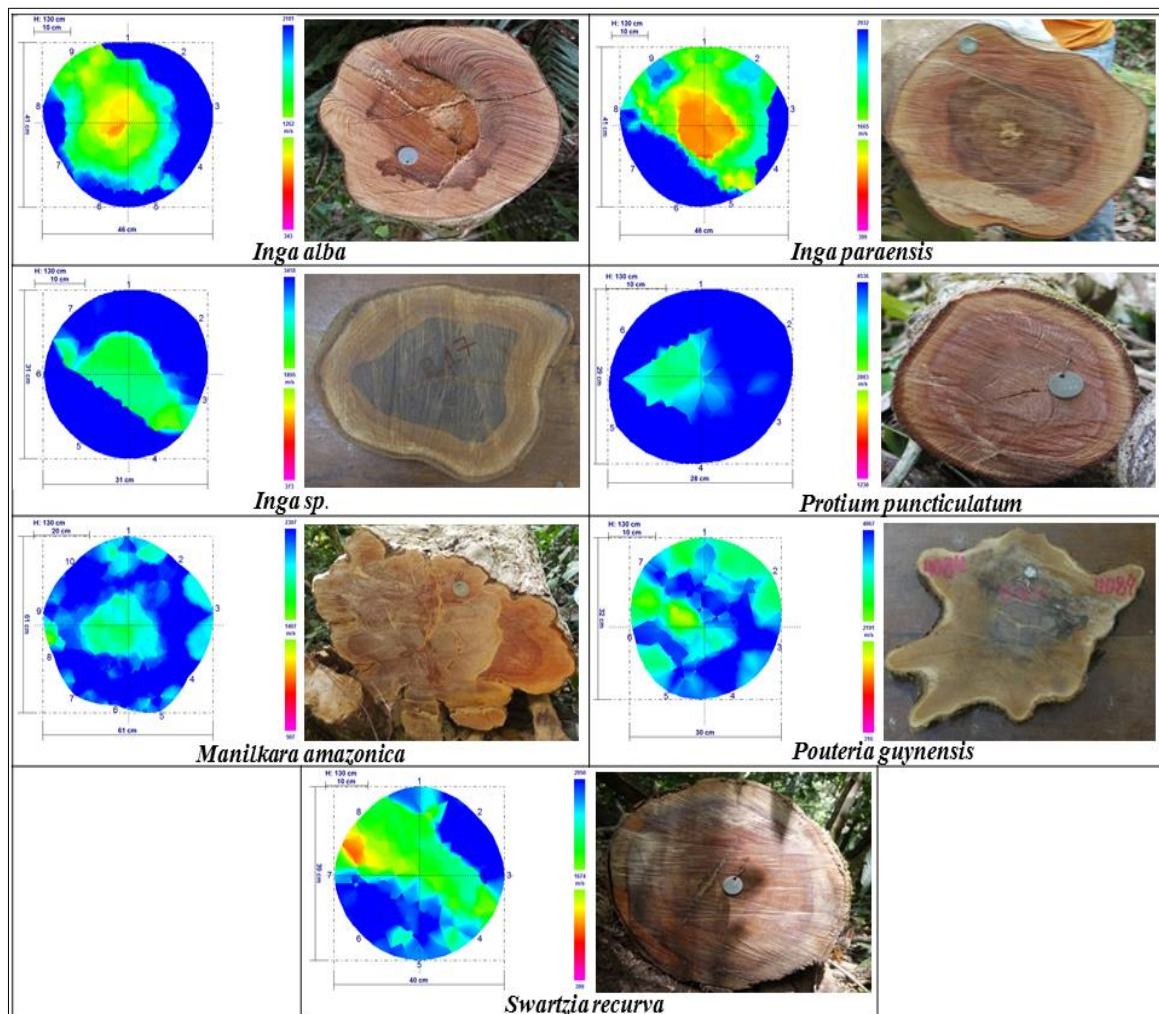


Figure 3: (A) X-ray images in a cross section of the trunk; and (B) cross-sectional views of each tree.

In general, the surface images of the cross sections of the seven individual trees do not present an image pattern that allows us to differentiate the woody material (heartwood vs. sapwood), but it is clear that the image composition is formatted according to the passage of the mechanical wave inside the wood, responding in line with the woody material found. Therefore, the image compositions do not follow a standard. In this study, it can be inferred that wood is a material that varies according to species and also within a single tree.

The X-ray images of the species *Inga alba* and *Inga paraensis* showed red/orange coloration, more evident in the latter, the internal defect in the *heartwood* area being confirmed only in its specimens. However, the percentage of hollow areas detected by visual analysis (1.25%) was smaller than that found by X-ray imaging (13.87%). A comparison between the data obtained by the visual analysis of the wood and the X-ray images shows that the X-ray reading overestimated the affected area by about 12%. This may be related to the diameter of the stem, its shape, or small differences of density between healthy and injured wood and even between heartwood and sapwood.

X-ray imaging and visual analysis both showed the better quality of *Inga sp.* with an absence of internal defects, indicating that the wave propagation did not suffer interference or discontinuity during its course; only some differentiation between the mechanical wave velocities could be observed. Another factor that could have been responsible was wood density, which ranged from 0.90 to 0.97 g/cm³.

Protium puncticulatum recorded the image in blue and green with soft yellow shading. No deteriorated areas were found by visual analysis, a fact which is confirmed by the X-ray image and the values of the wave velocities that formed it, confirming the absence of deteriorated tissue in this individual tree. The speed ranged from 329 to 3,814 m/s, for a density of 0.84 to 0.88 g/cm³, showing good quality wood.

Manilkara amazonica and *Pouteria guynensis* presented similar images regarding colour arrangement, where blue and green predominated in the image. This formatting may have been related to the geometric shape of the wood, causing spaces between the sensors, and reducing the speed of the mechanical wave that passed through. Neither species presented any internal defects, leaving only the differentiation between the mechanical wave velocities to be observed.

Swartzia recurve in its composition presented greater variation of green and blue, with a small red area between sensors 7 and 8. In the visual analysis, no internal wood defects were found to justify the presence of red, but it may have been related to some intrinsic characteristic of the wood.

Analyzing the formation of the X-ray images suggests that they may be related to the constitution of the wood, or to the pattern of hits executed on each sensor, since it was clear from the wood images that these specimens were free of internal defects. Since the tomograph works on various parts of the wood, producing images in response to the various sensors attached to the tree, it eventually recognizes several levels of density along the section.

Observations regarding the variation of the images corroborate the findings of Rollo (2009), who analyzed tomographic images of the Tipuana species; he maintains that blue and green are the colours that indicate higher velocity mechanical wave propagation, while those in the yellow and red part of the spectrum indicate lower velocity.

The images thus generated revealed the varied state of the wood, through the construction of the cross sections, demonstrating the practicality of handling the equipment. This procedure was recommended by Rinntech (2005), who advised that X-ray images should not be the sole basis for deciding to evaluate a cross section; they should be used in combination with other data collected from the tree.

The results achieved are in agreement with those found by Medeiros et al. (2017) using the impulse tomograph in Amazonian forests, implying that this technique is demonstrably efficient, since there were no major divergences between the tomographic image obtained and the visible state of the wood after logging. These were confirmed, both by the chainsaw operator's cut-off evaluation and by that of the impulse tomography.

Likewise, the impulse tomograph was used to evaluate the trunks of *Quercus alba* and *Carya spp.* trees, showing correlation between the reading and the visual evaluation, with an error of 3% to 8% in the image produced, besides being effective in locating and identifying deteriorated areas of the wood. Close correlation was found between the tomographic readings and the visual evaluation of the sections after tree felling (GILBERT & SMILEY, 2004), as in Amodei et al. (2010), who analyzed the wood of the *Tectona grandis* tree and recorded that impulse tomography helped to diagnose regions where the wood had suffered degradation.

According to Candian and Sales (2009), sound and more rigid wood generally has a faster tension wave propagation velocity, with an inner modulus of elasticity than deteriorated wood has. The presence

of line degradation between the two transducers results in a decrease in the velocity of the voltage wave propagation in comparison with a reference velocity.

The image of the internal structure of the wood generated by the impulse tomograph, in response to the different transmission speeds of the sound waves, can be correlated with the physicochemical properties (density, modulus of elasticity, humidity, etc.) and makes it possible to determine the percentage of heartwood//sapwood, reaction wood, knots, wood rot, marrow eccentricity, etc., as observed by Rinntech (2005) and Picus (2015).

4.2 Frequency of tree wood velocity

The wave velocity inside the trunk of the trees in question had a positive asymmetric distribution (Figure 4), and it can be concluded that the mode is higher than the median and the mean.

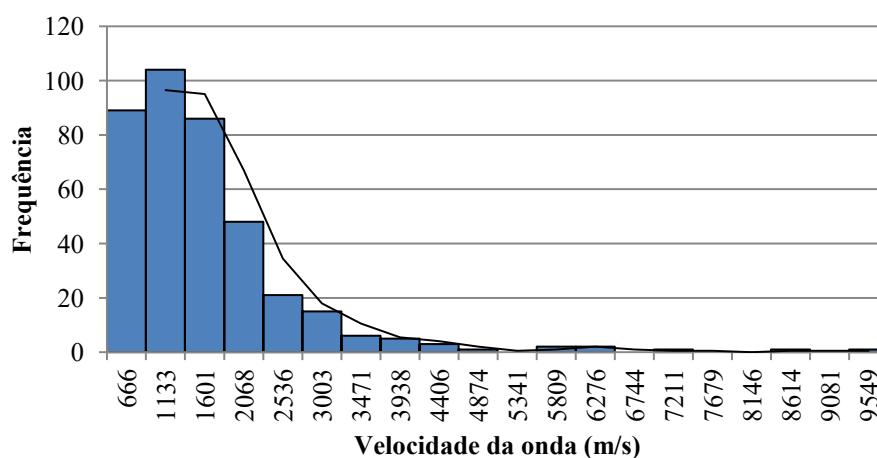


Figure 4: Frequency histogram of the mechanical wave velocity in the wood of the sample trees.

In 100% of the trees, the wave velocity through the wood recorded readings in the ranges of 666-1,133, 1,133-1,601 and 1,601-2,068 m //s. For 90% of trees the mechanical wave velocity values in the wood ranged from 2,068-4,874. However, in 28.5% of the trees a frequency of 4.874-9.549 m //s was observed from data evidenced in the histogram of the wave speed frequency through the wood.

The wide variation in velocity recorded for trees of the same age on the same site (plot) can be attributed to the physicochemical differences found between species and even within the same tree, since tree trunks exhibit different types of wood, related to the stages of their formation.

These differences confirm what Rinntech (2005) concluded about the particularities that need to be taken into account between species. In addition, they can be attributed to external influences (wind, rain, loud noises) and the inherent influence of the equipment, such as stroke quality (the different intensity of the strikes on the sensors) and the ways in which the metal connectors were fastened.

Similar studies confirming this result of the use of pulse tomography were observed by Amodei et al., (2010) who evaluated 8 *Tectona grandis* LFA trees and found great variation of velocities (500 - 3,091 m //s) among the trees studied, though they were the same age and from the same stand. This can be attributed to the anatomical, physical and chemical variations found between the trees and even within the same tree.

With regard to variations in velocity, Dijk (2014) states that the cross-sectional dimension has also been held responsible for velocity variations because it affects the freedom of wave propagation.

In the cross sections analyzed, the zones showing an estimated velocity of between 600 and 1,600 m/s correspond to the areas with signs of deterioration, while zones with higher speeds, between 1,200 and over 2,000 m/s, indicate healthy wood. In this study, it was observed that, although the trees presented these two speed scales, one for healthy wood and the other for possible deterioration, only one tree presented an internal defect that was worse than the one registered in the X-ray image. Thus, it appears that not all speeds below 1,600 m/s mean defective wood; they may be related to the characteristics of the wood within the wood or even to the species itself.

Similarly, Dackermann et al. (2014) have also found that voids, cracks, and degradations generally cause the wave to slow down in order to find a different path around the defects; these deviations extend the travel time of the wave. Moreover, the speed of propagation of mechanical waves tends to be higher in species with denser wood.

In general, Wang (2013) states, mechanical waves propagate faster in healthy, high-quality woods than in poor-quality decayed woods, as Rayner & Boddy (1988) also observe; this is because rot changes the physical and mechanical properties of wood, degrading cell wall components, reducing the mass, the elastic properties and the internal strength of the material.

4.3 Relationship between pulse tomography speed and wood density

A dispersion diagram was constructed for the species using the collected data. The correlation of wood density with wave propagation velocity through pulse tomography has as its principle the emission time of the wave and the waiting time for the response. By graphically presenting this correlation of the 7 species analyzed, the value of R^2 was found to be 0.647 (Figure 5).

The value of the coefficient of determination (R^2) was significant in the 1% Tukey test, suggesting that the mean pulse tomography velocities and wood density averages obtained over a cross-section are similar for all samples.

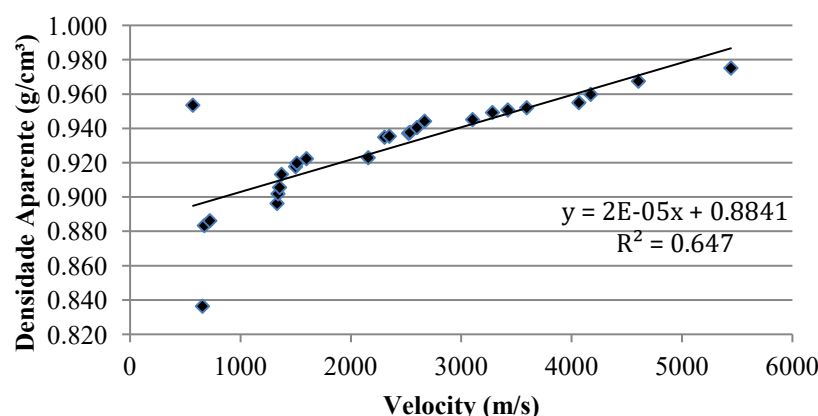


Figure 5: Dispersion diagram of the mean mechanical wave velocity (x axis) vs. mean apparent density (y axis), with significant R^2 at 1% by the t test.

R^2 is understood as the coefficient of determination, ranging from 0 to 1. It represents a measure of adjustment of the statistical model, that is to say, how well the model can explain the observed values. Thus, it is observed that R^2 0.647 demonstrates that the velocity and density values are correlated, since the

impulse wave velocity tends to increase directly with the increase in density. This recalls the theory of acoustic physics, in which sound propagates faster in a solid medium, corroborating the view that the wood is of good quality and composed of healthy material.

This result confirms the theory of Rinntech (2005), according to which the impulse velocities within wood are closely correlated with the density of the material, and therefore can be used to gather information about its quality.

Uliana (2010), using pulse tomography to detect lesions and hollows in the *Manilkara huberi* (*maçaranduba*) species, found that the tomographic image was correlated with the quality of the stem after cutting, confirming the relationship between speed and wood quality.

Other studies also confirm the close correlation between the mechanical wave velocity generated by pulse tomography and wood density: see Rinntech (2005); Oliveira & Sales (2005); Pereira et al. (2007) and Lin et al. (2011).

Evaluating standing trees, Stević et al. (2013) used the sound tomograph and resistograph and obtained results showing that the wood structure was not damaged, but contained local cracks that reached its core. Rollo et al. (2013), using pulse tomograph and resistograph on two healthy torques of *Eucalyptus saligna* Sm, claims that by generating an image of the entire cross-section, pulse tomography presents more complete data than those generated by the resistograph. However, studies of live trees, with internal lesions and of different species and densities should be performed to better understand this technology.

The information provided by the use of pulse tomography allowed us to evaluate the wood a preliminary, non-destructive, qualitative way. Impulse tomography proved to be an effective and practical method, which provided more information about the internal state of the trees than other methods did, besides enabling affected areas to be found. It is an innovative and easy-to-use technique for characterizing the wood of any tree.

However, Stangerlin et al. (2008) states that mechanical wave velocity in living trees should take into account not only wood density, but such other factors as modulus of elasticity, moisture content, anatomical characteristics, grain type and sample size, which also influence the form of wave propagation.

4.4 Dynamic elasticity modulus

Studies show that the relationship between ways of estimating wood strength can be accepted, whether mechanical or dynamic categories. Standard NBR 7190/1997 establishes four categories of hardness for hardwoods, with values ranging from 9,500 to 24,500 MPa of stiffness for timber structures. Figure 6 shows the dynamic modulus of elasticity (MOEd) values obtained by pulse tomography for the above sample of species.

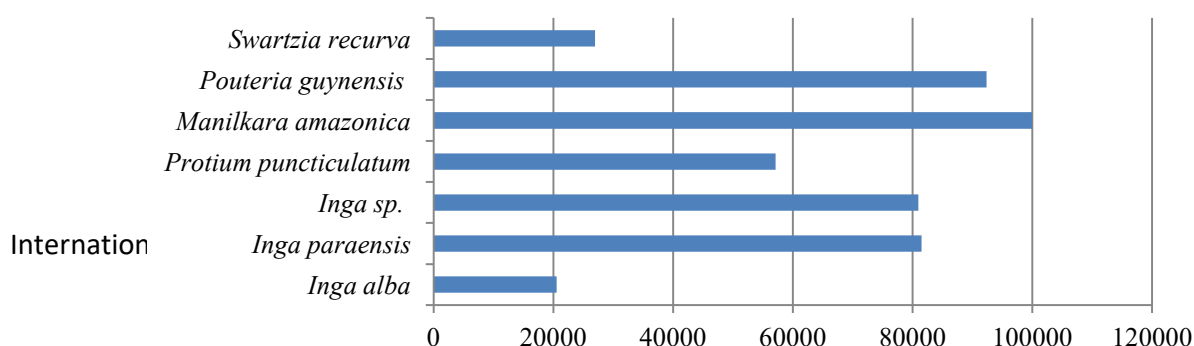


Figure 6. Dynamic modulus of elasticity via pulse tomography.

Teófilo (2016) reports that the modulus of elasticity is used to estimate the stiffness of a material. Stiffness is the ability of wood to resist bending (bending/deformation), while strength is the ability of a material to resist or oppose stress. Thus, the modulus of elasticity points to an evaluation of the quality of a material, measured by its stiffness, suggesting that the product presents resistance when subjected to stress. The greater the modulus of elasticity, the lower the elastic deformation resulting from the application of a particular stress (hence, greater stiffness).

The information from Teófilo (2016) corroborates this result that *Manilkara Amazonica* presented the highest value of the MOEd (99,963 Mpa), followed by *Pouteria guinensis* (92,364 Mpa), registering that these species present high resistance value when subjected to loads. In contrast, *Inga alba* (20,533 Mpa), which obtained the lowest MOEd value, should not be discarded for use, since the value it possessed is within the classifications of NBR 7190/1997. Thus, it was found possible to determine the dynamic modulus of elasticity of wood by pulse tomography.

Few studies have been performed to determine the MOEd of a specimen by pulse tomography; most researchers use voltage wave emission or transverse vibration. However, Carrasco et al. (2017), who used the acoustic tomograph, concluded that it could be helpful for determining the modulus of elasticity in the fibres by only one experimental test.

This work confirms the need to agree on a standard classification for the dynamic method; it is needed because too little is known about these tests of live trees in the Amazon and the values obtained. The higher the MOE, however, the better the wood resistance.

5. CONCLUSION

The use of non-destructive tests to evaluate wood quality is an important tool to use since the tests do not change the characteristics of their sample.

The impulse tomography technique, by means of tomographic images that are associated with photographs of tree cross-sections, speed variations and species characteristics, allowed a preliminary evaluation of the internal quality of the wood in seven trees. The reconstruction of the cross sections indicated the possible defects present in the trees analyzed, showing that the impulse tomograph is an effective tool.

It was possible to associate the wood density with the mechanical wave propagation velocity generated by the pulse tomograph, confirming its influence on the formation of the image. The quality of the wood was also confirmed by the high values obtained with the dynamic elasticity modulus, via the velocity of the impulse tomography. This result confirms that through a "quality inventory" it becomes possible to predict the quality of wood *in situ* using impulse tomography techniques. These techniques help in decision-

making in the pre-exploratory stage of forest management. It has been found that this information has helped to build an efficient methodology for assessing the quality of a tree's wood while it is still standing. The technique can be applied to other species, advancing the progress of the species or individual towards better use.

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Performance analysis of a condensation-extraction steam turbine operating in a sugar-alcohol factory cogeneration system

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Abstract

In this work a thermodynamic analysis for a condensation-extraction steam turbine capable of driving a 40 MVA electric generator in a sugar-alcohol factory was carried out. Sensibility analyses were performed to evaluate the behavior of the overall energy efficiency of a plant with the condensation-extraction steam turbine in function of the boiler efficiency, the specific consumption of steam in the processes as well as the condensation rate in the turbine. The analysis results have shown that this turbine in the cogeneration system contribute to increasing the power generation, although the condensation reduces the overall efficiency of the plant. It has also been observed that the plant efficiency is very sensitive to the condensation rate variation and increases with the demand for steam in the processes.

Keywords: Cogeneration; Condensation-extraction steam turbine; Sugar-alcohol factory.

1. Introduction and Objectives

Brazilian sugar-alcohol factories had been deploying low-efficiency single-stage back-pressure steam turbines ^[1] as well as low pressure and low temperature boilers (below 2,200 kPa and 300 °C, respectively). There was no special concern towards obtaining high energy production efficiencies since the demand for mechanical driving and processes steam, as well as their own electricity consumption, was entirely met ^[2].

The Brazilian electric system is much dependent on hydroelectricity. However, as a consequence of the seasonal water crises facing the country, the energy cogeneration system is a viable option and for this reason the sugar and alcohol sector has gained a lot of prominence because in addition to the primary productions of this sector, ethanol and sugar, beyond the electricity production ^[3]. Learning the hard way from such crisis, governmental incentives emerged with the creation of a Brazilian program for electricity generation from alternative sources (PROINFA), including biomass ^[4,5].

Facing the prospects of an expanding market for electrical energy, several Brazilian sugar cane industries have resolved to improve the efficiency of their equipment and processes by taking measures such as decreasing the process of steam consumption biomass ^[6]; substituting the steam driven mills by electric ones; employing more efficient boilers as well as condensation-extraction steam turbines ^[1]. The latter in particular allows for much more flexibility to satisfy the ever-changing relationship between thermal and electrical energy production in the plant ^[7].

Although at first the proposed floor price for electricity sale established by the PROINFA has disappointed investors, they have taken to heart the opportunity offered by PROINFA conditions to

refurbish their more than 20 year-old plants. An actual example is Pioneiros Bioenergia, a mid-size sugar-alcohol factory located in the Northwest of São Paulo State, which has expanded its cogeneration system with an eager eye to electricity commercialization through PROINFA.

The present paper is part of a complete work in which the expansion process of the cogeneration system of the previously mentioned sugar-alcohol factory was studied. In this work a thermodynamic analysis of the condensation-extraction steam turbine selected for use in Pioneiros Bioenergia was performed, by analyzing the behavior of the plant global efficiency and power production, considering some relevant parameters such as the boiler efficiency, the specific steam consumption in the processes and the condensation rate in the turbine.

2. Material and Methods

2.1 Details of the Plant and Turbine

The Figure 1 depicts a very schematic view of the condensation-extraction steam turbine which drives a 40 MVA electric generator, with nominal production capacity of 32 MW of electric power. This turbine has been designed to operate with admission of 140 t/h of steam at 6,468 kPa and 530 °C.

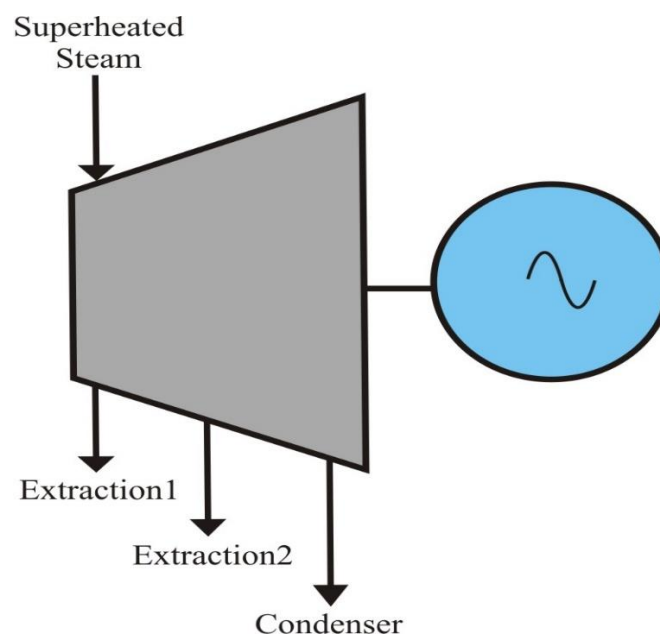


Figure 1. Scheme of condensation-extraction steam turbine

Manufacturer data sheet is shown in Table 1 for minimum and maximum mass flow rate, temperature and pressure values in the points of admission, extraction and condensation, keeping in mind that extraction 1 valve must necessarily be fully closed or open [8].

Despite the constant changes implemented to improve performance, Figure 2 shows the simplified thermal power plant of the Pioneiros Bioenergia that operated until recently. In this plant all the mechanical equipment are driven by electric motors, with the demanded electricity supplied by the generators GA and GT. The condensation-extraction steam turbine ST A drives the generator GA, while generator GT is driven

by a back-pressure steam turbine ST T working at 2,156 kPa and 330 °C.

Table 1. Steam turbine ^[4].

Local	in (t/h)		P (kPa)		T (°C)	
	min	max	min	max	min	max
Admission	-	140	-	6,600	-	530.0
Extraction 1	0	36	2,650	3,020	425.0	438.0
Extraction 2	64	120	2,370	237	134.5	147.2
Condensation	8	40	5	11.5	34.6	48.6

Data sheet for the condensation- extraction.

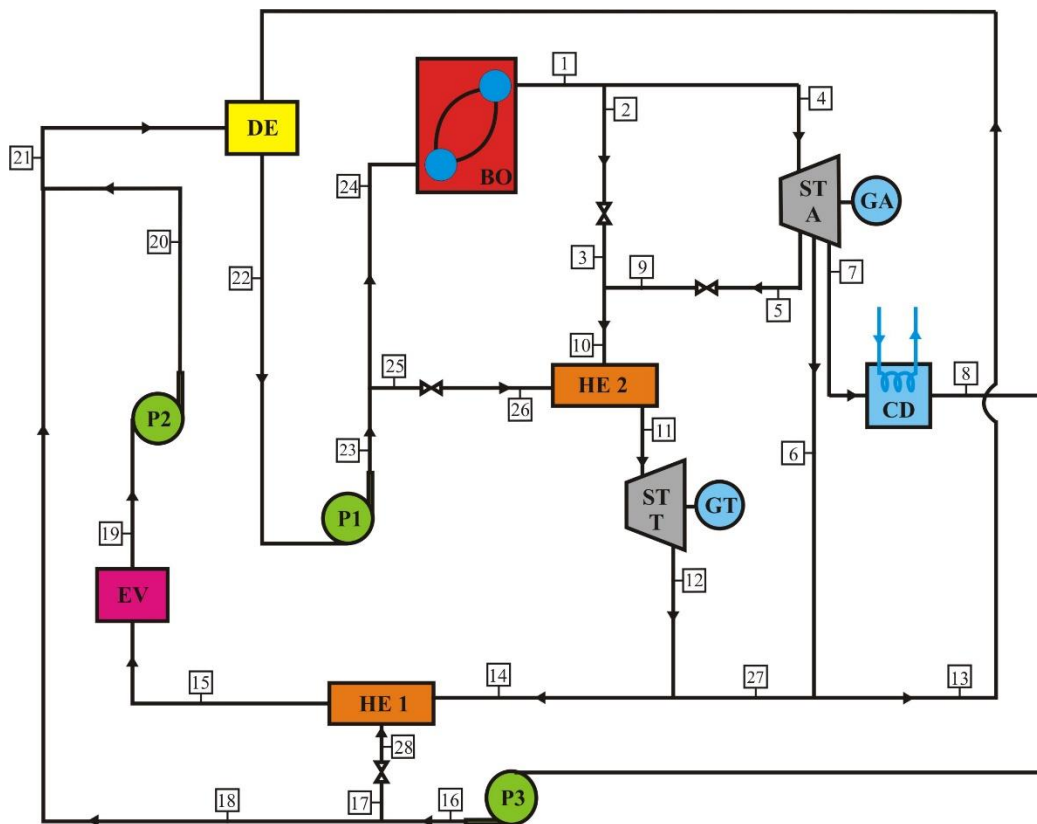


Figure 2. Simplified thermal plant of Pioneiros Bioenergia.

In the heat exchangers HE1 and HE2 the steam temperatures are brought down to the design-established levels by means of water injection. Through HE1 the steam temperature is reduced to 135 °C, suitable for the industrial process input (point 15), while in HE2 the steam temperature is reduced to 330 °C, adequate for the ST T turbine input (point 11).

Most of the steam extracted (point 15) is used for the broth evaporation process EV, through which steam is condensed and pumped (point 20) to the deaerator DE, which also receives the steam from extraction (point 18) and condensation (point 13). After preheating in the deaerator, the water is pumped back (point 24) to the boiler BO, beginning the cycle all over again.

Condensation flow rate in the turbine within the range established in Table 1 depends on the steam

consumption process. Therefore, according to the process needs, different operating points are possible and, consequently, several distinct thermodynamic performances. Table 2 illustrates recent operational data for the plant.

Table 2. Operational data of Pioneiros Bioenergia thermal plant

Operational Data	Value
Sugar cane consumption	1,400,000 t
Hours of operation in the year	4,914 h
Sugar cane flow rate in the mills	284.9 t/h
Bagasse consumption-Steam production Ratio	0.47
Fiber in the sugar cane	13.5 %
Fiber in the bagasse	47.4 %
Bagasse flow rate in the boiler	70.5 t/h
Bagasse flow rate consumption	70.5 t/h
Bagasse flow rate production	81.1 t/h
Bagasse flow rate surplus	10.6 t/h
Annual bagasse surplus	52,297 t

Energetic and Exergetic Analyses of a Sugar-Alcohol Factory of the Cogeneration System in Expansion

Table 3 lists the mass flow rate, pressure and temperature in the numbered locations of Figure 2. Notice that the extraction 1 valve of the turbine ST A is kept closed, justifying the null mass flow rate in points 5 and 9.

Table 3. Mass flow rate, pressure and temperature at the numbered points of the plant in Fig. 2.

Points	$\dot{m}$ (t/h)	P (kPa)	T (°C)
1	150.0	6,468.0	530.0
2	10.0	6,468.0	530.0
3	10.0	2,156.0	510.2
4	140.0	6,468.0	530.0
5	0.0	-	-
6	120.0	245.0	134.5
7	20.0	7.2	39.6
8	20.0	7.2	39.5
9	0.0	-	-
10	10.0	2,156.0	510.2
11	11.5	2,156.0	330.0
12	11.5	245.0	164.5
13	3.5	245.0	134.5
14	128.0	245.0	137.2
15	128.2	245.0	135.0
16	20.0	490.0	39.6
17	0.2	490.0	39.6
18	19.8	490.0	39.6
19	128.2	245.0	100.0

20	128.2	490.0	100.1
21	148.0	490.0	92.0
22	151.5	245.0	105.0
23	151.5	8,820.0	106.8
24	150.0	8,820.0	106.8
25	1.5	8,820.0	106.8
26	1.5	2,156.0	107.9
27	116.5	245.0	134.5
28	0.2	245.0	39.7

2.1 Formulation

Considering steady-state process and neglecting kinetic and potential energy, the first law of Thermodynamics for a control volume that involves the condensation-extraction steam turbine presented in Figure 1 can be written as ^[9] :

$$\dot{W}_{CV} = \dot{m}_{ST} h_{ST} - \dot{m}_{E1} h_{E1} - \dot{m}_{E2} h_{E2} - \dot{m}_{CO} h_{CO} \quad (1)$$

The equation for mass conservation in this control volume is given by:

$$\dot{m}_{ST} - \dot{m}_{E1} - \dot{m}_{E2} - \dot{m}_{CO} = 0 \quad (2)$$

In this case, the efficiency based on the first law of Thermodynamics can be defined as:

$$\eta = \frac{\dot{W}_{CV}}{\dot{m}_{ST} h_{ST} - \dot{m}_{E1} h_{E1} - \dot{m}_{E2} h_{E2} - \dot{m}_{CO} h_{CO}} \quad (3)$$

Note that this efficiency depends on the mass flow rate associated to the specific enthalpy of each output of the turbine, which for non-condensing fluid is related solely to the pressure and temperature.

The specific steam consumption in the turbine (RSTPO) can be defined as a relationship between the steam consumption and the electrical or mechanical power production, as follows:

$$RSIPO = \frac{\dot{m}}{\dot{W}} \quad (4)$$

An alternative way for the thermodynamic analysis can be performed considering three independent control volumes, as three different turbines (Figure 3), with the same steam property values. Thus, it is possible to determine the specific steam consumption for each control volume or part of the turbine. The sum of the power generated by each control volume must be equal to the total power as if a single control volume involving the turbine had been considered.

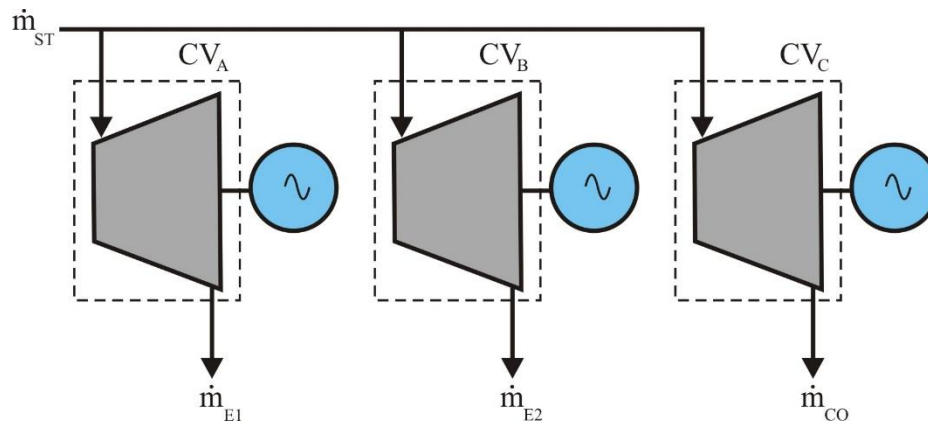


Figure 3. Control volumes for each extraction functioning sequentially.

The power generated in each control volume of Fig. 3 is again obtained by the application of the first law of the thermodynamics, resulting, respectively:

$$\dot{W}_{CV_I} = \dot{m}_{ST} (h_{ST} - h_{E1}) \quad (5)$$

$$\dot{W}_{CV_{II}} = (\dot{m}_{ST} - \dot{m}_{E1}) (h_{E1} - h_{E2}) \quad (6)$$

$$\dot{W}_{CV_{III}} = (\dot{m}_{ST} - \dot{m}_{E1} - \dot{m}_{E2}) (h_{E2} - h_{CO}) \quad (7)$$

In this case, the specific steam consumption for each control volume considered is given by:

$$RSTPO_{CV_I} = 1 / (h_{ST} - h_{E1}) \quad (8)$$

$$RSTPO_{CV_{II}} = 1 / (h_{E1} - h_{E2}) \quad (9)$$

$$RSTPO_{CV_{III}} = 1 / (h_{E2} - h_{CO}) \quad (10)$$

There is another alternative to perform a thermodynamic analysis of the condensation-extraction steam turbine. It is by considering that the steam admitted in each control volume of the turbine is driven to just one exit that controls the volume. Thus, it is possible to determine the specific consumption of steam in each point of extraction or condensation, considering separately each one of the control volumes presented in Figure 4.

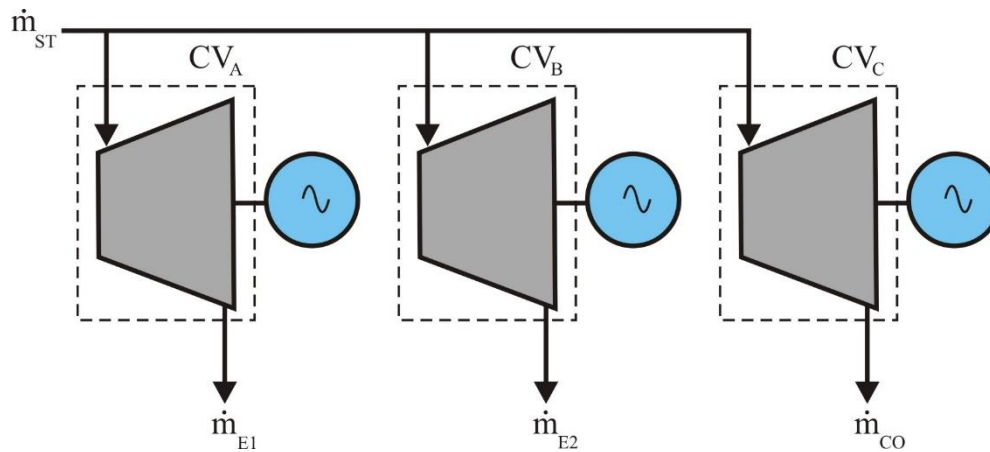


Figure 4. Control volumes for each extraction functioning simultaneously.

In this case (Figure 4), the specific steam consumption for each control volume considered is given, respectively, by:

$$\text{RSTPO}_{\text{CV}_A} = 1 / (h_{\text{ST}} - h_{\text{E1}}) \quad (11)$$

$$\text{RSTPO}_{\text{CV}_B} = 1 / (h_{\text{ST}} - h_{\text{E2}}) \quad (12)$$

$$\text{RSTPO}_{\text{CV}_C} = 1 / (h_{\text{ST}} - h_{\text{CO}}) \quad (13)$$

In order to obtain an energetic analysis of the plant presented in Figure 2, mass and energy balances should be performed, as well as properly defining the first thermodynamics law of efficiency, considering a control volume for each equipment, and the first law efficiency for the whole plant can be defined as a function of the mechanical and electrical power produced ($\dot{W}_{\text{mec}}$ and $\dot{W}_{\text{ele}}$) and consumed in pumping ($\dot{W}_{\text{pump}}$), the useful heat transfer rate consumed in the processes of distillation and evaporation ($\dot{Q}_{\text{evap}}$ and $\dot{Q}_{\text{dist}}$) and lost in the condensation ($\dot{Q}_{\text{cond}}$) in addition to taking into account the energy of the bagasse ($\text{LHV}_{\text{bag}} \dot{m}_{\text{bag}}$):

$$\eta_{\text{global}} = \frac{\dot{W}_{\text{ele}} + \dot{W}_{\text{mec}} + \dot{Q}_{\text{evap}} + \dot{Q}_{\text{dist}} - \dot{W}_{\text{pump}} - \dot{Q}_{\text{cond}}}{\text{LHV}_{\text{bag}} \dot{m}_{\text{bag}}} \quad (14)$$

After implementing the thermodynamic model for the whole plant, the resulting system of equations has been solved by means of EES[®] (Engineering Equation Solver) ^[10], adopting the temperature of 25 °C and pressure of 101.3 kPa as reference state, and considering $\text{LHV}_{\text{bag}} = 7,736 \text{ kJ/kg}$.

3. Results and Discussions

Table 1 describes four cases selected for analysis (complemented by Table 5), based on the turbine restrictions. The first law efficiency, the power production and the specific steam consumption in the control volumes of the turbine depicted in Figure 3 are presented in Table 5 for each case.

Table 4. Definition of the cases selected according to Table 1 constraints.

Parameters	Case 1	Case 2	Case 3	Case 4
$\dot{m}_{ST}$ (t/h)	140.0	140.0	140.0	140.0
$\dot{m}_{E1}$ (t/h)	36.0	36.0	0.0	0.0
$\dot{m}_{E2}$ (t/h)	84.0	64.0	120.0	100.0
$\dot{m}_{CO}$ (t/h)	20.0	40.0	20.0	40.0

Table 5. Efficiency, power production and specific steam consumption for each case of Table 4, based on the control volumes presented in Figure 3.

Parameters	Case 1	Case 2	Case 3	Case 4
η_{CV_I} (%)	69.1	69.1	69.1	69.1
$\eta_{CV_{II}}$ (%)	92.2	92.2	95.1	95.1
$\eta_{CV_{III}}$ (%)	34.1	35.0	30.9	31.4
$\eta_{CV_{Total}}$ (%)	82.1	79.0	86.3	83.2
$\dot{W}_{CV_I}$ (kW)	6,681	6,681	6,681	6,681
$\dot{W}_{CV_{II}}$ (kW)	16,333	16,339	22,693	22,693
$\dot{W}_{CV_{III}}$ (kW)	993	1,805	892	1605
$\dot{W}_{CV_{Total}}$ (kW)	24,007	24,825	30,266	30,979
$RSTPO_{CV_I}$ (kg/kWh)	21.0	21.0	21.0	21.0
$RSTPO_{CV_{II}}$ (kg/kWh)	6.4	6.4	6.2	6.2
$RSTPO_{CV_{III}}$ (kg/kWh)	20.1	22.2	22.4	24.9
$RSTPO_{CV_{Total}}$ (kg/kWh)	5.8	5.6	4.6	4.5

In all cases it can be noticed that the mass flow rate in the condenser is smaller than the second extraction flow rate. However, the efficiency for each control volume can better express the behavior of each part of the turbine while operating sequentially, such that the flow state at each exit is the same at the entrance for the next stage.

Taking as example Case 1, assuming that CV_{III} has the same mass flow rate of CV_I (140 t/h) and considering the efficiency obtained, the power generation in CV_{III} ($\dot{W}_{CV_{III}}$) would be 6,951 kW, this is

larger than the power generation in CV_I ($\dot{W}_{CV_I}$).

Therefore, to compare the behavior of the control volumes, the specific consumption of steam in each one of them must be used, because for the same situation this parameter allows evaluating different conditions of mass flow, pressure and temperature of the steam. This does not stand with the power and the efficiency; because they depend on the mass flow rate and the enthalpy variation in the isentropic process.

In Table 5, the total values for efficiency, power and the specific consumption of steam, were defined considering only a control volume involving the turbine. The maximum total power generation occurs in Case 4, in which the extraction 1 is closed and the condensation rate is the maximum.

The control volumes CV_I and CV_{III} have larger specific steam consumption in function of the small enthalpy difference. On the other hand, the control volume CV_{II} has lower specific consumption.

Although the control volumes CV_I and CV_{III} have almost the same specific steam consumption, they present a great difference in the efficiency; 69.1 % and 34.1 %, respectively. This occurs because the enthalpy difference for the isentropic process is different in these control volumes.

Table 6 shows the specific steam consumption for minimum and maximum mass flow rate in each control volume of the turbine shown in Figure 4, according to the data of Table 1.

Table 6. Specific steam consumption

Parameters	Minimum	Maximum
$RSTPO_{CV_A}$ (kg/kWh)	18.4	21.0
$RSTPO_{CV_B}$ (kg/kWh)	4.8	4.9
$RSTPO_{CV_C}$ (kg/kWh)	3.9	4.0

Minimum and maximum mass flow rate in each control volume presented in Figure 4.

Note that the specific steam consumption (Table 6) can vary for a same control volume because the conditions of pressure and temperature change in function of the mass flow rate at each exit. Had the steam the same invariable conditions, the specific steam consumption in each control volume would have been the same, like in the back-pressure turbines which have only one steam exit.

It can be verified that the lower specific consumption of steam (3.9 kg/kWh) occurs when the steam is directed to the condenser. However, the condensate amount has influence on the efficiency and power generation, so that when there is an increase in the condensation rate, the power generation increases and there is a decrease in the efficiency.

Table 7 shows the power generation and the efficiency, considering the maximum admission of steam, for the condensation rate variation that is between 8 and 20 t/h. Note that the first extraction, for this situation, must be fully open due to the constructive restrictions presented in Table 1.

Table 7. Power and efficiency as a function of condensation rate from 8 to 20 t/h.

$\dot{m}_{CO}$ (t/h)	$\dot{m}_{E1}$ (t/h)	$\dot{m}_{E2}$ (t/h)	$\dot{W}_{CV}$ (kW)	η (%)
8	36	96	23,437	84.8
12	36	92	23,636	83.8
16	36	88	23,827	82.9
20	36	84	24,012	82.1

As shown in Table 7, the power behavior is contrary to the efficiency with respect to the variation of the condensation rate, therefore, the point where the inversion in the turbine behavior occurs can be defined by means of a normalization of the values of efficiency and power. Thus, the maximum values of these parameters are 24,012 kW and 84.8 %, respectively. Then, the curves shown in Figure 5 are obtained and it can be observed that the curves intersection occurs in the point (12.9; 0.986). Thus, for a condensation rate smaller than 12.9 t/h the turbine is more efficient and when this rate is increased the power generation is improved.

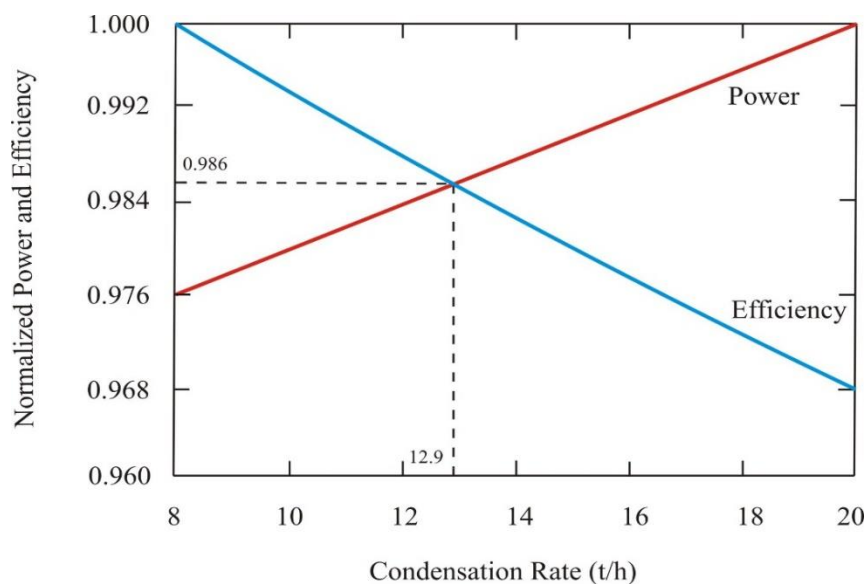


Figure 5. Normalized power and efficiency as a function of condensation rate from 8 to 20 t/h.

Table 8 shows the power generation and the efficiency considering the maximum admission of steam, for the variation of the condensation rate between 20 and 40 t/h. In this case the first extraction is closed, since only by means of the second extraction and condensation will the maximum extraction of the steam admitted (140 t/h) be possible.

Table 8. Power and efficiency as a function of condensation rate from 20 to 40 t/h.

$\dot{m}_{CO}$ (t/h)	$\dot{m}_{E2}$ (t/h)	$\dot{W}_{CV}$ (KW)	η (%)
20	120	30,266	86.3
26	114	30,494	85.3
33	107	30,742	84.2
40	100	30,979	83.2

Normalizing the variables by the respective maximum values (30,979 kW and 86.3 %) the curves of Figure 6 are obtained, from which the intersection of the curves in the point (27.2; 0.986) is found. Thus,

for condensation rates up to 27.2 t/h the turbine is more efficient and the power generation is improved when this rate is increased. In the following the Figure 2 depicts the analysis of the influences of the boiler efficiency, steam consumption in the processes and condensation rate on the power production and on the global efficiency of the plant.

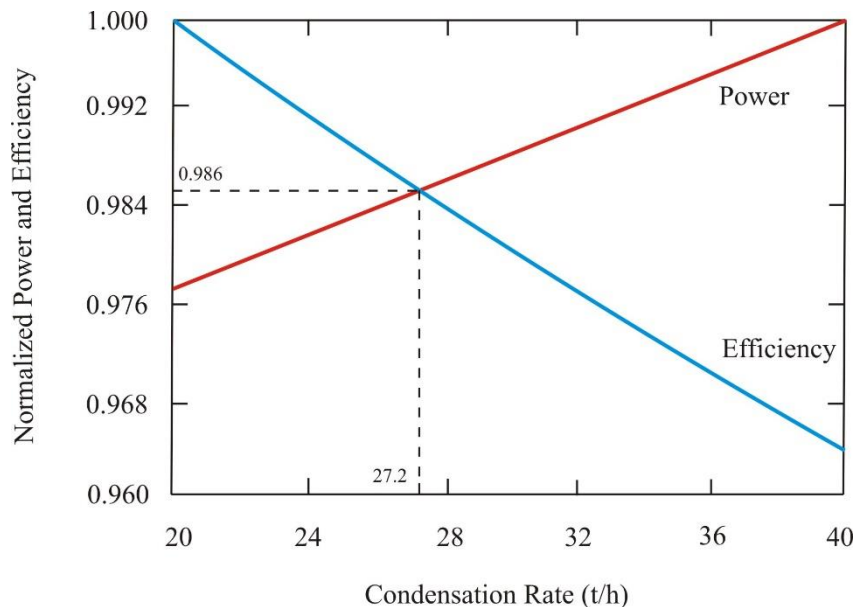


Figure 6. Normalized power and efficiency as a function of condensation rate from 20 to 40 t/h.

The first analysis takes into account the influence of the variation of the boiler efficiency between 71 and 87 %, representing a compatible range for modern high-pressure boilers which are much more efficient than the traditional low-pressure boilers. The results are shown in Figure 7 that illustrates that the global efficiency is directly proportional to the boiler efficiency, so that for each 1.3% of change in the boiler efficiency there is 1 % of change in the global efficiency.

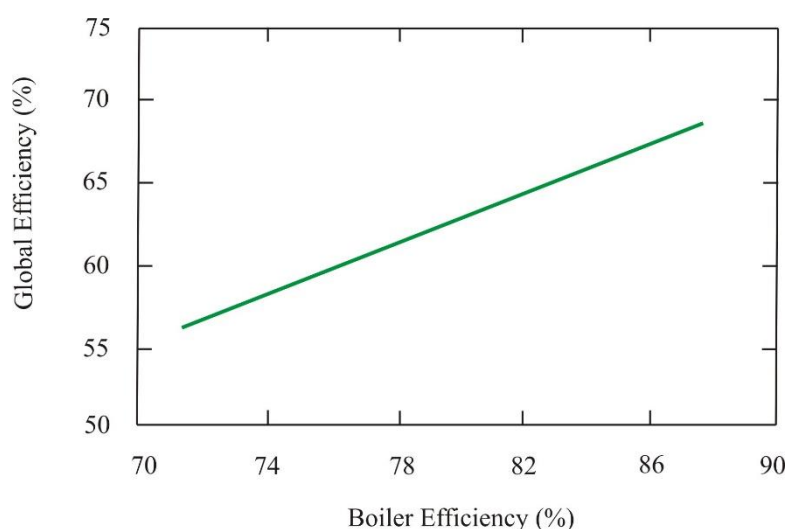


Figure. 7. Global efficiency of the plant as a function of the boiler efficiency.

The second analysis takes into account the influence of the change in the steam consumption in the

processes from 400 to 515 kg/t of sugar cane that is the maximum value possible in function of the restrictions for steam production in the boiler and for the mass flow rate in the turbine. In this case, the total power and global efficiency of the plant can vary from 27,577 to 31,698 kW and from 54.5 to 76.4 %, respectively, Figure 8 shows the behavior of these parameters normalized by its maximum values (31,698 kW and 76.4 %, respectively) is depicted in Figure 8.

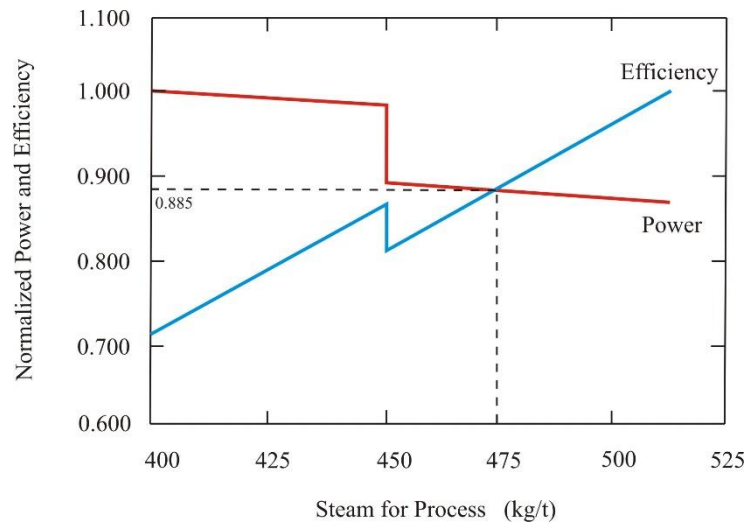


Figure 8. Normalized total power and global efficiency as a function of the steam consumption.

The first part of the curves in Figure 8, for specific steam consumption varying between 400 and 450 kg/t, are obtained when the turbine is operating without extraction 1, while the second part of these curves, for specific steam consumption greater than 450 kg/t, the extraction 1 is operating. The intersection point (475; 0.885) corresponds to the generation of 28,038 kW and an efficiency of 67.6 %. Thus, for specific steam consumption smaller than 475 kg/t, the plant is less efficient but produces more power, if compared with a situation in which the consumption is greater than 475 kg/t.

The third analysis takes into account the influence of the change in the condensation rate in the turbine from 8 to 40 t/h. In this case, the total power and global efficiency of the plant can vary from 27,627 to 31,939 kW and from 48.5 to 76.4 %, respectively, the behavior of these parameters normalized by its maximum values (31,939 kW and 76.4 %, respectively) can be studied in Figure 9.

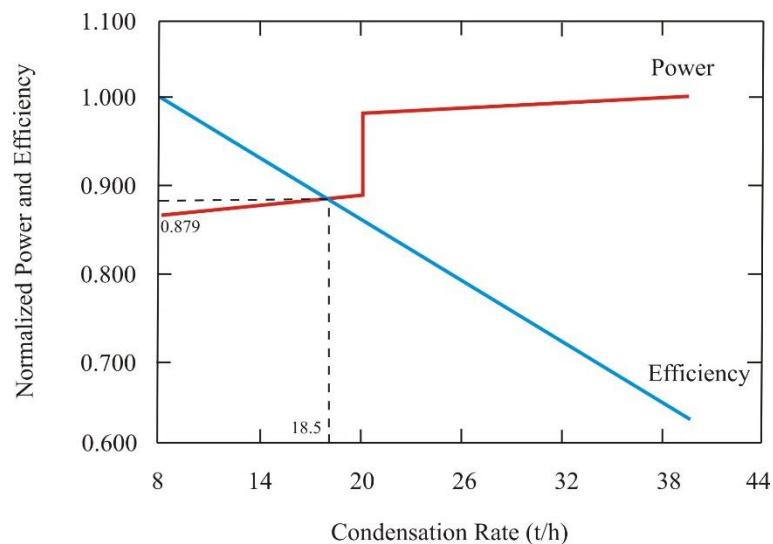


Figure 9. Normalized total power and global efficiency as a function of condensation rate.

The jump observed in the curve of the power generation for the condensation rate of 20 t/h is due to the extraction 1, which operates when the condensation is smaller than this value. For condensation rates greater than 20 t/h, the extraction 1 is closed and there is an increase in the enthalpy difference in the turbine and, consequently, an increase in the power generation. The point of intersection of the two curves shown in Figure 9 (18.5; 0.879), corresponding to the generation of 28,071 kW and an efficiency of 67.1 %, represents the point of inversion for the behavior of these parameters. For condensation rates smaller than 18.5 t/h, the plant operates with a larger global efficiency and, for condensation rates greater than 18.5 t/h, mainly over 20 t/h, the power generation is improved.

Note that the behavior in Figure 9 is the same presented in the previous figures in which only the turbine efficiency was considered, showing that when the condensation rate in the turbine increases there is a decrease in the global efficiency of the plant.

5. Conclusion, Heading Level-1.

In this work a detailed energetic analysis of the condensation-extraction steam turbine, used in a Brazilian sugar-alcohol factory, was carried out. The behavior of the global efficiency of the plant and of the power production was evaluated, as a function of some important parameters such as the boiler efficiency, the specific steam consumption in the processes and the condensation rate in the turbine. It was concluded that the efficiency of the turbine depends on the mass flow rate in each extraction, considering that the steam presents different properties in each one of them.

When the turbine is operating with extraction 1 open, the condensation rate of 12.9 t/h defines the point of inversion in the behavior of the turbine. When the objective is to prioritize the efficiency, a condensation rate smaller than 12.9 t/h must be selected. However, if the objective is to prioritize the power production, a condensation rate greater than this value must be chosen. For the operation with extraction 1 closed, the condensation of 27.2 t/h defines the point of inversion in the behavior of the turbine.

Note that all inversion points mentioned above are defined only from the point of view of the turbine

and not of the thermal power plant.

With respect to the behavior of the global plant in function of the condensation rate in the turbine, it was concluded that, if the goal is to maximize the efficiency of the plant, then a condensation rate smaller than 18.5 t/h must be used. However, if the goal is power production, a condensation rate greater than this value should be chosen. On the other hand, specific steam consumptions in the processes smaller than 475 kg/t will prioritize the power generation, while greater specific consumptions will prioritize the efficiency of the plant.

The efficiency of the condensation-extraction steam turbine contributed to increase the power production; although the condensation reduced the global efficiency of the plant.

Finally, it has been observed that the plant efficiency is very sensitive to the condensation rate variation, increasing with the demand of steam for processes.

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Appendix

Appendix 1- Latin Symbols

BO	Boiler
BP	Back-pressure
CO	Condenser
DE	Deaerator
EC	Extraction-condensation
EV	Evaporator
h	Specific enthalpy (kJ/kg)
HE	Heat exchanger
G	Electric generator
LHV	Lower Heating Value (kJ/kg)
$\dot{m}$	Mass flow rate (kg/s)
P	Pressure (kPa) or Pump
$\dot{Q}$	Heat flow rate (kW)
RSTPO	Ratio between steam consumption and power generated (kg/kWh)
ST	Steam turbine
T	Temperature (°C)
$\dot{W}$	Power (kW)

Appendix 2-Greek Symbols

η	First thermodynamics law efficiency (%)
Δh	Enthalpy difference (kJ/kg)

Appendix 3- Subscripts

0	Reference state
1, 2, 3	Equipment number
A, B, C	Control volume index

bag	Sugar cane bagasse
cond	Condensation
CV	Control volume
CO	Condenser
dest	Distillation
ele	Electric
evap	Evaporation
E1	Extraction 1
E2	Extraction 2
in	Input
iso	Isoentropic
I, II, III	Control volume index
mec	Mechanical
out	Output
ST	Steam turbine

DIVERSIX: Development and systematization of an Active Method for Engineering Teaching

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Abstract

Current society is heavily influenced by science and technology, indicating the need to train generations with critical ability to analyze messages and make responsible decisions in the context in which they act. This is reflected in teaching in general, requiring the university to be a stimulating environment and not merely transmitting knowledge. The teaching-learning process in science education, in particular engineering, can not therefore be restricted to traditional methods. New practices and technologies, with diversified resources and strategies, have been necessary in the improvement of teaching. The present work had the objective of developing an active method for teaching in engineering, at the School of Engineering of Lorena, University of São Paulo. The results show that students crave experiences that develop transversal competences, and that the transmission of theoretical content loses its place for teaching that promotes a process of autonomous construction of knowledge.

Keywords: Transversal Competences; Engineering Teaching; Active Methodologies

1. Introduction

Rapid changes are taking place in society, with a large volume of information in transit, and this is reflected in education in general, requiring the university to be a stimulating environment and not merely a transmitter of knowledge. In this sense, the dynamics of cooperative construction of the school reality brings intentional meaning to education, due to the constant interrelationship between the school environment and the student's daily life, in an interpretative perspective (CARVALHO, 2004).

The teaching-learning process in science education, particularly in engineering by its own varied demands, should not be restricted to traditional methods. It should rather privilege problem solving, scientific thinking, the use of multiple languages and argumentation (SOUZA AND SASSERON, 2012). This implies pedagogical practices that involve, promote and develop intellectual activity, critical thinking and mobilization of cognitive and metacognitive resources (TEIXEIRA, 2013). Such conduct, which can be extended to all levels of education, requires different methodologies than usual, with participatory pedagogical practices, as pointed out by the research by Prsybyciem, Silveira and Sauer (2018).

Based on classroom practice and existing work as a reference, we realize that Higher Education, and the disciplines that make up the undergraduate curriculum in general, and in particular in Engineering, is poorly adapted to the multiple needs and varied from today's clientele.

Thus, we developed an active methodology for use in higher engineering courses at the Lorena School of Engineering, University of São Paulo.

1.1 Active Methodologies and Technologies

There are currently several reflections on the organization and functions of the school and university. The contents covered are more complex and comprehensive. The construction and development of diverse and specific skills and competences are required by the Ministry of Education and Culture (MEC) itself and by the increasingly demanding labor market. According to David Goldberg (apud BARBOSA, 2013), students in the technology area (where we include Engineering) are not able to ask, name, model, decompose, measure, visualize and communicate, requiring changes in the way we teach for more development. effective in such skills, fundamental in the formation of a complete professional. Moreover, as stated by Anastasiou and Alves (2012), learning does not occur in the same way, nor does it occur at the same time.

It is necessary to reflect on the contextualization of teaching, meaningful learning, the use of intelligent resources, a transformation of ideas into results, thinking, a creation, an innovation, a decision, a problem solving and teaching practices in new methodologies.

Under these conditions, learning should be when the student interacts with the subject and is encouraged to learn the knowledge and not just passively receive it. Involve a student-focused, non-teaching teaching proposal where interaction and knowledge building are present. In this scenario arise the so-called Active Methodologies.

The educational process is part of an education class that stimulates the teaching-learning processes critically, in which the student actively participates and is committed to their own learning (BORDENAVE AND PEREIRA, 2004). Although somewhat publicized, they are not currently their own assumptions. In Brazil, Freire (1996) already defended the 80's and the educator should recreate the knowledge, re-signifying an individual reality.

Examples of active teaching and learning methods are: Case Study, PBL - Problem Based Learning, PjBL - Project Based Learning; Concept Maps, Writing Across the Curriculum, Peer Instruction, Think Pair Share and more.

The objectives of the active methodologies involve an effective teaching strategy, which enables the assimilation of more content, develops confidence in one's own decisions and confidence in what is known, improves oral and written expression, as well as interpersonal relationships, and establishes one's own. interest in solving problems and conducting projects.

Active learning environments are those that involve activities that generate meaningful learning, ie discussions, teamwork, case study, brainstorming, use of concept maps, device modeling, processes and systems, research and research activities.

We emphasize that despite the emphasis on the student figure, the creation of active learning environments never goes without the teacher figure, on the contrary, it is definitive in the success of the enterprise. The use of such methodologies usually requires the following attitudes and posture from the teacher: being a mentor, co-learner or consultant, coordinating and monitoring teamwork (with students and other teachers), organizing the course around real events, encouraging interdisciplinary work, mediate discussions,

stimulate observation, understanding, reasoning, judgment, and practice procedural evaluation. In other words, the teacher starts to have much more complex tasks than those of expository and traditional classes as he guides the student work in a more personalized way, which facilitates their learning (FERRANDIS, FERRANDIS AND LATORRE, 2018).

1.2 Higher Education in Engineering

Applied sciences, among them engineering in general, are usually marked by concrete problems arising from the labor market or the demands of society. With social development, the problems became more diversified and the market became more demanding, and the need for more elaborate solutions that analyze various aspects led to increased complexity and more knowledge is required (RAMOS; FONSECA FILHO; FREIRE ; PERES, 2010).

Traditionally in undergraduate courses, subjects typically form parts of knowledge and are grouped into areas by some similarity. With the emergence of new objects or approaches, other parts are needed, leading to fragmentation and hindering the much needed interaction for the professional's global formation.

With the typical limitations of traditional training, with fixed content menus and focus on content, other ways of promoting interaction between such “parts” are needed. More and more content needs to be taught in the same fixed amount of time. This has made the results less positive today than in previous times.

At the same time, the current professional profile of the engineer is no longer due to an essentially technical background, but much more comprehensive and multidisciplinary. Thus, it is evident that professionals trained for decades had their training appropriate to the time, but nowadays new skills require development. From the year 2000, important congresses about education have been approaching the subject. According to Valente et al (2012), besides traditional skills such as calculation, for example, others related to decision making, social responsibility, sense of ethical responsibility, environmentally conscious attitudes, among others, were included. These are the so-called behavioral skills, increasingly required by the labor market.

1.3 Diversix

At EEL-USP, since 2012, movements have been made to follow the implementation of new teaching methodologies. From this experience came the proposal to develop and systematize the use of an active teaching methodology for engineering, diversified and integrated.

The methodology developed by us was called DIVERSIX for its reference to various pedagogical techniques and for its integration with a skill that is not formally considered in teaching: humor. It enables teamwork, the learning of new teaching-learning methodologies, the development of teaching activities, and the production and use of different learning objects. The term DIVERSIX comes from the junction of the words fun with the definition of the number of resources to be used in the development of didactic activities. It is foreseen the development of competences and diverse skills, such as: creativity, communication, analysis and synthesis, teamwork, leadership, information transmission, writing and others.

The integration of activities by humor is proposed due to the fact that for many years the school, having been considered a place of formal learning that requires seriousness, abolished on almost all levels - except early childhood education - playfulness, which promotes activation. of emotions that facilitate learning.

Even today, it is evident the request for silence, a restrained and restricted posture to pay more attention, the very disposition of desks that directs the observation to a single focus (the teacher), the upper platform where the teacher is, shows of a tradition of seriousness and formality required in academic life.

2. Methodology

We opted for action research as a methodological research strategy. It is known that the educational context is considered an interesting niche of this type of research since the mid-70s, where educational intervention goes with the diagnosis of reality and the construction of action strategies (GORI, 2006).

We chose to conduct a reflective practice and investigate it. In this sense, we follow the proposal by Elliot (1994) about the fact that action research is a constantly changing process, in spiral movements of reflection and action. Such movements include diagnosis of a practical problem that seeks to solve, formulation of action strategies, development and evaluation of the efficiency of these strategies, understanding of the new situation and procedure of the same steps in a new practical situation.

As Thiollent (1998) points out in this type of research, researchers and participants representative of the problem are fully involved in a cooperative and participatory way. In it, the researcher equates the problems found, monitors and evaluates the actions. In action research, rather than investigating academic aspects, it is intended to receive and analyze what the people involved have to say and do. This is in line with that proposed by Barbier (2007) which indicates that in action research there is an intentional action to transform reality and to produce knowledge regarding this transformation. In it you work with others and not others. According to Barbier (2007), the issue of change in this type of research, which is not easy to specify, is central. To analyze evidence of it, we chose to apply a questionnaire at the end of the application of the teaching methodology we proposed.

From these considerations, our methodological research option is fully in tune with the action research framework.

Our target audience was formed by students from all undergraduate engineering disciplines and was enrolled in the Organizational and Work Psychology discipline. It was a qualitative research that used the records.

The teaching methodology built was applied in the discipline of Organizational and Work Psychology. Therefore, it was a qualitative research that used daily records of occurrences in class, with students and teacher.

As it is a research concomitant to an applied procedure, all officially enrolled in the discipline were involved, coming from the following courses: Physical Engineering, Materials, Biochemistry, Production, Chemical, Environmental, Industrial Chemical, day and night.

All students were informed on the first day of class about the methodology practice and the use of the requested resources. The rules for the development of the activity and the various competences and skills that would be observed and fostered.

Participants were presented with the rules established for the application of the methodology:

- The classes would take place throughout the semester, with the presentation of themes chosen by the teacher / researcher, based on the syllabus provided by the university.

- Students would be divided into groups in a number conditioned on the total number of students enrolled per class.
- Themes would be drawn between groups
- Each group should use 6 different features, integrated by humor / fun, namely: group dynamics, lecture, videos, article selection, essay building, room evaluation (preparation, application, correction)
- Other resources could be used, at the discretion of the groups, provided that the teacher was consulted in advance for validation of adequacy.

The competencies and skills sought to be fostered throughout the application of the methodology were as follows: creativity, communication, analysis and synthesis skills, teamwork, leadership, information transmission, writing, ethics.

The students' formal assessment also respected what was recorded in the course program, which requires the assignment of grades from zero to ten, with an average of five, considering two formal grades (P1 and P2) from which the arithmetic average is made. P1 consisted of scores from the eight tests, presentation, essay, including test design, application, and correction. The P2 was an evaluation covering all semester content, held on the last day of class.

3. Results

Data collection for systematization purposes of this article occurred in two classes of the Organizational and Work Psychology discipline, with a total of eighty-three students regularly enrolled. The course is semiannual, making fifteen weekly meetings and has an institutionally approved menu, available in the academic system. The menu and the syllabus were fully respected, with modification exclusively in the teaching and evaluation methodology.

On the first day of class the students had an introductory class where the menu, the syllabus and the justification and proposal of the new methodology were presented. It was explained that the intention to adopt such a practice was linked to a research on new possibilities of developing transversal skills important for future engineers. All agreed and some expressed positively about the experience, especially regarding the possibility of bringing humor to the presentations. One student even said, "Can we laugh a little in class? How nice..."

Groups of six to eight students each were established. The choice was free, mostly voluntary and random, as most students did not know each other, as the subject is offered for all seven engineering courses, from the fourth to the twelfth periods. This promotes great heterogeneity in the room, making the groups have components of varied courses and different moments in graduation.

Still on the first day of school, the teaching methodology was explained. This explanation was taken up in the second class, which also presented some basic concepts of Organizational Psychology as introducers of the themes to be presented by the groups. In the second class, the following subjects were drawn: Communication, Groups and Teams, Organizations, Recruitment and Selection, Motivation, Leadership, Training and Development. Students were asked to create a facebook group to communicate the course and to post the slides. One student from each class volunteered and the groups were created, as shown in figures 1 and 2.

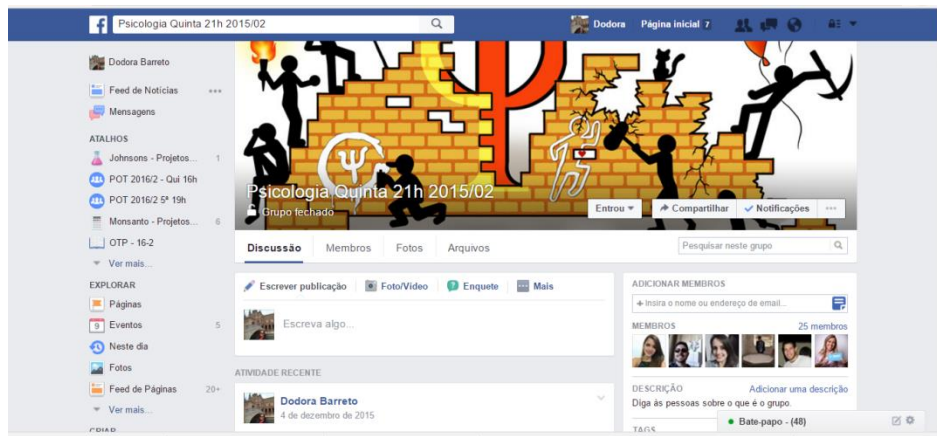


Figure 1. Print screen of the facebook group 1



Figure 2. Print screen of the facebook group 2

Most students joined the groups. Some left at the end of the discipline, others simply failed to access, because there was no more movement of the discipline. We chose not to close the groups, because there is the possibility of sharing files of interest, yet.

From the first presentation the groups became familiar with the methodology which consisted of: each week a group made the presentation containing all the requested resources, delivered the written essay, received feedback from the classroom and the teacher. Three days after the presentation, the group sent 15 questions, with feedback, to the teacher who analyzed and returned the questions that would compose the test 1 day before the application. The following week, the group applied a test on the subject presented throughout the room, corrected it, and returned it. Table 1 below clarifies this system:

Table 1. Group work presentation steps

Phases	Activities	Skills and Abilities

1st step	Oral presentation of the theme Essay delivery (written assignment)	Communication Responsibility Commitment Creativity Team work Analysis and synthesis capacity Writing
2nd step	Preparation and submission of the test to the teacher. on the stipulated date	Responsibility Deadline accomplishments Ethic
3rd step	Test application in class following presentation	Role reversal Ethic
4th step	Test Correction	Attention Responsibility
5th step	Posting Spreadsheets Delivery of corrected tests in class following application	Organization Deadline accomplishments

As already pointed out, at the end of each presentation, the groups were brought together and the teacher was asked to provide feedback to the room with the following instruction: “Each group should highlight three positive aspects of the presentation and three that need to be improved. Feedback is a gift we use or not, it is up to us. But we do not refuse it, so the stance must be open to criticism to improve performance and one should not bounce back. ”

At first the students were inhibited and afraid to criticize their colleagues. From the moment they understood that this would improve everyone's performance, they became more comfortable and feedback effectively contributed. After all the groups made their comments, the teacher also highlighted positive aspects and others that needed to be improved. The same feedback procedure was adopted after each test application.

Throughout the activities, many gains were observed in relation to the two classes, which, due to the objectives of this work, were treated as one. Since at no time was there any intention of comparing them, it was decided to treat them as a population, even to avoid discrimination in the treatment of students. The gains observed could be confirmed by the feedback that, throughout the semester, became increasingly discerning and turned to small details, since there was a significant improvement in the presentations, pointed out by the students. In addition, as the groups introduced themselves, more students came to the teacher for more information on research sources and resources to be used. It is interesting to note that this semester, first of 2016, a student who does another, optional subject, with the same teacher, sought to say that made the choice of the optional subject by the methodology adopted. She has been able to identify great progress in her development through exposure and feedback and believes that new experience will make her develop further.

At the end of the semester, the researcher applied a questionnaire to evaluate, also qualitative, the teaching

methodology. It was requested feedback in the same way as the classes, where students should list positive, negative and suggestions. In addition, a self-assessment was requested so that the observations made could be confronted with the perception they might reveal. For this we list some of the most spoken skills during the semester. To conduct the research, students were asked from the outset to sign an informed consent form.

It is interesting to note that the separation of competences happens exclusively for better understanding. However, in practice they blend and complement each other.

The most worked skills during the semester were: teamwork, cooperation, responsibility, commitment, ethics, communication, ability to analyze and synthesize, creativity, work under pressure and meeting goals and deadlines.

Teamwork refers to the competence to act together. It involves skills such as sociability, planning, organization, empathy, leadership - as a leader or led - prioritization.

Cooperation refers to the competence to assist in the execution of tasks and involves skills such as willingness to serve others, joining efforts, help.

Responsibility refers to the competence to care for what has been requested by both the teacher and colleagues.

Commitment concerns engagement in activities, including prioritizing tasks to meet deadlines.

Ethics is related to the entire course but is made clearer in the design, application and correction of the test for which each group is responsible.

Communication permeates the entire process to a very high degree. All steps require group members to communicate in person or by message and imply objectivity in achieving what is agreed upon.

Analysis and synthesis skills are manifested both in the preparation of the presentation for the room and in the construction of the written essay delivered on the day of the presentation.

Creativity is present mainly in the choice of the dynamics and the videos that make up the presentation. Despite well-defined initial parameters, there was scope for flexibility and new possibilities for presentation and testing.

Work under pressure manifests itself in respect of deadlines. Perhaps more effective for the first group, which has a shorter lead time. However, it is clear that most do not prioritize planning yet, so the deadlines are tight, causing pressure to not anticipate activities.

Achievement of goals and deadlines refers to meeting what was requested on the requested date: presentation and written work in one day, posting of slides, test questions, with feedback, up to 3 days later, receipt of test questions 1 day before application, test printing, application, correction and delivery to teacher 1 week after.

Separately, for the sake of completeness, as it has already been explained that both classes were considered as one, each presented the results described in figures 3 and 4.

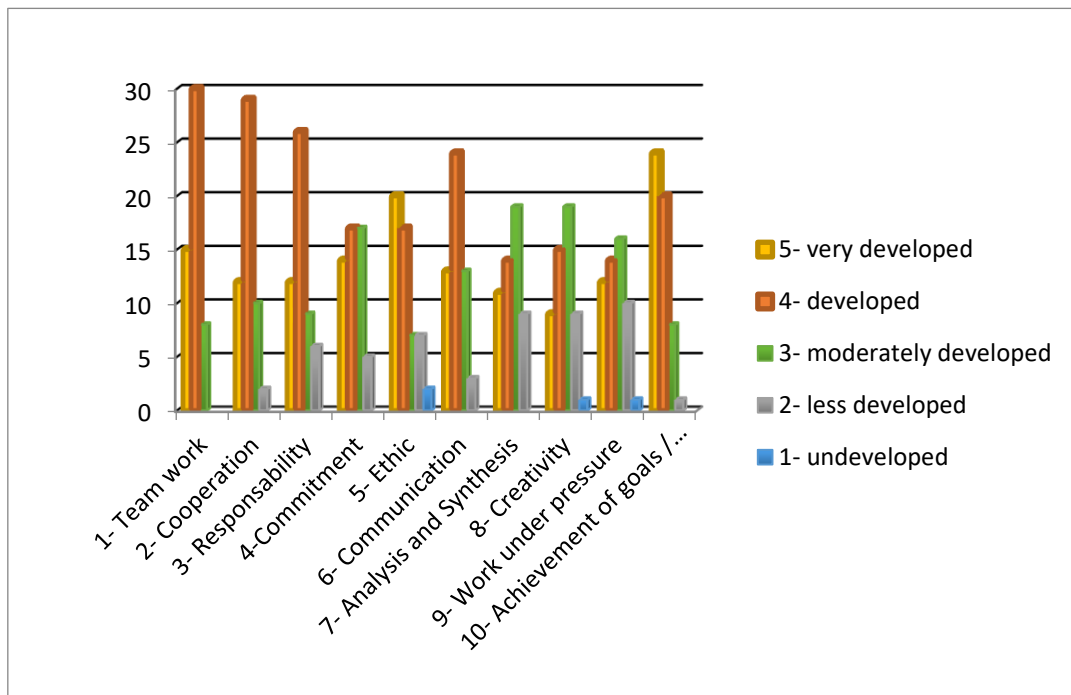


Figure 3. Self-assessment class 1 for skill development

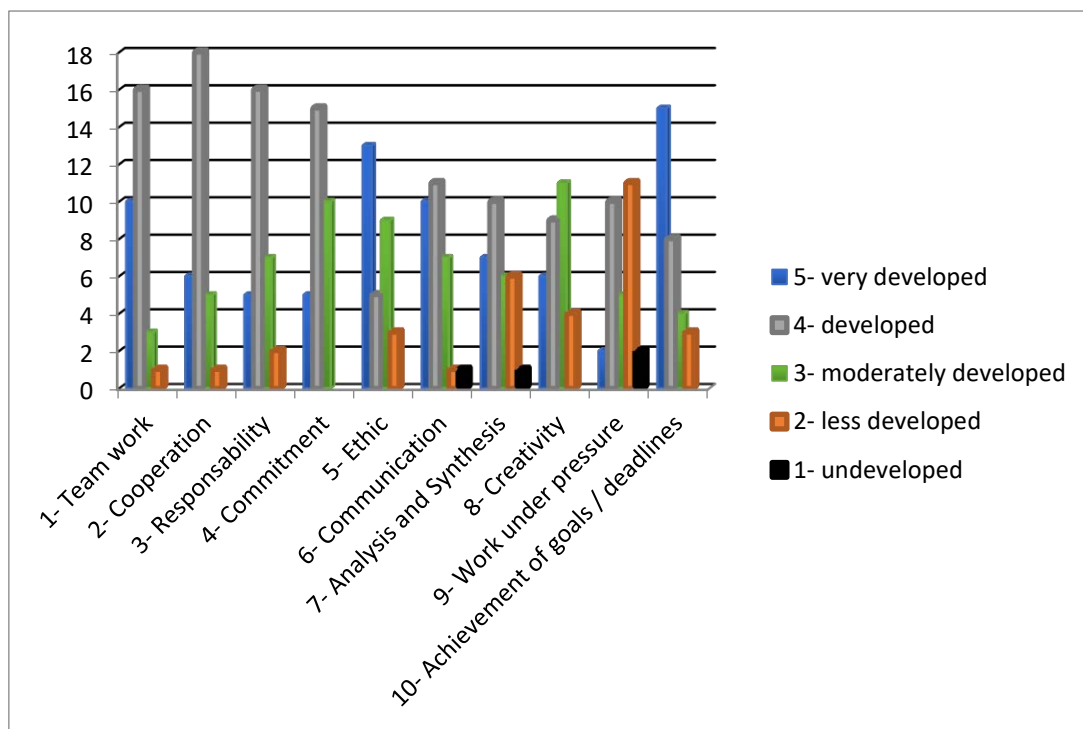


Figure 4. Self-assessment class 2 for skill development

The overall results obtained with the questionnaire were as follows, shown in figure 5.

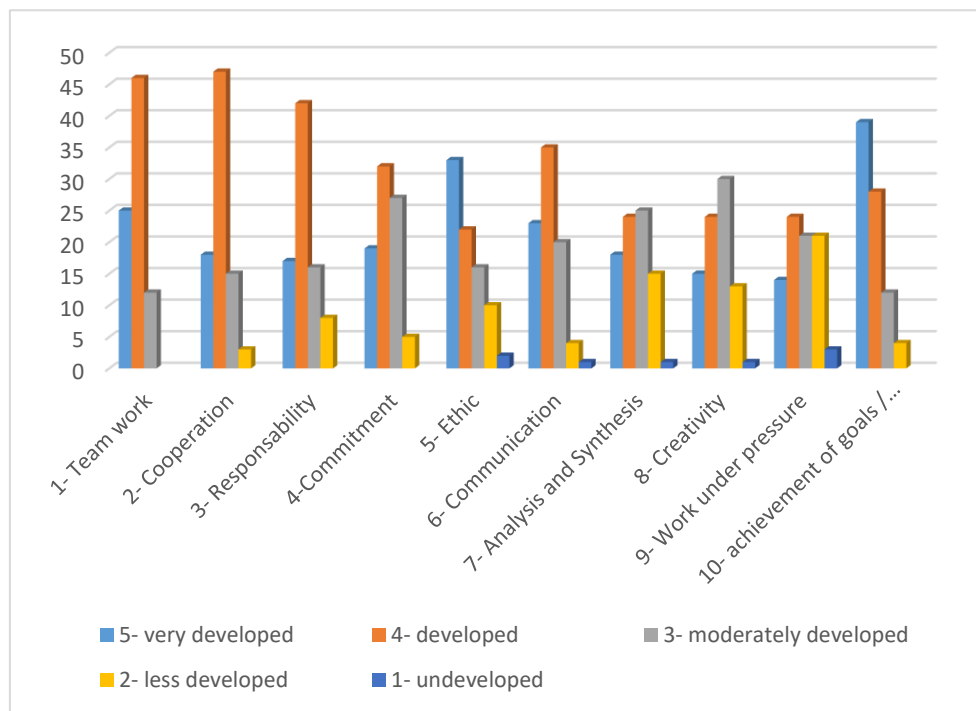


Figure 5. Self-assessment regarding the development of transversal competences

From the answers we identified that the best evaluated competences in the sense of their own development were teamwork, meeting goals / deadlines, cooperation, followed by responsibility and communication. Considering the opinions Very Developed and Developed, they corresponded to 85%, 81%, 79%, 71% and 70%, respectively.

Such answers are in line with what was expected with the establishment of the methodology rules. In order to meet the deadlines, it was necessary for everyone to work in cooperation in the execution of the tasks assigned by members of the groups themselves. In this process, effective communication was fundamental to the fulfillment of the activities, mainly because, as they were students from different courses and periods, if they did not exercise and use skills such as these they could not reach the goal, because there were no specific moments that would find spontaneously.

We emphasize that Teamwork did not have a single unfavorable response, in the fields Little or Not Developed, which corroborates that methodologies like the maid stimulate and reinforce skills of working together with others, essential for the future engineer.

The least developed skills, according to the students' opinion were: work under pressure and analysis / synthesis, followed by creativity. Considering the underdeveloped and underdeveloped opinions, we found 29%, 19% and 17%, respectively, which, although identified as less developed compared to other competencies, do not mean such an unfavorable score. Considering that these skills are measured individually, rather than in groups, and in this case, evaluated according to their own personal impression, according to their own perception that is always loaded with subjective aspects, we hypothesized that they were pointed out as underdeveloped due to some variables. Indeed, only the first group in each class was under pressure to meet deadlines, as it had less time to complete all tasks. As the schedule was released at the beginning of the semester, the groups that organized themselves had time to elaborate the stages, so

supposedly they were not pressured to deliver the activities.

In addition, the ability to analyze and synthesize is most directly used in the preparation of slides and the written essay. With the division of tasks, some people did not really need to intensify their efforts, as another member of the group might have been responsible for the task involving the use of such a skill.

Finally, as there were well-defined parameters as to the resources to be used, creativity could be more exercised in choosing and applying the dynamics and eventually in different resources they wanted to use. Unfortunately, students generally do not exercise such ability. Usually they tend to do what they ask, so there was little scope for creativity, reiterating the idea that traditional actions are still very much present in both teaching and learning.

In order to maintain the standard of evaluation of the practice, which invariably occurred in all classes, we asked them to complete the questionnaire with positive and negative aspects of applying the methodology. They were also asked to make suggestions on the practice experienced during the semester.

We got a total of eighty-three answers. All students responded, even with the clarification that it was a voluntary assessment. This also indicates the commitment to participate in the process. The vast majority strove to participate in all phases of the work.

As positive aspects were raised the following points, highlighted in Table 2, as follows:

Table 2. Positive points of the teaching methodology, according to the students

Strengths
* Dynamic class exposure method facilitating learning (32)
* Student exposure in presentations assists in developing communication and accountability (16)
* Importance of Teamwork (14)
* Greater student involvement and engagement due to new methodology employed and topics covered (14)
* Teacher's domain in relation to content and communication with students - didactics (7)
* Importance of Feedback (7)
* Beacon classes (4)
* Humorous character in presentations facilitates learning and attention in class (4)
* Learning beyond the subject (2)
* Greater absorption of content with tests and varied weekly activities (2)
* Knowledge of the practice of a selection process
* Subject choice and presentation by the group itself
* Well designed P2 assessment with student help

Placed in ascending order of occurrence, we can see that there was great emphasis - thirty-nine statements - on the dynamism of the classes, recognizing that this condition facilitates learning. This meets one of our initial assumptions that the use of diversified activities motivates and enhances learning.

Then the highlight - sixteen statements - was the perception of the development of diverse skills caused by the exposure of students in the presentations. This perception meets the development of skills that we

intended to encourage students as communication and adds to the next highlighted item, teamwork. As the students all needed to present the work, they had to get organized, set priorities, identify and search sources, select material and take responsibility for proper performance.

These obligations, added to the variety of activities and weekly tests were pointed as triggers of students involvement and engagement.

In isolation, with less emphasis, but also with great relevance, since works with individual perception, which varies greatly from student to student, other positive observations added to the already reported. Among them was observed the importance of feedback at each presentation, which guides the next groups and increases the critical capacity of all.

It was also noted the importance of beacon classes, a more “traditional” moment that meets, at least in part, the need for some to maintain old schemes and receive the “final word” from the teacher.

It was also highlighted the presence of humor in the presentations, as a facilitator of learning and attention in class, confirming the research that addresses this possibility (LA TAILLE, 2014).

Interesting the note about learning beyond the subject, which indicates initiative in the gathering of relevant information. Such attitude corroborates the concept of active methodology, which prioritizes the autonomous search for solution to the proposed problems.

In addition to these, other specific considerations such as specific content (recruitment and selection theme), possibility of choices (subject and type of presentation) and evaluation consistent with what was developed, were also observed.

As negative aspects, the following points were raised, highlighted in Table 3:

Table 3. Negative points of the teaching methodology, according to the students

Negative points
* Overwork and weekly assessments (23)
* Time and amount of restricted (beacon) classes, few exclusive teacher classes (22)
* Lack of direct orientation to presentations, lack of script (13)
* Presentations and extensive content (12)
* Poorly performing groups disrupting learning (6)
* Less credibility of the contents of the classes, as they are taught by the students. (4)
* Elaboration of tests and tests made by students (4)
* Delay in note communication (3)
* Seminars in the conventional classroom (3)
* Collective Feedback
* Drafting questions for P2

According to the students' perception, there is overwork and evaluation. Such observation was already expected, since apart from individual perception, students are not used to doing activities constantly in class. As they have a more passive attitude, due to a more traditional teaching, which prevails in most classes. It is natural for them to find so many activities performed by them not only in their own group presentations, but in the dynamics and feedback in every class that required everyone's participation.

Likewise, as tests on the subject took place in virtually every class, which required some prior preparation every week, caused some strangeness in some less accustomed to constant activity. These observations match the following, which call for more lectures from the teacher and more definite scripts for the presentations. Although many have adapted and highlighted the novelty of the methodology as something positive, as seen in the previous points, it is a fact that other students still do not enthusiastically welcome the proposed changes. Although expected, it is a sign that we need to present more frequently the need for student action in the classroom so that they become familiar with methods that develop skills such as those proposed here. Attachment to the practices of lectures, in which often the student does not need to reflect, select, seek, act, is still very present.

It was also pointed out as negative, the low performance of some groups and the low credibility of the contents of the classes, because they are taught by students. It also reiterates the lack of confidence in the performance of the students themselves, even with the guidance and monitoring of the teacher. The teacher still represents a figure of maximum authority of knowledge, who supposedly holds the knowledge. Once again there is a lack of confidence, perhaps due to a lack of practice in finding and revealing information on the topics.

Interestingly, the presentations and contents were extensive, as they never exceeded the predetermined class time and that the groups themselves selected the topics to be presented in each theme. Similarly, although they were free to choose the form of presentation, it was pointed out that they happened in the conventional way. This pattern repetition matches the difficulty that many present in adapting to innovations in teaching methods.

Other specific comments related to the evaluation system. In the proposed model the student was evaluated throughout the process. At each presentation and written assignment, the group received feedback from the class and the teacher, and all students took a test on the subject presented. They all added up to a maximum of 10 points. At the end of the semester a formal evaluation was also applied, on all the content presented in the semester was prepared by the teacher, including suggestions from the class itself, also worth 10 points. Arithmetic average of the two notes was made. In the observations, the autonomy of the groups in elaborating and correcting the tests was pointed out as negative, the delay in the communication of the grades, made only at the end of all tests, and the students' suggestions for the second evaluation. We emphasize that the same aspect was considered positive by some students, which is consistent with the differences in perception. As we talk about changing habits and new practices, this disagreement is natural and does not interfere with the development of the process.

As suggestions, students who spoke noted the following, as shown in Table 4.

Table 4. Suggestions about the teaching methodology used in the semester

Suggestions
* Increase the frequency of beacon classes
* Explanation of the content by the teacher and preparation of a case by the students, each class
* Orientation and direct monitoring of the teacher regarding the content of the presentations - script

* Organization by the teacher of time in relation to the clues and the dynamics
* Support material for writing the texts
* Decrease the amount of reviews and assignments
* Replace weekly assessments with summaries of each group
* Evaluations with alternatives
* Enter substitute ratings
* Award extra grades to more participating students
* Practical activities focused on the theme: selective processes
* Training and preparation for the labor market
* Feedback only for each group or in discussion form
* Smaller groups to do the work
* Psychology classes at the beginning of the course, as they prepare better
* Discussion of other topics as well
* Continue with humorous presentations
* All subjects use the methodology (ideal world)

It is noticed that many of the suggestions mentioned refer to the traditional teaching model. By requesting more landmark lessons, presenting the content by the teacher, establishing a systematic script, organizing the time done by the teacher rather than the group, they are in fact claiming a model in which they perform what is rigidly defined, in which the teacher is who it sets the steps more rigidly and where freedom of creation is reduced to few possibilities. Here we see the resistance, also by students, to less structured models of knowledge construction. The same happens with the suggestion that they have the indication of support material for the written work. This further indicates that the student waits for the more directed indication of the teacher.

As for the suggestions of practical activities and training, we ran into the same difficulties of workload. It is a theoretical discipline, with a workload of 30h / a, which requires the selection of methods according to the proposed teaching and learning objectives. Thus, the methodology seeks to minimize the distance between theory and practice by using the proposed active tools.

As for evaluations, an even more critical concept when it comes to the joint construction of knowledge and pre-established institutional needs, such as the establishment of a grade, we see that suggestions go in two ways: in the reduction of activities by students and in facilitating and / or expanding possibilities for getting more grades. Once again, the traditional grading model rules over task execution rather than learning itself. An example of this is the suggestion of reducing the number of evaluations and assignments, replacing weekly tests with abstracts, more tests with alternatives, inserting substitutive evaluations, and awarding more grades for participation.

Some suggestions go against institutional determinations, such as smaller groups. As we have a maximum number of students of sixty and the classes are developed in fifteen weeks, interspersed with the marker classes, we have to distribute the number of students regularly enrolled and in a maximum of eight classes. Although we consider that four students per group would be an almost optimal number, we have not been able to achieve this as long as classrooms have this total number possible. Similarly, the suggestion of

discussion of other topics is prevented by the specified number of classes. However, whenever a student mentioned a related subject, it was discussed in the presentations and marker classes.

A specific observation about the methodology refers to the feedback. It was current and determining in the process the weekly feedback given to students about the performance of the groups. Both by peers, by the teacher and by the members of each group. This feedback was pointed out as a positive point (table 2), but in the suggestions came the annoyance of someone because they are public, which makes one think that it is necessary to clarify, especially the reason for not being individual and confidential. Similarly, one of the rules of feedback was that students should not rebut. By suggesting that it be done in the form of debate, they wish to justify any failure. This may be best explained in the practice of classes.

Interesting the suggestion that the classes take place at the beginning of the course, because this meets the full and diverse training of skills and competencies. Very relevant to this research were two observations that came up in the suggestions: to continue inserting humor in the presentations and that all disciplines started to use this methodology. It is evident that this is the personal perception of a student who had his expectations exceeded, but in any case, we have a record of significant experience with the introduction of the methodology.

4. Conclusions

The results show that, even in isolation, that is, in the proposal to change the teaching methodology of a single subject of different undergraduate courses, it is possible to verify and propose new conceptions, besides reformulating relations between teachers and students, to define different directions and emphases for vocational training.

It was possible to provide students from various engineering courses with experiences that they will probably find in their professional future in a short time. As many are in the final stages of the course, participate and will participate in selection processes in various companies. In addition, the importance of knowing how to work in teams is increasingly imminent, which was also provided by the introduction of the methodology. More than that, it facilitated the experience of finding, reflecting and building diverse knowledge more autonomously, which was achieved through research and presentations, as reported by the students themselves.

Based on the results of this work, it is possible to suggest replacing the traditional passive methods with the active ones. The transmission of theoretical content loses place for teaching that promotes a more autonomous process of knowledge construction, which includes practical situations, the reality of each student.

It is interesting to point out the testimony of students who voluntarily enrolled in non-compulsory subject in the semester following the application, which uses the same methodology. Their statements corroborate the search for experiences that develop transversal skills and competences

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Evaluation of Manual Dexterity of Teenagers with Autistic Spectrum Disorder: Comparison Among Validated Tests.

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SUMMARY

The Autism Spectrum Disorders (ASD) encompasses a group of neurodevelopmental illnesses that involve communication, social interaction and behavior changes. Motor aspects are still poorly investigated in this population. The aim of this study was to evaluate the manual dexterity of adolescents with ASD through three different tests, correlating them with the cognitive assessment and the handgrip strength and checking which one is shown to be more sensitive to this population. We evaluated 20 participants with ASD among 10 and 14 years, 18 boys and two girls. The WASI test was used to evaluate the intelligence quotient, the Van Strien test verified the lateral dominance and the Jamar dynamometer measured the handgrip strength. The manual dexterity was evaluated by three instruments: Box and Block Test (BBT), Jebsen-Taylor Hand Function Test (JTHFT) and the Minnesota Test. Statistical analysis found a high correlation for dynamometry, BBT and JTHFT indicating that when there is a good performance with the dominant hand, there will be also with the non-dominant hand. No correlation was found between handgrip strength and manual dexterity in any of the tests. The only one to show significant result when correlated to WASI scores was Minnesota ($p \leq 0.02$), indicating that the higher the IQ, the shorter the time of task execution. It was found that it is possible to assess teenagers with ASD with instruments validated in the literature, and the most sensitive to this population was the JTHFT, followed by the BBT test.

Keywords: Autistic Spectrum Disorder. Motor Dexterity. Evaluation studies.

INTRODUCTION

Autistic Spectrum Disorder (ASD) is a term that encompasses a group of neurodevelopmental illnesses (APA, 2014), characterized by qualitative and quantitative alterations of communication, whether in verbal or non-verbal, social interaction and behavior characteristically stereotyped, repetitive and with restricted range of interests. In the case of a spectrum, the degree of difficulty differs from people who have a mild picture, with complete independence and discrete problems of adaptation to those people who are dependent for activities of daily living (ADLs), throughout life (SÃO PAULO, 2013).

ASD is multifactorial, that is, both its etiology is constituted by genetic as well as environmental components. For this, some aspects are: exposure to chemical agents, vitamin D and folic acid deficiency, maternal infections, use of certain drugs such as valproic acid during pregnancy, prematurity (below 35 weeks) and low birth weight (<2500 g). The risk factors that involve genetic components are: having a first-degree family affected, congenital abnormalities and either maternal or paternal age over 40 years old.

There are cases of ASD that are associated with genetic syndromes and others that this association does not exist (FUENTES et al., 2012).

The estimate of the Centers for Disease Control and Prevention (CDC), in the United States, was 1 in 68 or 14.7/1,000 for children up to eight years (CDC, 2014). In a new survey released recently (CDC, 2018), this index increased to 1 in 59. According to a study by Baxter (2015), changes in diagnostic criteria and methods for determining the ASD in recent decades have contributed to this increase, generating the need for better understanding of the impairments presented in ASD and their repercussions throughout their lives.

Given the increasing prevalence of ASD in the world, recent researches are looking for evidence that can contribute to better understand the functioning of these people (MIERES et al., 2012), as well as the reports on the unusual sensory functioning and motor difficulties, apparently due to voluntary or involuntary disorders which vary widely among individuals (SCHWARTZMAN AND ARAUJO, 2011). These deficits can influence the global developing and can also cause impact on education, socialization and communication of these people (VAN WAEVELDE et al., 2010).

People with ASD may experience sensory hypersensitivity reaching the extreme irritation or getting pleasure from stimulation or sensations perceived as unpleasant or indifferent to most people. These characteristics can produce behaviors such as: side view display in order to reduce this excess of stimulation; handling objects repeatedly; having fixing by water, both in the bathing and tactile stimulation, in the visual stimulation or the assessment of its movement; having dietary restrictions based on textures, flavors, colors and present agitation crises in public transport or noisy environments, presenting auto or hetero-aggressive behavior when upset or disappointed.

Aspects of the motor performance of individuals with ASD are not used as diagnostic criteria, but some authors (LIU et al., 2013) discuss on the integration of these deficit motors standards in these criteria. The purpose of this insertion is to characterize the impaired motor dexterity at an early stage, increasing the possibility of earlier intervention and so, some cognitive and social problems could be minimized (LLOYD, MACDONALD AND LORD 2013). For these authors, fine and global motor activities may have implications and deficits in social and communication skills (CATELLI; D'ANTINO; ASSIS, 2016).

The motor impairment could be characterized as neurological comorbidity along with epilepsy and sleep disorder, common in ASD and associated with the most severe phenotype of the disease. The motor impairment includes delays and deficits, stereotypes, dyspraxia, incoordination and ride deficiency, and they are often associated with cognitive impairment (JESTE et al., 2011).

Regardless of age or level of commitment, people with ASD have limited mobility in all their skills compared to their typically developing peers. Among the motor performance differences are the manual functions that are few explored in some researches as well as the relationship between manual and functional laterality activity (MILER et al., 2014).

The evaluation of motor behavior in a given individual is performed from a process of analysis and observations by means of instruments such tests or scales which assess the motor skill assuming a reference pattern previously constructed in these materials (SOARES; CAVALCANTE NETO, 2015).

The motors impairments are present throughout the life of these individuals and assessments and interventions could contribute to the understanding of the limitations and to the acquisition and

maintenance of motor dexterity, meeting the needs of families and improving their long-term development (QUINTAS et al., 2014).

The motor behavior analysis allows measuring and comparing the motor performance of an individual with their typically developing peers, making possible, by analyzing the results, specific guidance for each case (REIS et al., 2012).

To measure the motor performance is necessary to use a test or a battery of tests to be validated and appropriated for the population studied (GORLA; ARAÚJO; RODRIGUES, 2009; ROSA NETO, 2002), which does not always happen when it comes to evaluate people with ASD.

Considering this need and observing the lack of literature on the subject, the aim of this study was to evaluate the manual dexterity of adolescents with ASD by using three different tests, correlating them with the cognitive assessment and handgrip strength in order to check which of them is shown to be more sensitive and appropriate for this population.

METHOD

20 adolescents participated in this study, aged among 10 and 14 years (18 boys and 2 girls). They are with a diagnosis of ASD and go to a school specialized in the care of these people

The study included adolescents who could understand the verbal commands, a necessary criterium for using rating scales, and whose guardians authorize the volunteer participation in this research, being excluded from the study people displaying neurological or orthopedic problems already diagnosed, or who do not conclude the tests during the evaluation period.

Data collection was carried out in an attendance room granted by the institution itself, in a suitable environment, as recommended by the manuals of the instruments used. For evaluation, we used the Wechsler Abbreviated Scale of Intelligence test - WASI, Van-Strien questionnaire, Jamar dynamometer, Box and Block Test (BBT), Minnesota test (only the placing-test, due to the complexity of the tasks of this instrument) and Jebsen-Taylor Hand Function Test (JTHFT). The application of the instruments was carried out individually in four sessions, lasting about 40 to 60 minutes.

Data were recorded in a standard protocol and analyzed with the help of statistical tests. These understood the descriptive analysis of the data (mean, standard deviation, maximum and minimum), sample normality test and the comparison of results by T-test. The correlation between the handgrip strength and the performance in each of the tests were investigated. The project was approved by the Mackenzie Presbyterian University Ethics Committee under number 1,717,700.

INSTRUMENTS

✓ Wechsler Abbreviated Scale of Intelligence - WASI: applicable scale in people from six years old up to 89 years old, which provides information about the Total Intelligence Quotient (IQ). The scale provides the possibility of evaluating the Total IQ with only two subtests (Vocabulary and Matrix Reasoning) (TRENTINI, YATES, BATES, 2014).

✓ Tests such as Van Strien: questionnaire with 10 tasks to run through mimes, such as: pick up the pencil when drawing; holding the brush; brushing the teeth; unscrew the cap of a

bottle; throw a ball; dealing cards from a deck; pick up a racket; open the lid of a box; grab a spoon when eating soup; erasing with a rubber; open a door with a key. The evaluated individual is classified as right-handers when he presents a score among 8 and 10, or left-hander, if he gets results among -10 and -8 (FREITAS; BOTELHO; VASCONCELOS, 2014).

✓ Jamar dynamometer is widely used in the clinic by professionals from the rehabilitation field. The instrument has two parallel handles, one fixed and one mobile. The latter is adjusted into five different positions, according to the hand size of the assessed individual. The handgrip strength is recorded in kilograms or pounds. As the participant presses the bars, they bend, causing a change in the resistance of the gauges, occurring a corresponding change in the output voltage that is directly proportional to the force exerted on the bars (FIGUEIREDO et al., 2007; PRIOSTI et al., 2013).

✓ Box and Block Tests (BBT): is designed to measure the ability and manual dexterity, these functions are often underestimated in assessing patients, and it is also presented as a pre-vocational test for people with physical disabilities. The BBT consists of transporting small pieces of wood from one side to the other for one minute. These blocks must be taken from end to end from a wooden box with partition. The number of blocks has to be recorded for the upper dominant and non-dominant member upon three attempts for each member (MATHIOWETZ et al., 1985; MENDES et al., 2011).

✓ Minnesota Manual Dexterity Test (MMDT): evaluates the gross motor skill of the assessed individual, considering the unilateral and bilateral manual dexterity. It is used for various purposes, including the measuring of the degree of disability and/ or the patient evolution in specific training programs or manual activities of interest in practical life, as to handgrip strength (LOURENÇÃO et al., 2007; INSTRUMENT, 1998).

✓ Jebsen-Taylor Hand Function Test (JTHFT): is similar to those manipulative tasks performed daily, divided into seven subtests: 1) writing; 2) simulation of a task of turning letters; 3) lifting of small objects; 4) simulation using spoon for food; 5) stacking blocks (checkers pieces); 6) lifting of large and light objects; and 7) lifting of large and heavy objects. In the case of wider manipulative tasks, this test appears to be related to the various aspects involved in the operation of the hands and upper limbs (JEBSEN; TAYLOR, 1969; LIMA et al., 2012).

RESULTS

The results are related to 20 adolescents with ASD in the study. In the application of Van Strien Hand Preference Test (HP), 18 participants were presented as right-handers (90%) and two (10%) were left-handers. From the HP defining the tests for strength and manual dexterity were applied considering dominant hand (DH) and non-dominant hand (NDH).

The participants' performance is described in Table 1 for the manual dexterity tests, considering the units of measurement for each test, that is: to dynamometry, in kilogram-force (kgf); BBT, quantity of blocks transported per minute; Minnesota, in seconds required for placement of the discs on the board;

JTHFT, in seconds required to perform each of the seven tasks. It is also shown in the Table, the score for the Intelligence Quotient (WASI) and the age of the participants.

Table 1: Descriptive statistics of the tests used for the assessed group (n = 20).

		Average Group	Median	Min/Max ⁵	SD ⁶
Dynamometry	DH³	15.07	14.5	8/29	6.15
	NDH⁴	15.55	13.5	5.5/29	5.18
BBT¹	DH³	46.9	41.5	15/65	11.18
	NDH⁴	42.1	42.5	12/66	13.31
JTHFT²	DH³	24.43	148	69/282	56.98
	NDH⁴	28.1	160	88/338	66.18
Minnesota		139.75	126	93/260	50.64
WASI		68.95	70.5	44/95	15.96
Age		11.62	11	10/14	1.32

¹Box and Blocks Test, ²Jebsen-Taylor Hand Function Test, ³Dominant Hand, ⁴Non-Dominant Hand,

⁵Minimum/Maximum, ⁶Standard Deviation.

The Shapiro-Wilk and Kolmogorov-Smirnov tests were used to verify the normality of the sample for all analyzed variables, not being found normality for most of them. It was decided, therefore, by using the Spearman non-parametric test.

The parameters used to measure and interpret this correlation were based on values from 0 to 0.30 / -0 to -0.30 being insignificant, from 0.30 to 0.50 / -0.30 to -0.50 being low, from 0.50 to 0.70 / -0.50 to -0.70 being moderate: from 0.70 to 0.90 / -0.70 to -0.90 being high and from 0.90 to 1.00 / -0.90 to -1.00 being too high (MUKAKA, 2012).

Table 2: Correlation among the studied variables in relation to the assessed group(n=20)

Variables	DIN. ¹ (DH) ⁴	DIN. ¹ (NDH) ⁵	Minnesota	BBT ² (DH) ⁴	BBT ² (NDH) ⁵	JTHFT ³ (DH) ⁴	JTHFT ³ (NDH) ⁵
DIN.¹ (NDH)	.755** (.000)						
Minnesota	-.292 (.212)	-.276 (.238)					
BBT² (DH)	.002 (.995)	-.159 (.504)	-.477 (.034)				
BBT² (NDH)	.155 (.513)	-.074 (.755)	-.462 (.041)	.882** (.000)			
JTHFT³ (DH)	-.313 (.179)	-.108 (.650)	.537* (.015)	-.638* (.002)	-.716** (.000)		

JTHFT³	-.224	-.034	.344	-.481	-.599*	.939***	
(NDH)	(.343)	(.888)	(.138)	(.032)	(.005)	(.000)	
WASI	.008	.063	-.642*	.552*	.325	-.361	-.207
	(.972)	(.793)	(.002)	(.012)	(.161)	(.118)	(.382)

¹Dynametry, ²Box and Blocks Test, ³Jebsen-Taylor Hand Function Test, ⁴Dominant Hand, ⁵Non-Dominant Hand. **Moderate ***, **High ****, **Very High *** Correlation**

The assessed group was divided into two groups, group 1 (G1) showing IQ $\geq$ 70 and group 2 (G2), IQ <70. Each group is made up of 10 subjects.

To assess the difference between the groups G1 and G2 in relation to Minnesota tests, BBT and JTHFT, the Mann-Whitney test was carried out. There was no statistical significance for G1 and G2 in relation to BBT ($p = 0.26$) and JTHFT ($p = 0.13$), considering the value of $p \leq 0.05$. However, in Minnesota test was found statistical significance with the value of $p \leq 0.02$, indicating that if the IQ is greater than 70, the better the test result will be. The Descriptive statistics of the tests used in relation to the manual dexterity in G1 and G2 are shown in Tables 3 and 4, respectively.

Table 3: Descriptive statistics of the tests used in relation to the manual dexterity of G1 (IQ $\geq$ 70).

			Mean	Median	Min/Max ⁵	SD ⁶	DH ⁷	NDH ⁸
G1	Dynamometry	R³	15.65	15	8/35	7.32	15.55	15.30
		L⁴	15.30	13.5	11/29	5.42		
	BBT¹	R³	46.40	44	31/65	10.29	46	45.7
		L⁴	45.35	46.5	29/66	12.17		
	JTHFT²	R³	124.3	99.5	69/208	54.9	174.5	173.89
		L⁴	149.2	118	88/258	61.3		
	Minnesota		112.40	109	93/139	16.08	-	-
	IQ		82.40	80	75-95	7.75	-	-

¹Box and Blocks Test, ²Jebsen-Taylor Hand Function Test, ³Right, ⁴Left, ⁵Minimum/Maximum, ⁶Standard Deviation, ⁷Dominant Hand, ⁸Non-Dominant Hand

Table 4: Descriptive statistics of the tests used in relation to the manual dexterity of G2 (IQ <70).

			Mean	Median	Min/Max ⁵	SD ⁶	DH ⁷	NDH ⁸
G2	Dynamometry	R³	14.6	13.25	9.5/27	5.07	14.6	13.7
		L⁴	13.7	13.5	5.5/24	5.09		
	BBT¹	R³	38.4	38.5	15/58	11.06	39.1	38.5
		L⁴	39.4	39	12/65	14.37		
	JTHFT²	R³	167.1	163.5	84/282	53.16	147.9	163.6
		L⁴	189.8	171	90/338	67.64		
	Minnesota		167.1	135	102/260	59.10	-	-
	IQ		55.5	55	44-66	8.71	-	-

¹Box and Blocks Test, ²Jebsen-Taylor Hand Function Test, ³Right, ⁴Left, ⁵Minimum/Maximum, ⁶ Standard Deviation, ⁷Dominant Hand, ⁸Non-Dominant Hand

DISCUSSION

The aim of the study was to assess the manual dexterity of adolescents with ASD by using three different tests, correlating with cognitive assessment and strength of the handgrip strength, besides checking which of them seems to be more sensitive and appropriate for this population.

One of the objectives of this study was to analyze the relationship between handgrip strength and its influence on the performance of the manual dexterity tests. Then, the dynamometer was correlated with the Minnesota ($p = 0.21$) BBT ($p = 0.66$) and JTHFT ($p = 0.17$), using the Spearman non-parametric test. Considering the normal standards, the association among the variables is not statistically significant, indicating that either the handgrip strength is greater or not, people with ASD did not perform better in the ratings.

In relation to JTHFT a very high correlation was found and for handgrip strength (DIN) and BBT, it was found a high one, indicating that when the participant has good performance with DH, he also performs well with NDH. A moderate correlation among JTHFT, Minnesota test and BBT test was obtained, indicating that if the individual can successfully run the JTHFT possibly he will go well in the other two tests. Moreover, a moderate negative linear correlation was found among the scores of the intelligence test (WASI) and the runtime in Minnesota and BBT tests, pointing out that the lower the IQ, the greater the run time of the tests. This finding suggests that although the BBT and Minnesota are tests of only one task, they demand more persistence and concentration.

The literature points out disadvantage of this population in researches with a focus on motor evaluation. Quintas et al. (2014) observed that people with typical movement show a superior motor performance to people with ASD in all areas: manual dexterity, ball skills, balance and global motor performance, analyzed by Movement Assessment Battery for Children (MABC-2) scale, and manual dexterity was ranked as the second-worst analyzed skill.

Researches suggest that the difficulties in motor skills in people with ASD would be directly related to sensory processing. This relationship was observed by researchers who evaluated 32 children with ASD in order to examine the processing performance and motor-sensory skills through Short Sensory Profile (SSP) and the MABC-2 tests. Descriptive data show that all people with typical development were classified in the green zone, which represents motor performance without impairment, and 80% of people with ASD were classified in the red zone, suggesting significant motor impairment (LIU et al. 2013).

Motor skill deficits are present and persist in school children with ASD (SOARES et al., 2010; VAN WAELVEDE et al., 2010). These researches have been reported through a review of the literature which presented studies from different regions, indicating the motor disadvantages for people with ASD from different age groups and, consequently, the need for intervention researches in this area. (CATELLI et al., 2016)

In this study, the assessment of handgrip strength was carried out smoothly, with good understanding and cooperation from the participants. During the Box and Blocks Test, some of the assessed

individuals reported that they were tired, or did not have the persistence to complete it. Sometimes the blocks were organized by color, or they demonstrated their preference since the test has blocks in the blue, red and yellow colors. As it is a speed test, perhaps these factors did not allow the participants to run as fast as they could.

The Minnesota test has been performed with some difficulty, since participants were dispersed at some point, not completing the placement of the discs on the board (placing test) quickly. But the Jebsen-Taylor test was of good understanding and participation. Being quick tests, the execution of the tasks was as requested. However, this study did not consider the item "write" to the final result because some participants did not write, as they still meet the literacy process.

The importance of knowing what is the best assessment is essential to the success of therapeutic programs, because only by knowing the dysfunctions an effective intervention is possible. Thus, these findings indicate that three tests are able to assess the group with ASD, however, considering its particularities, the JTHFT is the best for application, perhaps in an adapted form in relation to writing or to the application process, depending on the age category.

Due to the difficulty of people with ASD and the difficulty of understanding in relation to the instructions provided in the various evaluation tools, some research suggests that there would be the need to adapt the instruments or the way in which the instructions should be provided to these people so that this process could facilitate the understanding of the instructions and impact on the standard scale scores. (QUINTAS et al., 2018; LUI et al., 2013).

Motor deficits could be directly related to socialization and communication (VAN WAELVELDE et al., 2010). In order to determine whether the functional motor abilities predict success on standardized social communication skills, 35 people with high-performance TEA were evaluated, among 6 and 15 years old. The results indicated that children with motor skills below that expected for age are more likely to have deficits in social communication (MACDONALD et al., 2013).

Thus, stimulation programs for people with ASD aimed at the improvement of manual skills and of attention can contribute to better school performance and promote greater independence, autonomy and greater chances of social inclusion.

The concepts and more comprehensive analyses of the motor and sensory evaluation could contribute, in a multidisciplinary context, to understand and to map out the best clinical procedures and more efficient treatment protocols (MIERES et al., 2012; RINEHART et al., 2010).

Some points in this study should be considered with caution and may be indicative of possible limitations of the study, such as the small number of people assessed and the evaluation procedures being performed by a single evaluator. All these descriptions could impact in the generalization of the results presented. New researches could help to better understand the assessment processes that are needed to understand the impairment of people with ASD and their repercussions throughout life.

CONCLUSIONS

The specialized literature highlights the relevance of studies focusing on motor aspects for people with ASD since several authors point out disadvantages compared to typically developing peers. The

instruments that are used for assessment of hand function are not validated for people with ASD, and studies like this will help to demonstrate what is the most effective for this analysis.

Based on the results, it was found that it was possible to apply the suggested tests in adolescents with ASD and that the most sensitive to this population was the JTHFT, followed by BBT. Moreover, it was observed that the Minnesota test is best performed by those who have higher cognitive scores. It is suggested continuing research with a larger number of participants in order to be noted the results in a greater proportion.

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COMMUNITY ODONTOLOGY AND FAMILY HEALTH STRATEGY IN DISCUSSION: Contributions and Challenges

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Abstract

This article discusses the way how members of a family, living in a socially vulnerable community, perceive their own health and the community dental practices performed by the Family Health Strategy. The context of the study is the axis on the condition of life of the care model, as recommended by the National Policy of Buccal Health that foresees the approach of the population from their familiar universe and from the social relations experienced in the territory. It is a social study of qualitative, exploratory and descriptive approach carried out in a municipality of Santa Catarina by means of collective interview and adjusted thematic analysis. By means of the category "Bonds in a community cultural reality", the data analysis revealed that both health and community dental practices are perceived through relations that express the subalternity, the intersubjectivity, the willingness to work, the bond with the evangelical church, life through arts, and sexual violence. The conclusion drawn is that materialization of the model of care, through the axis life conditions of the communities, requires the problematization of professional certainties generated by the hegemonic production of a technical scientism detached from the real life of vulnerable families.

Keywords: Education in Health; Community Odontology; Community-Institution Relations; Family Health Strategy.

1. Introduction

Over the course of the second half of the 20th century, public health services coexisted with several "Odontology Alternatives" to guarantee dental practices (SOARES *et al.*, 2017). A few historic and care models competed for the social space of the public odontology, by composing peculiar strands for the field, such as "Sanitary Odontology, Preventive and Social Odontology, Simplified Odontology, Integral Odontology (NARVAI, 1994; NARVAI, FRAZÃO, 2008; LIMA, 2017). These movements (LIMA, 2017) represented an advancement in the sector as far as they crossed the hegemony relations (MENDES, 1994) of the liberal and privatization model, in force since de 1920 decade (LIMA, 2017).

However, the historical moment of fighting for re-democratization required a broader movement with the purpose of operating a care model for buccal health in dialogue with the social health determinants: then, in the late 1980's, the movement of Collective Buccal Health (SBC) was born at the initiative of a collective of dentists who defended the inclusion of Odontology in the health policy arena. Since it also represented the theoretical anchor for the practices in the context of the Brazilian Unified Health System (SUS), the

SBC enters the 21st century like it did when it was established, that is, still disputing the “moral and intellectual direction” (GRAMSCI, 2007) of the dental practices with the private strand of odontology (SOARES *et al.*, 2017) in substantial expansion⁷ guided by a mostly technicality and a-historic care model (TESSER, PEZZATO, SILVA, 2015).

A new movement emerged in 2003, this time at government level, as one of the most inclusive policies of the Brazilian public health history: the Brazilian Smiling Program. Designed by the government of Luiz Inácio Lula da Silva, the program achieved the policy status the following year, by establishing the organization of the practices by means of the three levels of the SUS care: Primary Health Care, mean complexity and high complexity. The premises of this national policy were: qualification of the primary health care actions, guarantee of the integralities of the actions, performance according with the health vigilance, planning linked to epidemiology and to the territory information and stimulation to funding an agenda of researches grounded on scientific evidences (BRASIL, 2004).

Two years later, the Ministry of Health (MS) edited the National Policy of Primary Health Care (PNAB/2006), stating that the Family Health Strategy (ESF), established as the main operational modality of primary health care, could incorporate a buccal health staff to operate the expansion of the dental practices which till then were of care nature, towards the integral care of the individuals, families and communities. According with the PNAB/2006, the ESF buccal health staff is composed by a dental surgeon (C-D, preferably a specialist in family health), assistant and technician in buccal health, with a labor load of 40 weekly hours for all of them (BRASIL, 2006).

In 2008, the Department of Primary Health Care of the MS (DAB/MS) launched the Booklet of Primary Health Care of no. 17, as a guidance instrument of the dental practices. The Booklet described the life condition axis as a care basic axis because it was linked directly to the production of health and sickness. From then on, the need of odontology professionals to know their performance territory in the perspective of the historicity of their institutional arrangements, by taking into consideration its peculiarities and the relations between the people and the local institutions of cultural, religious, political and economic nature (BRASIL, 2008).

Fifteen years after the issue of the PNSB, a large part of the Brazilian communities have not won the right to the dental practices within the ESF yet due to several reasons, to mention a few of them:

- * The ESF itself does not have a national and universal character because it is invested of an inductive mode since its origin, by means of incentives from the federal government, being dependent on the willingness of city mayors. In 2016, the coverage of the Family Health Strategy was of 64%; 14 states showed a coverage between 75% and 100%, while 11 states, between 50% and 74.9%; São Paulo and the Federal District showed coverages lower than 50% (NEVES *et al.*, 2018). It is worth pointing out that 100% coverage in a state does not mean that all the communities of all municipalities are covered.

- * The adhesion to the ESF with buccal health may exist in several municipalities since the incentives are always attractive but adhering does not mean betting in fact in this operative care modality for and with the territory;

- * The absence of an effective pact of accountability among the federal entities to promote the sector based on universality and equality (RIBEIRO, MOREIRA, 2016);

- * The unequal conditions among the 5,570 subnational governments in terms of fiscal, government and resources capacity (RIBEIRO, MOREIRA, 2016); and
- * the lack of institutional information and communication about the won right.

To these reasons, there is the addition of the austerity measures taken in 2016 and 2017 that designed new configurations for the execution of the primary health care.

The new Fiscal Regime, within the context of the Fiscal and Social Security Budgets of the Union, established by the Constitutional Amendment nº 95/2016 reduced the social expenses per capita until 2036 (BRASIL, 2016). Over 20 years, the MS budget will be readjusted only by the inflation calculation (measured by the National Index of Prices to the Broad Consumer).

The recently approved Labor Reform has established new labor relations where it is worth mentioning the legitimization of outsourced work for core end-activities of the State and the flexibilization of the working day hours through the creation of the intermittent contract (BRASIL, 2017b).

In fine tune with the Labor Reform, the second revision of the PNAB/2006, provided by Ordinance no. 2436 of 2017, recognized the strategies for the AB compatible with the flexibilization of the working day hours; it has rendered the municipal induction of the ESF difficult by opening space for the mayors to choose strategies that do not require 40 daily hours from the professionals; and, it has conditioned the implementation of enlarged standards of care to the willingness of the municipal managers, among others (BRASIL, 2017a).

The new text favors the return to the care odontology because the labor force may be guaranteed by intermittent contracts. Upon aligning itself with the New Fiscal Regime and the Labor Reform, the PNAB/2017 opened the doors to the possibility of returning the packages of selective public services, poor services for poor people and, in effect, to the possibility of increasing the distributive inequality of actions and services in the Country. The product may be a deep reversal of the right to health, in the field of practices.

These historical and conjunctural facts point out to the need of discussing community odontology within the ESF by taking into consideration the perception of the individuals, families and communities about their own health and the practices offered to them.

This article discusses the way how members of a socially violated family living in an occupation zone of a municipality from Santa Catarina perceive their own health and the dental practices offered by the community dental services performed by dentists of the ESF program. The context of the study is the life condition axis of the care model, as recommended by the National Policy of Buccal Health.

2. Methodology

It is a study of qualitative, exploratory and descriptive approach carried out in accordance with Resolution 466/12 and approved by the Ethics Committee of *Vale do Itajaí* University, SC, by means of the CAAE 76930417.9.0000.0120.

The empirical *corpus* comprised a family dwelling in a violated territory of a big-sized municipality of Santa Catarina. The choice of this territory type derived from the fact that the people who constitute it are inscribed, from the perspective of the Protection Bioethics, in a “broad context that can be qualified as that

one of shortage situations – which are those where, indeed, the “susceptible” and “violated” ones must live (SCHRAMM, 2017).

Two instruments have been utilized to collect the data: field diary and collective interview. The first aimed at registering the methodological path and the non-verbal manifestations expressed by the participants (MINAYO, 2014). The second was applied with the objective of giving the opportunity to the collective expression of thoughts by the people who live in similar material conditions of existence (ZANETTE, 2017).

In order to establish the strategies of entrance in the territory, a meeting was scheduled with the coordinator of Buccal Health of the municipality when he was requested to suggest the indication of a violated neighborhood. The coordinator indicated an area where there was an occupation zone and informed the telephone number of the health community agent (ACS) responsible for the respective area. The ACS was invited to participate of the visit and she promptly accepted the invitation.

Next week, the field work took place. The occupation zone was composed mostly by wooden houses without basic sanitation. The main street was not paved, there were many holes with rain and sewage standing water where several bare feet children played flying kite. Many dogs were around and at this occasion a campaign of free castration was taking place in the neighborhood. At the end of the street, there was a deposit full of garbage with houses nearby. As per the ACS, most of the occupation zone dwellers worked with a cooperative of informal garbage collectors from the area.

The family appointed by the ACS lives in a lot where there are two houses: one in the front, a single room dwelling and another in the back, a wide home with living room, bedroom, kitchen and bathroom. The backyard house is inhabited by an elderly woman (P1), her daughter (P2) with her son (P3), his wife (P4), three school-aged children and a baby. The front single room house apparently without bathroom is occupied by P5, the second daughter of P1.

In the meeting, women P1, P4, P5 and the children were present. The interview was made in the backyard house after the signature of the free and informed consent. It lasted 50 minutes and was registered in audio and transcribed afterwards.

The data were analyzed by means of the content analysis of the adapted thematic type, guided by the meaning of the apprehended arguments and ideas, independent of the number of times when they manifested themselves (MINAYO, 2014).

At first, attentive readings have been carried out aiming at the certification of the representativeness of the content. Once it has been proven, free readings were made with the objective of getting hold of the gross material (MINAYO, 2014). Next, the units of register and context were selected for further attribution of codes. Once the material has been coded by use of semantic criterium, one reached the step of grouping per analogy (MORAES, 1999). Finally, the material was explored from a transversal point of view in order to categorize it (MINAYO, 2014).

From this process, emerged the analysis category: “Bonds in a community cultural reality”.

3. Results/Discussion

Based on the category: “Bonds in a community cultural reality”, the results are introduced and discussed afterwards by exhibiting the selected register units in dialogue with the theoretical framework and related currents of thought.

The interview was opened with the question that is the basis of the instrument: How is your life going?

P4 answered it promptly with another question: *May one complain?* Among laughs and looking at the ACS, she added: *[...] oh yeah, it's good [...] but I have to make an appointment for Alex, he has high blood pressure [...]* (P4).

The answer of P4, although apparently simple, seems to carry a complex social representation: that, before the health professional, the answers about life not rarely address issues regarding diseases; in this case, the problem of hypertension of the son.

In an essay about the development of an individual in the social relations, Pierre Janet is mentioned, whose conception of language has, at the same time, “a representative function [...] and a stronger status [...] for the participation in the planning of individual actions; [through] language, the individual prepares an act to be consummated” (GOES, 2000). From this perspective, it can be that at the moment of elaborating a thought to answer the question “how is your life going?”, there was a representation in the imaginary of P4 previous to the one that she executes in the daily life: the representation of the need to take her son to the UBS.

This answer can also be interpreted in the perspective of its subjective character, of a subjectivity dialectically tied to the experience of the real world (SEPPILLI, 2011). Of a world that more and more distributes less its richness (SHORROCKS, DAVIES, LLUBERAS, 2014), where “the cultural patrimony of the subaltern strata results strongly determined “by the top”, based on the role that they have to perform in the ‘perfect’ reproduction of the social system inside which they must continue to be subordinate” (SEPPILLI, 2011, p. 906).

Over the two first decades of the 21st century, almost at the end, the biggest and the most progressive distinction among the individuals of a same society is the gap of wealth distribution imposed by the capital accumulation of a few ones (SHORROCKS, DAVIES, LLUBERAS, 2014).

A study carried out in Aveiro, Portugal, with the objective of learning the perception of poor families on which solutions were scheduled that foresaw reaching their life targets, has signaled that these targets are focused in the improvement of dwelling and health conditions (SOUSA, RIBEIRO, 2005). In other words, life conditions do not depend of efforts by the involved subjects, but of the country policy. In the most developed European countries, the social democratic capitalist ideology nourishes the Social Welfare State and, indeed, the dream of improving dwelling and health conditions. As to countries of neoliberal ideology, like Brazil since the 1990's, where “the economic elites identify themselves with international elites, and not with the people” (BRESSER-PEREIRA, 2018, p. 27), the dream for such improvements are in the horizon line.

A study on health and quality of life, carried out with 150 low-income adults, out of which 84.7% were Afro-Americans and 15.4% belonged to other race or minority ethnicity, has shown that “subjective perceptions of health in low-income individuals might be a better indicator of the quality of life than the presence of systemic alterations” (SCHULER, 2015, p. 225). In this regard, being able “to complain”,

laughing and looking at the ACS, may be signaling to life, interaction, inter-subjectivity within the care micro policy, considering that the ACS has power of dialogue in a territory with high vulnerability.

When questioned about things of the day-to-day life that made them to feel sad, P4 said that, in principle, [...] *nothing*; but, afterwards, she mentioned [...] *lack of money*. This speech was uttered with the eyes turned towards the ACS, as if calling her to participate of the talk. After a symbolic silence, ACS expressed herself; it seemed however that she wanted to say other thing: [...] *yeah, I know, lack of money makes you feel sad, doesn't it?* (ACS). From this moment on, ACS became integrated into the family, by reaffirming that it is in the setting process that the qualitative research effectively develops.

After ACS has entered the conversation, P4 added:

[...] if Alex will feel well in the nursery, I think I will be able to work next year [...] yes, I will be able to work [...] oh, I loved it, I did not go through what I am facing now [...] oh, I could unwind and clear my mind, I left in the morning and came back in the evening, I had peace in my life when I worked. I used to work, nothing lacked for my son, and now I face difficulties, you see [ACS]? (P4)

At the transversal analytical level, in the above speech, it is possible to recognize the response to the previous question, "how is your life going?". Willingness to work, succeeding in the job, providing conditions of life to the children; it seems this is how life goes for P4. P4 demonstrates in the intonation of her language that she had life peace when she worked and that nowadays peace is not a reality when she stresses how important it is to work. It should be highlighted that this statement only took place after the ACS intervention.

Regarding the ACS role, it is worth emphasizing that a research-intervention carried out in a Family Health Unit of a small-sized city from the south of Brazil discussed the possibilities and challenges of the ACS's performance, by taking as basis the National Policy of Popular Education in Health. The authors point out that the ACS's job maximizes the actions of the Popular Education in Health because it lies between the popular knowledge and the technical expertise (MACIAZEKI-GOMES *et al.*, 2016). That is, the shine of the ACS's job is in its ability to respect and to unveil the people's knowledge because the ACS's are genuine people and, in the dialogue with such knowledge, it is possible to operationalize the technical expertise in a community context.

When asked if they had the habit of getting together with the neighbors, P1 said: [...] *I talk with the pastor [...] Here in this area, the rule is every man for himself and God for all [...] Each one manages as he can.* And P4 stated: [...] *I never got together with the neighbors [...] with my mother, yeah.*

The above question aimed to know if they, to some extent, talk about their problems and/or the community problems, if they participate of a resident's association or of a local health council. The answer allows perceiving that the dialogue takes place with the *pastor* or with the *mother* showing that the religious and the maternal bonds are the ones that bloom in the interviewees' life to discuss problems; that the cultural reality does not contemplate the debate on community problems neither the solutions for the improvement of the community life conditions.

The analysis of the two case studies about the power of faith and the miracle of power signals that the Pentecostal movements have won the popular grassroots extensively to their churches through the

evangelic mediators and their sermons and dogmas. The central core of this achievement at present seems to be in the capacity of the mediators and pastors to transform and to displace borders in their eagerness to reach what could be named as a “sensitive key [...] the assessment of the political leadership of the “men of God”, in specific social contexts – because they are subaltern -, where they warn that “they condemn the lack of horizons of those who practice blindly the obedience to the laws of men” (BIRMAN, 2012, p. 135). It might be that the experience with the pastors works as a constraint of health and disease of subaltern individuals to some extent.

It is worth mentioning that the transversal analysis of the material allowed recognizing another community connection of P1, besides the bond with the *pastor*: the CRAS, the Reference Center of Social Care, the entrance door into the Social and Care Network, located in areas of higher social vulnerability and responsible for the execution of services, programs and social projects developed by the Union, the States and the Municipalities. While a public space of territorial basis, the CRAS works as a basic unit of the Unified System of Social Care – SUAS. Its objective is working on the reduction of social risk in the territories, by stimulating the strengthening of the family and community bonds besides the expansion and the guarantee of access to the citizenship rights (SÃO PAULO, 2019): *When one has some problem or one needs help, the CRAS is there [...]* (P5).

The speech of P4, where the mother appears as partner to discuss problems, was completed with the following statement: *Oh, on Thursdays I attend the handicraft course when I enjoy myself, I laugh, I play [...] oh, we enjoy ourselves there.*

The above statement exhibits life through arts; arts while a space of expressing feelings, freedom, promotion of bonds and health. A study carried out with a handicraft group of a Health Primary Unit of Maringá, Paraná, made in 2009, searched to understand the users' motivation to participate of the mentioned group. The women unveiled a daily routine crossed by various needs, i.e.: of having somebody to share pains, flavors, anguishes, experiences, fears; of interacting and feeling herself valued in the relation with the other side of herself. Belonging to this group represents escaping from the routine, sometimes, tiresome and gloomy (SCARDOELLI, WAIDMAN, 2011).

The meeting of P4 with laughing, having fun, playing through the handicraft course, seems to convey her to a space of right, although not with her recognition. And the labor force of a UBS has an important role in supporting the recognition of this space: how can the UBS workers contribute? A fertile path is the one of politicization of the daily work: with political will, the dentist, for example, can produce historical consciousness (BERLINGUER, 2012), in the work relations; in this case, promoting in P4 the recognition of the space of handicraft meeting as a potential space to discuss issues about the neighborhood, to foster the debate on social rights, and among these, the community participation in local decisions.

When asked how they perceive the UBS services, P1 reported: *[...] look, they have helped me, me particularly whenever I needed support, I always received help from the health care service [...]*.

The speech reveals welcome from the UBS, but in the sense of help, and it maybe signals that P1 did not know that once she belongs to the territory where she lives, the Unit is hers, it belongs to the community and being welcome is a right of hers.

A report on the experience about the implementation of welcoming in an ESF staff of a UBS from a municipality of Santa Catarina (VIANA, LIMA, 2018) told about the place that the welcoming act occupies

today within the Strategy: welcoming has been constituted of a programmatic action guided by procedural steps in view of the progressive increase of needs and demands.

When asked if it has been easy to obtain treatment with the dentist in the health care “service”, P4 said:

Yes, when I was dying of pain, I needed it and I was attended very well thanks God. The dentist said that I had to have the tooth pulled out because I had not finished the treatment of the root canal that I started long ago. He is going to make the appointment to pull it out and I will have to put another one (tooth) because I do not want to become toothless, can you imagine it. It's the one in the front, woman, how can I become toothless? My children will not even look at me, I am not beautiful and how can I become toothless? (smiles) It is not possible, isn't it? [...] I know that in that other place [CEO] they make those dentures, full bridgework, for elderly people.

Again, P4 resorts to laughing to manifest pain. A pain which is generated by excluding macro-economic policies, by lack of life conditions, by unfair and avoidable inequalities, by government neglect, by lack of work, by lack of opportunity to succeed in life, by low self-esteem, by seeing the hungry children, by the dentist, by the health system, by the capital force.

The Brazilian society has won the SUS, but the great society mass is not the owner of the System. It has won the Smiling Brazil; after 112 years of tragic slow pace, a federal government recognized the right of people to move their lives ahead with teeth. It won the National Policy of Primary Health Care (BRASIL, 2006; 2017a). It won the regulation (BRASIL, 2011) of the Health Organic Law (BRASIL, 1990), the regionalization of the System, although by decree: of no. 7,508 of June 28, 2011 (BRASIL, 2011). However, from the early Old Republic until today it has not won a Social State which treats social rights as non-negotiable and recognizes that only a healthy and fair society can produce economic wealth; that recognizes that in the poverty line and below it no person will look at himself/herself as a subject with dignity and citizenship and with conditions to get up every morning and to produce richness to the Country. The teeth or the lack of them reflects the political economy. The Brazilian context of deep social inequalities is also expressed “in the mouth”. The resource of extraction removes the local symptom, yes, sometimes unbearable, but it is also “a strategy that produces a [...] condition of vulnerability: of not having teeth, as a consequence of the treatment plan of dentists”. Upon producing violated individuals, the resource of extraction produces “a false expression of the political economy in the subject and it creates the illusion of re-establishing the health” (COSTA *et al.*, 2013, p. 466). It only lacks [to place] *another tooth, or [a] denture*.

When asked about the access to the dentist over their lives, P1 answers with a report of violence:

The first time I went to the dentist [...] he wanted to abuse me and my minor sister there, we never went there again [...] I was 13 and she was 10 [...] he wanted to kiss us in the mouth [...] he touched our breast with his hand [...] then we did not go there anymore [...] we had the trauma of going to the dentist, you understand? Then, when I went there, I wanted to pull 4, 5, out once so that I did not have to go there often [...] I was 25 when I had my first denture [...].

In the search for the perception of their own health and dental practices, sexual abuse has been evidenced. The relationship between the interviewers and the report showed that P1 had already overcome, to some extent, the episodes of violence, experienced in the early years of adolescence. Her understanding that it was violence occurred in the same time when the episodes took place because she states that: [...] *I have had sexual education at school [...] they (the teachers) also taught it.* The sexual education was probably of great value because notwithstanding the unsurmountable fractures in her intimate tissue, she could recognize that the way of attending was configured as abuse. She could protect herself and her younger sister, when she decided to extract all her teeth at once to expel the need of returning to the dentist.

A review of 2015 about sexual violence practiced against children and adolescents systematized technical contributions from several researchers who study the theme. The author's objective was to shed some light on the possible consequences of this form of violence. Findings signal that the consequences of sexual abuse are "extensive and diverse to the victims"; that especially doctors, psychiatrists, psychologists and sociologists have made efforts to gather elements that might outline intervention proposals by respecting each one's singularities. The author comments, yet, that "it is not possible to generalize or to delimitate the effects of sexual abuse perfectly once the gravity and the extension of the consequences depend on the particularities of each victim's experience" (FLORENTINO, 2015, p. 144).

Finally, new qualitative studies with families undergoing vulnerability are recommended as a way of understanding life mechanisms and movements in subaltern classes that are apart from the right condition of having rights.

4. Considerations

The article identifies and discusses the way how the members of a socially violated family, living in an occupation zone of a city in Santa Catarina perceive their own health and the dental practices of the ESF. Grounded on the category "Bonds in a community cultural reality", the data analysis revealed that both health and dental practices are perceived through relations that express the subalternity, the intersubjectivity, the willingness to work, the bond with the evangelical church, life through arts, and sexual violence.

The conclusion drawn is that the materialization of the care model, through the axis of life conditions of the communities, requires the problematization of professional certainties generated by the hegemonic production of a technical scientism detached from the real life of violated families.

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RURAL CREDIT IN FAMILY AGRICULTURE

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Abstract

Rural credit in family farming, as an instrument of leverage for growth in agricultural production, plays a fundamental role in fostering the local economy. Thus, this shields small farmers against market competitiveness. Hence, this study aimed to analyze the perception among rural producers of agricultural credit in family farming as an instrument for strengthening their productive capacity, income distribution in rural areas and the promotion of farmers' quality of life. For this, bibliographic research and a field study were carried out, collecting data through interviews with small farmers who are members of an association of small producers in a Brazilian state in the Amazon region. The results show that rural credit has a strong influence on the local economy and is this important for family farming. A credit line already served all the respondents and 70% stated that between 91% and 100% of the resources used in production were originally bought on credit and unanimously said that rural credit had an impact on increasing income and income production.

Keywords: Rural; Credit; Family farming; Development;

1. Introduction

This reflects the thinking of Schneider, Mattei and Cazella (2004), who see rural credit in family farming as its method of strengthening productive capacity, contributing to job creation and income distribution in rural areas and promoting farmers' quality of life.

According to Lourenzani (2006), small farmers are responsible for increasing the supply of their products, most often in a new form, mitigating food shortages and contributing to the lowering the cost of the basic food basket. However, Mattei (2014) states that the distribution of rural credit was not always like it is today; this view is adopted by Souza (2017), who reports that no public policy at all the national level met the needs of small producers until the end of the twentieth century. To promote the growth of family farming in the country, the National Program for the Strengthening of Family Farming – PRONAF – was created in 1996 and was very soon successful.

Family farming plays a significant socio-economic role in Brazilian agribusiness, as can be evidenced by data from the Ministry of Agrarian Development (MDA) (BRAZIL, 2017) that directly links Brazil's economic growth to family farming. The reason is that food production is geared to feeding the country, including the urban population and generating jobs and income for small farmers. Given the need for a better understanding of the use of rural credit, this study presents the following research problem: what is the perception of agricultural credit among the food producers?

Following this research problem, the general objective of this study aimed to highlight the perception of rural credit among food producers as a driving force for agricultural activity, in investment, costing or in the commercialization of production.

The present study had the following specific objectives: to describe the producers' profile; identify the main credit lines that are available for the promotion of family farming for ASPRUV (Association of Small Rural Producers) producers; verify the percentage of resources used in the production that comes from rural credit; and identify the advantages of agricultural credit in the processes of family agriculture.

The study is justified by the relevance of the theme, which contributes more to existing work and the direction of future research on this vast subject than agribusiness accounting, especially in issues related to rural credit. Since the methodology of applied research is characterized as exploratory-descriptive in its approach and is classified as qualitative with quantitative aspects, the method to be used is deductive.

This is an applied research study because it looks for answers or generates knowledge regarding current problems. The procedures are classified as bibliographic and field research, in which interviews were used as the data collection technique, with semi-structured questions put to farmers in the Association of Small Rural Producers (ASPRUV), located on line P / 18 Velha, KM 03, municipality of Santa Luzia D' Oeste / RO, at its regular meeting on the 1st Thursday of September. Finally, the data were processed by content analysis using electronic tools.

2. Brazilian Rural Credit Instruments

In a situation where capital is scarce, such as most family farmers experience, the observed result of effort often provides minimal gain, which may be little more than its cost and, not infrequently, is less. In this context, Rural Credit has been one of the leading public policy instruments for the promotion of family

farming.

Rural credit is an instrument that allows farmers to equate the ratio of personal consumption and inputs to production, whether their income is continuous or seasonal. This feature also allows farmers to invest in fixed and human capital, thus making it easier to modernize and innovate (Miranda, Lemos and Bittencourt 2013). In Brazil, the body responsible for the creation, or elaboration of the rules and description of the purposes and conditions is the Central Bank of Brazil, which establishes the directives that must be followed by all agents that compose the National Rural Credit System (SNCR). Established by Law No. 4829/65 and governed by Decree No. 58.380 / 66, rural credit aims to promote agricultural production, within the criteria, guidelines and instructions for granting rural credit.

According to the Ministry of Agriculture, Livestock and Supply (MAPA 2016), rural credit is considered to be a costing modality whose resources are intended to cover such regular expenses as the acquisition of inputs, payment of labour, etc., for one or more periods, whether the product is agricultural or livestock. Investment credits are resources invested in goods or services whose enjoyment takes place over a more extended period; that is, over years.

Currently, the main credit instrument in Brazil is the National Program for Strengthening Family Farming, PRONAF, created in 1996. Its main objective is to provide financial support to agricultural and non-agricultural activities carried out in rural establishments or nearby areas, generating income and increasing productivity in family farming. The lines offered by this program are listed in Table 1 below:

Table 1: PRONAF Credit Lines

Pronaf Costing	Purpose: to finance expenses related to production costs, strengthening agricultural activity, provoking profitability and qualifying family labour.
Pronaf costing and marketing for family agribusiness	Purpose: to support the processing and industrialization of production, the acquisition of inputs, packaging, stockpiling, marketing support services and advances based on the price of products intended for sale.
Pronaf agroindustry (income aggregation investment credit facility)	Purpose: to meet investments in infrastructure, trying to reach the processing, storage, processing, marketing, forest products, extractivism and the exploration of rural tourism
Pronaf Woman.	Purpose: to meet proposals from rural women, associated with a technical project or simplified proposal.
Pronaf Agroecology	Purpose: to finance agroecological or organic production systems, covering the implementation and maintenance costs of the enterprise.
Pronaf echo	Purpose: to finance investments in renewable energy technology, conservation practices, water storage, acidity correction and soil fertility.
Pronaf more food	Purpose: to serve young people, encouraging their stay in the countryside by providing the implementation, expansion or modernization of the structure of production activities, storage and transportation in the rural establishment
Pronaf Microcredit	Purpose: to modernize the production and service infrastructure

(Group B)	developed in the rural establishment, whether in agricultural or non-agricultural activities.
Pronaf Forest	Purpose: to finance technical projects focused on agroforestry systems, ecologically sustainable logging, forest management plans, the enrichment of areas that already have forest cover and the recovery of degraded areas.
Pronaf Quotas - Parts	Purposes: to promote the payment of quota shares by Pronaf beneficiaries associated with cooperatives and to provide cooperatives with working capital, funding, investment or sanitation.
Pronaf Semiarid	Purpose: to promote sustainable investments by implementing and expanding, restoring, or modernizing productive infrastructure, focusing on the sustainability of semi-arid ecosystems.
Young pronaf	Purpose: to serve young people, encouraging their stay in the countryside by providing the implementation, expansion or modernization of the structure of production activities, storage and transportation in the rural establishment.

Source: Central Bank of Brazil (2017), adapted by the author (2018).

According to the Central Bank (2017), the PRONAF modalities in 2017 ranged from 2.5% to 5.5% per year, making it clear that the interest rates charged are the lowest compared to the lines financing, such as overdraft and personal loans, with rates of 359.94% per year, 112.66% per year.

3. Family Agriculture in Brazil

Family farming has contributed dramatically, especially in peripheral regions, to the Brazilian economy, generating jobs, foreign exchange and the commercialization of various products and fostering the economic growth of families. Corroborating this view, Lima and Wilkinson (2002) confirm that family agricultural activity providing opportunities for social work, contributes to men's choosing to remain in the countryside and to the development and sustainable growth of small and medium-sized municipalities, diversifies production systems, and empowers environmentally responsible businesses.

According to Miranda, Lemos and Bittencourt (2013), granting agricultural credit is a strategy to accelerate economic growth, which increases technical efficiency, allows rural producers to purchase more farm machinery and implements and gives them access to assistance with techniques in the field.

4. Methodology

The study is characterized as applied research following the deductive method, taking a qualitative approach with quantitative aspects. It is qualitative in verifying the use of rural credit in the production processes of family farming; it uses semi-structured interviews; and it is quantitative when it transforms

the information collected from the farmers into numbers.

The research has an exploratory, descriptive character, which is concerned with knowing, in theory, the possibilities of categories and then classifying, describing and comparing the data collected in the interviews along the lines used by Nascimento et al. (2018).

Following the understanding of Piacentini et al. (2018), the qualitative approach seeks to discover and classify variables based on their relationship. The exploratory objective seeks familiarity with a theme to make the problem explicit. In its procedures, the present research is classified as bibliographic and field research, observing the precepts that SILVA (2017) advocates. Twenty farmers were given semi-structured questionnaires in interviews at the headquarters of the Association of Small Rural Producers of the Municipality of Santa Luzia D'Oeste in Rondônia - ASPRUV. Content analysis was employed on the data with the help of electronic tools such as Word and Excel and then they were grouped according to the degree of similarity and the objectives established.

5. Results Analysis and Discussion

To characterize the study participants, it was first observed that the most representative age group, representing 35% of the respondents, was between 41 and 50 years old. 35% of the respondents had completed elementary school, followed by 25% whose course at the elementary school had been interrupted. Only 5% had attended higher education, on an agronomy course, but they had not completed this. Thus, the vast majority were illiterate or poorly educated. Still, according to Table 1, they had been working for some time as rural producers in the field of agriculture, but 30% ranged between 30 and 40 years old, which shows that they had been producing food while the scheme was in operation.

Regarding the family groups of the interviewees, initially based on the data presented in Table 2, it can be seen 50%, the largest group, are in households of 3 to 4 individuals, followed by 30% with 1 to 2 individuals in the household. From Table 2, we can see that the largest group of interviewees come from the south, corresponding to 30%, followed by those from the Southeast and Northeast regions, both 25%. 75% of them stated that they were married.

Regarding the activities performed by the producers, 65% had the care of livestock as their primary activity, 35% were engaged in agriculture and 24% in fish farming. The cattle ranchers also reported secondary activities to supplement their income, such as cattle-raising and agriculture. Asked about the products of their work with livestock, 55% of the respondents produced milk and only 10% beef, but 35% said they produced both. These results corroborate the view of Lourenzani (2006) in line with the thinking of Portugal (2002): that family farming plays a significant socio-economic role in agribusiness, in terms of the diversity of production for which family farming is responsible, such as certain items that make up the basic provisions for the nation, such as beans, rice, corn, vegetables, cassava, etc.

Regarding income, 60% of the respondents stated that the average family income includes between one and two minimum wage-packets, followed by 25% who answered that their average comprised between 3 and four minimum wage-packets and 15% whose income was less than the minimum monthly wage. The importance of rural credit in family farming is that it drives the acceleration of rural development, which, according to Lourenzani (2006), liberates resources that will be used to fund, invest in and commercialize

production.

In this regard, when asked about the use of a credit line, all the study participants stated that, in addition to having the intended use returned, the interviewees pointed out that the financing of the activity increased yield and productivity by 40%, 25%, 20% or 15%. The credit line most often used by producers was “Pronaf Custeio” (70% had used it), followed by “Pronaf Mais Alimentos” (30). This shows that the producers perceived rural credit as a propellant to agricultural activity, helping to determine the modernization of agriculture allied to economic growth, either by the promotion of investment in infrastructure, by stimulating new rational methods in the production system or the preservation of the environment and the correct use of land.

According to Leite and Wesz (2014), rural credit has become a tool for transforming and innovating in the agribusiness sector; this capacity was observed by the interviewees. Rural credit impressed 70% of the respondents, who perceived more and more keenly the impact made on the increase of production and income. 20% of them reported an increase of income and 10% had noted a growth in output. This confirms the view of Miranda, Lemos and Bittencourt (2013), who regard the granting of agricultural credit as a strategy to accelerate economic growth. It increased technical efficiency, allowed rural producers to purchase farm machinery and implements and gave them access to technical assistance in the field. The information collected from the farmers into numbers.

6. Conclusion

The general objective of this study was to highlight the farmer's perception of rural credit, within the criteria, guidelines and instructions for granting credit, as a driving force for pastoral activity, in which it has become an indispensable tool in the modernization of Brazilian agricultural business. It has guidelines aimed at promoting rural production, providing leverage for the growth and expansion of activity, with a mission to strengthen productive capacity, generating employment and income distribution in rural areas and promoting the quality of farmers' lives.

The information obtained from the farmers shows that all had made the use of a credit line and intended to use it again, to finance activity at low rates of interest. This indicated their perception of credit: 70% of the respondents stated that between 91% and 100% of the resources used in production originates from confidence and unanimously acknowledged that the interest rates favoured the use of rural credit.

Thus, corroborating the importance of rural credit in family farming in the view of agricultural producers, it was found that 100% of the respondents agreed that rural credit had some impact and 70 % of them said that it had the effect of increasing production and income. From the above, it may be concluded that rural credit promotes the growth and expansion of agricultural activity, strengthening its productive capacity. Finally, for future studies, such research is recommended in other areas of business, as well as in different municipalities of the State of Rondônia, to reveal more about the role played by rural credit in family farming.

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INFLUENCES ON CONSUMERS' DECISIONS TO BUY NEW CARS IN CACOAL, BRAZIL

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Abstract

Regardless of the changes in the economy of the country in recent years caused by the global financial crisis, Brazil has managed to stand positively, despite the many variations in the national and international economic scenario. In the rise of the economy, the automobile sector was a prominent contributor, making it more advantageous for a consumer to purchase a new vehicle. This article aims to study the factors in the city of Cacoal that influenced a consumer's decision to buy a new car. The methodology was descriptive research, using the deductive method, a qualitative and quantitative approach, and bibliographic research. To collect our data, we used a questionnaire containing 14 questions, some semi-open and some multiple-choice closed, sent in a link via email and Whatsapp, with the help of the Google Forms tool. In our results, it was observed that a consumer's buying behaviour receives influences from both the external environment and the social group, both of which have a direct impact on the process of deciding to buy a new vehicle. The digital media, in the form of specialized electronic magazine websites, have become

popular for consumers to consult. It was found that consumers researching in order to make a purchase decision consider the following decision factors first: quality, trust in technical assistance, confidence in the brand, safety and finally price. To a consumer looking for a new car these items are found to be the most important. The present study aims to set the parameters for future studies and to justify an interest in research.

Keywords: Behaviour; Consumer; Automobiles; Purchase;

1. Introduction

Despite the changes in the economy of the country in recent years caused by the global financial crisis, Brazil has managed to stand positively, notwithstanding the many variations in the national and international economic scenario. As a result of its stability during the period between 2008 and 2010, the Brazilian economy advanced.

A prominent contributor to this advance was the auto sector, which was the main concern of the government in the crisis period; it became much more advantageous for a consumer to buy a new vehicle.

However, national traffic control agencies have focused their speculation on the growth in the number of motor vehicles on Brazil's roads, since there is not enough infrastructure to accommodate this growing and constant demand.

Each year thousands of cars of all brands roll on to the streets of its towns and cities; meanwhile the numerous strategies launched by the automakers to empty their stockrooms make the fate of the army of used cars a matter of doubt.

The general objective of the present research was to analyze the factors that influence a consumer's decision to buy a new vehicle. To this end, the following specific objectives were enlisted: to identify the socioeconomic profile of consumers of new cars in the municipality under study; to study consumer buying behaviour when buying a new vehicle; and to analyze the main consumer influences on the purchase of a new car.

2. Theoretical Foundation

2.1 The Consumer

Art. 2 of the Consumer Protection Code conceptualizes a consumer as an "individual or legal entity that purchases or uses a product or service as a final recipient". However, this concept in the Code has led to an innovation in terms of international law, because a legal entity is not considered a consumer in any country, but this code brings in the consumer as a legal entity. This interpretation reduces the figure of the consumer to a person who purchases and uses a product for his/her family's use.

Given this change, it is noted that the consumer as an agent who makes decisions is no longer the individual but the family. Broadly speaking, a consumer is someone who enjoys a good or service that meets a need, whether essential for survival or not linked to any necessity, but merely an act driven by an exercise of marketing.

Solomon (2008) defines consumers as organizations or groups, in which one or more people can decide to

buy a particular product that can be used by many. Hence, in other organizational situations, buying decisions can be made by a large group of people. In a general context, consumption should be considered as an act of purchase with a view to consume, but it is necessary to define the term 'consumption' as 'the act of buying without the intention of reselling what was acquired'.

If this definition is accepted, industrialists, intermediaries, and dealers are excluded from the category of consumers because consumers are more commonly characterized as individuals or collectives that purchase goods or services, whether public or private, which may be used for private, individual or collective purposes.

2.2 Consumer Behavior

Art. According to Paul and Olson (2009), consumer behaviour can be defined as the dynamic interaction between affect and cognition, behaviour and environment through which humans conduct actions related to barter exchange, where traders use the goods that they own to bargain before the creation of financial securities. There are several ways to analyze consumer behaviour in making decisions about a particular good or service, methods during which the manufacturer and/or seller inserts ideas into the consumer's mind before s/he buys a product or service.

The human body responds to the subliminal stimuli of its human consciousness, which are deeply capable of affecting the subconscious and, in turn, an individual's opinion about a particular item (FREITAS; PITZER; AZEVEDO, 2009).

According to Solomon (2008), many marketers recognize that behaviour is an ongoing process and is not restricted to what happens when the consumer gives the money or uses a credit card and in return receives his merchandise or service contract.

2.3 Decision-Making Process

Consumers have specific needs, often affected by variables that directly influence their decisions. As influencing factors they are usually added to the daily experience of consumers. There they act quietly, but decisively, in the process of making choices to meet needs and wants as a consumer.

According to Cobra (2009), the consumer is exposed to the strong impact of marketing devoted to the purchase of brands of all categories of product by extolling one or more of them in the market, and persuading a consumer to buy it.

This makes the main task of the marketer who wants to find the best place in the market despite the competition to ascertain and understand what happens in the buyer's conscious mind between the arrival of the external stimulus and the buying decision.

Alves (2010) mentions that individuals seek their fulfilment when they are motivated by internal stimuli, i.e. the stimuli that individuals have within themselves. These stimuli, sometimes called internal motivation, are caused by the prospect of pleasure, profit, self-esteem, or of avoiding pain or preventing loss; they depend on social approval or external factors such as personal factors, social factors, or the living group into which they are inserted, or cultural factors such as beliefs and experiences passed on to the individual by the family.

2.4 The Automotive Sector in Brazil

Consumers According to Botelho (2008), the first automobile manufacturer to settle in Brazil was Ford Motors do Brasil in 1923, followed in 1925 by General Motors do Brasil, better known by the acronym GMB. Both started their activities in São Paulo; initially, the companies were only assembly plants, together with maintenance services for their products.

Brazil began the twentieth century with about 18 million inhabitants, and a demographic density of 18.2 inhabitants per km². In this period technological advances led to the full use of production lines in the commercialization of goods and services; large urban nuclei begin to appear, forming population conglomerates and bringing more businesses that would require specialization into sectors at all levels.

Botelho (2008) mentions that in 1953 the Brazilian government opted to levy taxes on heavy-duty and imported vehicles, to minimize the cost of importing automobiles. Since automotive items and components were the most extensive imports, this measure to restore the balance of trade.

In recent years, the increase in consumer income in Brazil's economic expansion, has helped to leverage and accelerate market growth and consolidate the presence of famous car manufacturers in the sector's sales (SANTOS; SOUZA; COSTA, 1995). But before 1990 the Brazilian automobile market was closed to vehicles imported from other countries, generating a domestic monopoly.

This meant that companies supported by a market closed to external competitors were not concerned about the quality or price of their vehicles. They had such control of an uncompetitive market that they never worried about the welfare of the consumer (BOTELHO, 2008).

Cardoso (2000) notes that the function of quality inspector of Brazilian cars as they leave the production line is showing a slight tendency to become extinct. According to Godoy, Loreti, and Monteiro (2010), however, the recent world economic crisis observed and felt by countries such as Brazil forced the government to take urgent and far-reaching decisions to preserve the economy from the abrupt effects of its impact.

3. Methodology

This research is mainly characterized by a descriptive methodology, together with other methods such as the deductive method. In the view of Prodanov and Freitas (2013), the latter aims to explain the content of the premises, through a chain of reasoning in descending order, analyzing from the general to a particular conclusion.

This study took a qualitative and quantitative approach to the collection of data. Qualitative research was included because an exclusively quantitative approach limits researchers to the factual description of this or that event, ignoring the complexity of social reality (Prodanov and Freitas, 2013).

The empirical data were collected from answers to 14 (fourteen) semi-open and closed questions, structured according to the Likert scale. The survey was distributed during October and November 2018, through the tool googleforms.ca in the city of Cacoal, Rondônia, to a random sample of 198 residents. The sample size was chosen to comply with the proportion set by Anderson, Sweeney, and Williams (2003); it allows an error margin of 7% and a confidence level of 95%. After the data were collected, they were systematically classified through selection, coding, and tabulation. Content analysis was also used.

4. Data Analysis

4.1 Socioeconomic Profile of the Sample

The sample consisted of 208 participants, 107 female, and 101 male, between the ages of 18 and 66 years and over: 4.6% of the respondents were between 26 and 35 years old and both sexes represented. 99.5% are people of a physical nature. The highest percentage had mostly completed their formal education or were undergraduates. 109 respondents said that they were married, 66 were single and 33 people were either divorced, widowed or in a stable union; 56.7% had children, which corresponds to about 118 of all respondents.

From their answers it appears that 30.8% of them were single, and 30.8% also would describe themselves as young couples with independent children; 17.8% were young couples without children, 6.3% of the respondents were divorced and had children under six years old; 9.1% formed a group of older working couples with independent children, 2.9% were couples who had already retired, and 2.4 % of the total were widowed.

It was observed that 38.5% of them had a monthly family income ranging from R \$ 2,800.00 to R \$ 3,800.00; 23.6% of them had a salary of up to 1,900.00, about 20.7% said that their wages ranged from R \$ 4,700.00 to R \$ 5,700.00; in percentage terms, 17.4% of the respondents had a family income of R \$ 6,600.00 to R \$ 9,500.00, and half of this group had \$ 9,500 as their highest income.

4.2 Consumer Purchasing Behavior in the Purchase of New Cars

The information was collected during routine visits to the interviewees in which they were asked about this subject. It was found that 40.9% of the respondents claimed never to go to new car dealerships, 37% made an annual visit, and 18.3% frequented new car dealerships every six months.

The reason for this is that owners of new cars must meet the manufacturers' requirements by periodically bringing them back for warranty revisions. It is relevant to note here that at least 3.4% of the interviewees claimed to visit their original dealers every month to visit departments such as the auto repair shop, the outlet for auto parts, the insurance brokers, and the financial and other services.

Table 1: Consumer Behaviour Concerning Newly Available Makes and Models of Cars.

VARIABLE	1	2	3	4	5	TOTAL
I seek information about the options of popular car models that are available.	7%	11%	18%	42%	22%	100%
I seek information about the available colours in stock.	11%	16%	22%	37%	14%	100%
I want to know about the quality of the commercialized vehicles (factory warranty, fuel consumption, series accessories, comfort).	4%	5%	11%	34%	46%	100%

I seek information about the service provided before, during, and after sales (test drive, satisfaction survey, employee proactivity, etc.).	5%	11%	21%	35%	28%	100%
I want to know about the origin of the brand.	4%	7%	16%	35%	38%	100%
I research prices and payment and instalment terms	5%	7%	9%	33%	46%	100%
I look for the prices of spare parts and warranty reviews.	4%	10%	18%	33%	35%	100%
I seek information only on brands that I already know, and I'm used to buying.	10%	19%	19%	31%	21%	100%
I look for information only at dealerships located near my home or place of work.	19%	19%	25%	24%	13%	100%
I do not compare prices owing to lack of interest or time.	41%	23%	17%	12%	7%	100%
I do not gather information owing to lack of interest and time.	41%	24%	17%	12%	6%	100%

1 - Strongly Disagree; 2 - Disagree; 3 - Neither disagree nor agree; 4 - Agree; 5 - Strongly agree

Source: Research data (2018).

Regarding consumer behaviour regarding the full range of makes and models of the new cars available, 46% of respondents looked into prices, payment terms and instalments before deciding to purchase a new vehicle and 46.2% compared the quality of the vehicles on sale, regarding items such as factory warranty, fuel consumption, standard accessories and comfort, etc.

Among all the brands and models on offer in the market, it was essential for 38% to choose a brand of which they approved; 35% of this group looked into the prices of spare parts and warranty reviews.

4.3 Main Consumer Influences in New Car Buying

Given the large proportion of people who have access to the internet, it is not surprising to hear from the survey respondents that 71% of them used the internet as their primary source for researching car brands and models in the market.

Table 2: Sources of information regarding available new makes and models of cars.

VARIABLE	1	2	3	4	5	TOTAL
Referral by friends and relatives	11%	12%	25%	30%	22%	100%

Going personally to the dealer (self-assessment)	8%	9%	15%	31%	37%	100%
Flyers	27%	25%	24%	15%	9%	100%
Via telephone enquiries to dealers	30%	24%	22%	12%	12%	100%
Advertising in specialized magazines	18%	19%	15%	26%	22%	100%
Internet	7%	10%	12%	22%	49%	100%
TV Advertising	11%	22%	21%	23%	23%	100%
Newspaper Advertising	28%	25%	20%	13,5%	13,5%	100%
Outdoor Advertising	23%	21%	24%	17%	15%	100%
Previous consumer experience	11%	8%	15%	28%	38%	100%
Car fairs	16%	16%	16%	30%	22%	100%

1- Never used as a source; 2 - Little used; 3 – Neither used nor avoided; 4 – Used as a source; 5 – Often used as a source.

Source: Research data (2018).

However, it is relevant to note that 66% of the respondents still took their previous experience as a consumer into account. Among the sources of information used or most often used by consumers, the item ‘friends and relatives’ stands out with 52% of respondents agreeing; 52% also visit factory fairs in search of better terms at the time of purchase. The medium of television has an essential influence on consumer behaviour and is hugely significant; the survey data indicate that 46% of respondents use TV advertising as a source of information in making their decision.

Table 3: Criteria used in choosing the brand/dealership

VARIABLE	1	2	3	4	5	TOTAL
Variety of vehicles on delivery	13%	13%	28%	20%	26%	100%
Company tradition	5%	11%	25%	24%	35%	100%
Attendance	4%	8%	20%	23%	45%	100%
Reliability	4%	7%	15%	19%	56%	100%
Price	5%	5%	16%	12%	62%	100%

Payment conditions	4%	8%	15%	17%	56%	100%
Willingness to accept used vehicles in part payment.	6%	6%	18%	21%	49%	100%
Referrals from Other customers	9%	13%	20%	27%	31%	100%
Location	13%	23%	30%	15%	19%	100%

Source: Research Data (2018)

According to the data shown in Table 3, in the opinion of the interviewed individuals, reliability in the broad sense is the criterion in choosing a brand: 75% considered it essential or thought it more critical among all the variables. Of the respondents, 68% believed that the service provided by the seller was an important factor. Regarding the price, 74% rated this as an important or more important criterion and 73% of the respondents considered suitable payment terms to be essential or more critical; only 15% thought it was merely relevant and 12% saw it as a less significant factor.

Of the given criteria, the acceptance of used vehicles in part payment was rated as an essential or more critical factor in the purchase decision process, by 70% of the respondents. 35% of the interviewees used the tradition of the company as the crucial criterion, while 36% of them considered it less than crucial. Importantly, the location of the company in the municipality was believed by about 30% to be an irrelevant criterion, which shows that other factors contributed more directly to the decision process and the place of purchase is not a competitive differential.

The variety of brands and prompt delivery were considered irrelevant by 28% of consumers, and 26% considered them less critical, a sign of consumer attitudes to price, payment conditions, reliability, and service. These were recognized as the criteria in operation in most decisions to buy a new vehicle.

4.4 Factors that Influenced a Consumer's Decision to Purchase a New Vehicle

An important question in this research was which attributes were considered necessary in the decision to purchase a new vehicle, and which were the main ones: quality, price, fuel economy, durability, luggage space, comfort and durability are among the attributes that could be considered relevant when the participants in the survey were contemplating the purchase of a new car.

Table 4: Attributes considered most important in the decision to buy a new car.

VARIABLE	1	2	3	4	5	TOTAL
Quality	3%	5%	13%	16%	63%	100%
Price	2%	6%	17%	19%	56%	100%

Performance	2%	4%	18%	20%	56%	100%
Colour	9%	14%	34%	24%	19%	100%
Fuel Economy	4%	2%	17%	25%	52%	100%
Durability	2%	4%	16%	21%	57%	100%
Fuel (A. Diesel, Alcohol, Gasoline, Flex, Hybrid or Electric)	4%	9%	24%	27%	36%	100%
Brand Confidence	3%	5%	15%	27%	50%	100%
Modern Design	3%	9%	20%	38%	30%	100%
Safety	3%	3%	17%	12%	65%	100%
Confidence in technical assistance	3%	5%	14%	24%	54%	100%
Payment facilities	5%	4%	19,5%	20,5%	51%	100%
Luggage space	4%	9%	26,5%	24%	36,5%	100%
Comfort	3%	4%	15%	24%	54%	100%
Attendance	3%	6%	23%	25%	43%	100%
Embedded technology	5%	10%	17%	30%	38%	100%
1-Less Important ←—————→ 5 - More important						

Source: Research Data (2018)

The analysis of the survey data regarding the attributes considered most important in the decision to buy a new car identified the car's quality (chosen by 63%) and durability (chosen by 57%) as the most important. Aspects such as brand trust supported 77% in their choice and confidence in technical assistance attracted 78% of the answers. These qualities were cited as relevant or most important, earning 4 and 5 respectively in the ranking of percentages.

Regarding the attributes that the numerous manufacturers offered, 78% of the people answering this questionnaire evaluated comfort as an essential or significant feature, but 68% considered modern design to have equal importance. 65% believed that safety was essential or most important and 60.5% thought the same about luggage space, further data on this attribute, in their final decision to purchase a new car. 36.5% of the respondents rated this attribute with the 5th degree of importance and about 26.5% were indifferent to it, making this feature unimportant as a decision factor in the opinion of consumers.

In this survey of 208 people, 56% considered price the crucial attribute while 51% gave this rank to ease

of payment. Hence the consumer sample considers both factors to be determinants, most important according this analysis, in the choices made. With regard to the attributes considered determinative and influencing consumer behaviour in the decision-making process, it was found that fuel economy was cited by 52% as more critical

5. Conclusion

To demonstrate through the data the factors that influence a consumer's decision to buy a new vehicle, this field research sought to ascertain consumers' socioeconomic profiles from their buying behaviour. Thus, it was possible to analyze the leading influences on their consumption before any specific desire to buy a new car, by considering all the factors responsible for determining the behaviour in consumers who make a purchase. The objectives of the research were satisfactorily achieved, since the collected data responded clearly and objectively to the general purpose, the specific concerns and the problems raised by the proposed theme. These were made viable for analysis through the answers, which revealed the perspectives and behaviour of consumers at the time the influential factors were presented.

Regarding the expression of desire or aspirations to purchase an auto mobile, it was observed that consumers use very diverse sources to resolve matters of choice, given the immense variety of brands, models, and technologies available in the new car market of Brazil.

The desire-generating factor is responsible for several steps, from feeling the need to buy and searching for information on the market to the act of choosing the vehicle, where consumers are hit by a range of factors that try to influence their decision and behaviour during the decision process.

The present study is intended to provide parameters and reasons for research in future studies. Having completed this analysis, we suggest that new vehicle dealers in the municipality under investigation would benefit from the results if they re-designed their service, marketing, inventory, additional service, and aftermarket standards to leverage the results and ensure more efficient competitive advantage over their rivals.

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An overview of the appropriability mechanisms used in plant biotechnology industry

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Abstract

This paper aims to discuss the main appropriability mechanisms used by biotech firms to avoid imitation and appropriate the economic benefits from crop innovations. To this end, we analyze the strategic links between the technological development of genetically modified organisms (GMO) and the ownership rights over plant transformation technologies. We also discuss a key case study - the legal battle between Monsanto and Syngenta by the control of the GMO crops derived from the GA21 gene. Our findings show that a system of blocking patents has been built basically through strategies relating to intellectual property mechanisms. As result, Monsanto's efforts to sue competitors for patent infringement have proved to be a successful barrier to entry in plant biotechnology industry.

Keywords: genetically modified organisms; innovation; blocking patents; barrier to entry.

1. Introduction.

The development of agricultural biotechnologies began in the 1980s with the use of recombinant DNA technology in cultivated plants. These research efforts gave rise to the first generation of genetically modified organisms¹¹ (GMO), popularly termed as transgenic seeds. The development of GMO requires several crop transformation methods and a good relationship with the “plant breeders” (Qaim & Traxler, 2005). In the subsequent stages, related to the commercialization of transgenic seeds, it is also necessary to establish relationships with users, competitors and suppliers, characterizing a huge mobilization of complementary assets (Graff, Rausser, & Small, 2003).

Thus, crop genetic engineering makes room for commercial strategies carried out largely by companies

¹¹A GMO is a plant whose genotype was altered by genetic engineering techniques (Qaim, 2009).

linked to the seed industry (Silveira & Borges, 2012). However, for many decades, the large multinational companies feared the weak appropriability conditions in agriculture. This skepticism drove away private investments in crop markets.

Until 1977, the patents over living organisms were not accepted in any country, including the United States. In that year, the US courts ruled that natural products could not be patented per se, but only if they presented some modification due to the human intellect intervention. In 1980, as a result of the *Diamond vs. Chakrabarty* Case, the US Supreme Court decided to grant the first genetically modified bacteria patent. These two decisions have removed the main legal obstacles to the patenting of genes and GMO.

The strengthening of the intellectual property (IP) regime contributed to reduce the uncertainties over the plant breeding programs, especially the concerns regarding the appropriability of the profits from innovation (Rausser, 1999). As result, the top 3 agrochemical companies – Monsanto, Dupont and Syngenta – were attracted to the seed industry during the 90s and the 2000s. Since then, the market value of these firms is highly dependent on the development of plant biotechnologies and on their protection through IP rights.

Considering this context, this paper aims to discuss the main appropriability mechanisms used by biotech firms to avoid imitation and retain the economic benefits from GMO crop innovations. To this end, we study the strategic links between the technological development and the ownership rights over plant transformation technologies. We also discuss a key case study - the legal battle between Monsanto and Syngenta by the control of the GMOs derived from the GA21 gene. Our findings show that, in contrast with the models based on Kenneth Arrow's perspective, a system of blocking patents has been built basically through strategies relating to IP mechanisms.

The remainder of the article can be broken down into the following sections: Section 2 presents a theoretical framework to analyze appropriability strategies while Section 3 brings the discussion to the context of plant biotechnology. Subsequently, Section 4 highlights the IP mechanisms that were effectively used by Monsanto to deter its rivals and Section 5 presents the final remarks.

2. Theoretical framework: Appropriability of technical innovations.

The ability of a firm to appropriate the economic results from innovation is crucial to building and sustaining a competitive advantage (Laursen & Salter, 2014). Several studies have pointed out that firms use several appropriability mechanisms simultaneously to protect their innovations rents against imitators (Arundel, 2001; Cohen, Nelson, & Walsh, 2000; Levin et al., 1987). Among those mechanisms, the authors emphasize: i) patents and other legal mechanisms; ii) complementary assets, including sales, manufacturing and marketing capabilities; iii) product and process secrecy; v) quick market entry to capture first mover advantages against rivals.

The survey conducted by Cohen, Nelson, & Walsh (2000) reveals that in most sectors the complementary assets and the industrial secrets tend to be the appropriability mechanisms most used by firms while patent documents occupies a secondary position in corporate strategies for capturing the profits from innovation. The chemical industry, especially the pharmaceutical sector, is an exception. In these industries, patents have played historically a central and effective role in protecting innovations and, consequently, the

licensing practices have been widely disseminated (Arora, 1997).

These findings seem to support the Teece's (1986) statement that the private value of an innovation depends heavily on the complementary assets of the firm that intends to exploit it. The same studies also highlight the firms' intensive efforts to control the communication flows between their workers and the external environment in order to ensure that trade secrets are retained by the firm.

In most industries patents have been a fragile incentive to foster innovations (Marengo, Pasquali, Valente, & Dosi, 2012). However, in recent years, patent applications have grown strongly in all economic sectors. These ambiguous facts suggest that – in parallel to the protection of the innovation profits and to the collection of royalties – the IP efforts can involve other corporative motivations. Firms use patents not only to avoid other companies from copying their technology but also to block other competitors from entering their markets (Reitzig, 2004).

The literature has identified two kinds of blocking patents able of hinder market entry conditions and the emergence of new firms. In the case of industries where the patenting of substitute inventions (i.e. inventions functionally quite like each other) is possible, firms tend to focus their efforts in building patents fences around a core invention. This concept refers to the patenting of products and/or processes that may replace the original invention (Arora, 1997; Reitzig, 2004).

Another kind of patenting strategy emerges in complex industries. The development of complex products requires sequential innovations that combine several previous inventions. Patent laws sometimes assure to the holders of upstream inventions some ownership right over subsequent downstream innovations. This set of overlapping IP rights is called patent thickets (Shapiro, 2000). Because of these overlapping patents, an infringing inventor may have to pay royalties to multiple right holders. Due to patent thickets, companies have less incentive to development new complex technologies (Chu, 2009; Heller & Eisenberg, 1998).

3. Biotechnology, agriculture and intellectual property

According to Goeschl & Swanson (2003), the presence of a typical phenomenon of life science sectors (human and animal health, as well as plant biotechnology) leads to much less R&D investment than what would be allocated if the researches were conducted by a central planner. The reason is what the authors term “adaptive destruction”, which is the loss of the economic value of a biotech product due to the evolution process of pests, which can eventually occur over a period shorter than the patents lifetime.

As pest resistance to biotechnological solutions get stronger and faster, the gap between the private investment in R&D and the socially desirable value tends to increase. This market failure is not corrected by the patenting system (Yerokhin & Moschini, 2008).

The propositions put forward by Goeschl & Swanson (2003) run counter to the evidence of a period of intense patenting of plant biotechnologies after the start of GMO cultivation in 1996. The seed industry faced many uncertainties in the second half of the 1990s, which coincided with an intense patenting effort in this sector. Therefore, IP rights, especially, but not only, biotech patents, helped to sustain huge plant breeding programs and firms' appropriability strategies (Marco & Rausser, 2008).

Heller & Eisenberg (1998), as well as Wilson (2007), stressed that the multiplication of patent thickets (see Section 2 above) in biotech sectors could generate a new type of market failure. The famous "tragedy of

the commons" refers to problems of overutilization of the resources due to the absence of property rights. The increase of blocking patents leads to an opposite market failure called "tragedy of the anti-commons". The development of a new GMO integrates different types of biotechnological tools (e.g. vectors, markers, promoters, etc.). It is observed, therefore, the emergence of numerous right holders able to charge royalty fees over these intermediary technologies. As result, these overlapping charges tend to reduce the usage of the biotechnological tools themselves.

On the other hand, several authors have pointed out the crucial role of mergers and acquisitions (M&A) for mitigating the problems caused by blocking patents (Marco & Rausser, 2008; Shapiro, 2000). In a similar vein, Fulton & Giannakas (2001) argue that the M&A can reinforce the complementary assets required for protecting knowledge assets. According to the last authors, the top biotech companies usually combine complementary assets and patent rights with the aim of deterring new entrants and gaining market share.

4. Case study: the legal battle between Monsanto and Syngenta.

The development of a new GMO needs to integrate multiple scientific knowledges and several complex technologies. Graff, Rausser, & Small (2003) identified three groups of assets that must be used to accomplish this task: i) the DNA fragments responsible for encoding new agronomic traits in plants; ii) enabling technologies, i.e., the genetic engineering techniques used for inserting these genetic sequences into plants or for regulating the gene expression process; iii) the agronomic cultivars selected to receive the exogenous genes. The IP lawsuits presented below primarily encompass enabling technologies patents.

The roots of the conflict between Monsanto and Syngenta date back to the joint research agreements signed by the companies Calgene, Aventis and Dekalb in the early 90s. In this period, Aventis and Dekalb had the ownership of the main biotechnologies necessary to create herbicide-tolerant maize plants. The research efforts performed by Aventis improved the genes discovered by Calgene in the 1980s. On the other hand, Dekalb patented the bombardment techniques able to introduce these genes into cells. Under the 1991 agreement, Calgene and Aventis agreed to license their genes to Dekalb, which become responsible for performing the crop transformation. The GA21 gene was development through these joint research efforts. In 1994, the original agreement was reformulated. During these negotiations, Dekalb omitted some key information about the field tests conducted on its GMO crops. The company was accused by Aventis of violating the previous agreements. The lawsuit was won by Aventis and, as a result, Dekalb lost all its property rights over the GA21. The court also reinstated Aventis's exclusive rights in regard the transgenic seeds derived from this gene. Bayer acquired the GA21 from Aventis in 2002 and, then, sold it to Syngenta. Furthermore, the takeover of Dekalb by Monsanto occurred in 1998.

Monsanto has opted for developing herbicide-tolerant seeds through the insertion of the CP4 gene. Despite its preference for this gene, the company tried hard to avoid the emergence of another GMO derived from the GA21. In mid-2006, when Syngenta finished the tests conducted on Maize Agrisure™, Monsanto filed two lawsuits accusing the Swiss company of patent infringement.

The first case was judged by the United States Court of Appeals. Syngenta was accused of infringing the bombardment techniques claimed by patents No. US5538880 and US6013863. The Federal Court presented several evidences that the insertion of the GA21 gene into maize plants through the particle

bombardment method was first performed by Dekalb in 1993. Therefore, Syngenta did not perform, directly, this process, since the company legally purchased (from Bayer) the GMO containing the GA21 gene. Consequently, the Federal Court ruled that Syngenta did not infringe the patents No. US5538880 and US6013863.

Monsanto and Syngenta had a second legal altercation over the scope of the patent No. US5554798. This document demands legal protection for plant promoters used for developing fertile transgenic maize plants. Syngenta denied that its products have violated any kind of property rights. According to the Swiss company, the patent No. US5554798 did not specify the type of promoter used by Monsanto. Under this perspective, the legal document cannot cover the "rice actin" promoter that was incorporated into the Maize Agrisure TM.

Monsanto replied that the biotechnological tool termed promoter concerns the DNA construct that instructs the cells to start the biochemical processes that will result in the proteins synthesis. Therefore, the patent No. US5554798 covers all types of plant promoters. Unlike the previous lawsuit, the verdict promulgated in 2007 by the Missouri Court was favorable to Monsanto. One year after this sentence, the Swiss company negotiated an agreement with Monsanto that aimed to dismiss all the lawsuits between them.

5. Conclusion

As the case study analysis illustrated, Monsanto's appropriability strategies have been strongly grounded on patent enforcement rights. The ownership rights to exclude competitors from using some key biotechnological tools have acted as a strong barrier to entry able of slowing down rival companies. In this sense, the paper adheres consistently to the classic idea that patents are an important appropriability mechanism in certain industries, some of which are created by innovation itself, as the plant biotechnology sector (Arora, 1997; Marco & Rausser, 2008). Moreover, our findings are also consistent with those of Heller & Eisenberg (1998), for whom the patenting of enabling technologies could generate blocking patents, in such way that the outcome of this IP strategy is sometimes socially undesirable.

Backing to Section 3, it is admissible that pests are now more resistant to GMO products, as shown by the appearance of new glyphosate-resistant weeds. However, at no point in our study was it clear that the decline of R&D efforts in plant biotechnologies occurred due to this biological adaptation process, as argued by Goeschl & Swanson (2003). Instead, we highlighted some key IP strategies to raise entry barriers and to guarantee a significant market share that, at the same time, could have discouraged new researchers from coming to seed industry.

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Food security and agricultural markets: an analysis of the impacts of food price shocks on sub-Saharan countries

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Abstract

According to the Food and Agriculture Organization (FAO), the food price crises in 2007-2008 and 2011-2012 led to increases in the number of undernourished people worldwide. In this study, we address the issue of food insecurity by analyzing the main causes behind the food price shocks in the 2000s. Moreover, we also investigate whether the sub-Saharan countries are most vulnerable to these shocks, as often pointed out by specialized literature. To this end, we analyzed the correlation between the maize domestic prices—the most cultivated and consumed grain in this region—and the daily kilocalories consumption in African countries. Results show that the poorest nations, i.e. the ones with per capita income below \$ 1,400, suffer most from food prices crisis. Most African countries have advanced in addressing food insecurity issues. However, in some nations, the maize price shock in 2007–2008 was a throwback in this progress, causing daily kilocalorie consumption to fall by half in relation to levels of early-2000s.

Keywords: food insecurity, maize price; vulnerability; Africa.

1. Introduction

The fight against food insecurity has been a priority for the United Nations (UN) since its inception in 1945. This aim also inspired the United Nations Millennium Declaration, signed in September 2000. The first Millennium Development Goal (MDG) was to “Eradicate extreme poverty and hunger”, with the target being to halve hunger in a fifteen-year span.

At the end of this period, the UN launched the "Millennium Development Goals Report" which summarizes the results obtained. The MDGs have helped to lift more than 1 billion people out of extreme poverty since the 2000s, and to decrease the proportion of undernourished people by nearly half in developing countries. However, the fight against hunger has evolved unevenly among the regions of Africa, Asia and Latin America (United Nations, 2015).

In the past two decades, China alone accounted for two thirds of the total reduction in the number of undernourished people. In contrast, the pace of hunger reduction in the sub-Saharan countries was not enough to achieve the first MDG (United Nations, 2015). Currently, over 40% of the population of this region lives under conditions of extreme poverty.

Moreover, the fight against food insecurity has received a setback in the last ten years due to the: i) growing scarcity of water and land; ii) recurring environmental disasters; iii) humanitarian crises stemming from ethnic and religious conflicts; ii) two food price shocks in 2007-2008 and 2011-2012. The food prices crisis is an important issue, after all, the poorest individuals are more vulnerable to price shocks able to deprive them of an adequate calorie intake. Therefore, the world's number of undernourished people has increased sharply in the 2007/2008 biennium (HLPE, 2011).

The food price shocks were especially traumatic for sub-Saharan Africa, given its dependency to maize, the region's main food source. Among all foodstuffs, maize has suffered the most intense price shock (Minot, 2014), in part due to increased demand for biofuels in the USA (Abramovay, 2009). The raising maize prices have affected millions of people across Africa, since, besides being a fundamental food in the diet of dozens of countries, maize is also used to feed the cattle and other types of animals. Therefore, there is an all-round increase in the cost of the animal protein sources.

Given this context of price volatility, two aims were outlined for this study: i) to discuss the main causes behind the food price crises in 2007-2008 and 2011-2012; ii) to examine how the maize price shocks have impacted the food security conditions in sub-Saharan countries. To this end, we used the databases of foodstuff prices and food security indicators provided by FAOSTAT¹²s. Our results show that the poorest African nations, i.e. the countries with per capita income below \$ 1,400, suffer most from food prices shocks.

The remainder of the study is structured as follows: Section 2 discusses the causes behind the food price shocks; Section 3 describes the methodology, i.e., the indicators extracted from the FAOSTAT platform; Section 4 presents the empirical results, and Section 5 concludes the study.

2. Price shocks and food security.

Two price shocks have affected the supply of many agricultural products in the current century. The price of the cereals, dairy products and vegetable oils doubled between 2005-2007. Not even the 2008 World Crisis was able to contain this ascending movement. Moreover, with the onset of the economic recovery in mid-2010, food prices reached a new peak between 2011-2012, which this time also included the animal protein sources. More recently, since 2014, the foodstuff prices have stabilized with the slowdown of the Chinese economy (HPLÉ, 2016).

Poor countries spend their income largely on food, so they are strongly impacted by price shocks. The Food and Agriculture Organization (FAO) estimated that the food prices crisis of 2007–2008 led to an increase in the number of undernourished people from 850 million to 1023 million (HPLÉ, 2011). The global hunger increasing has changed some conventions about food insecurity.

¹² Available at <http://www.fao.org/faostat/en/#home>

During the second half of the 20th century, the food supply grew faster than the demand due to substantial gains of productivity in agriculture. It was assumed (among developed countries) that the hunger is not due to the lack of food, but rather to the existence of extremely poor consumers who do not have enough income to afford an adequate calorie consumption. The recent price shocks have shaken this belief. As a result, there is a growing fear that the price shocks can reflect a potentially gap between the demand for food and the agricultural output (World Bank, 2008).

According to this view, the main cause behind the price shocks is the increasing demand for food in Asia, particularly in China (Kearney, 2010). The income growth in Asian countries gave rise to a paradox. On the one hand, the increasing income in developing countries is a precondition for millions of people to achieve food security. However, the situation of the consumers living in other poor countries, who have not experienced the same income growth, tends to worsen due to the demand pressures and the increased food prices (World Bank, 2008).

The existence of a “new era of scarcity” characterized by a lasting imbalance between the supply and the demand for foodstuffs, is still a controversial issue. In fact, many scholars have rejected this idea. However, there is a much stronger consensus that several economic and environmental issues have hampered the food surplus growth rate. It is not possible anymore to expand the agricultural output by using extensively natural resources as water, land, biodiversity, and energy (HPLE, 2016).

Moreover, the trade barriers have also contributed to reducing the food supply in African countries. Several nations have tried to protect their markets from the international prices’ volatility, particularly in the case of maize. However, these measures put additional pressures on the domestic prices, which need to increase to equalize the demand for food with the domestic output. Hence, according to Minot (2014), the traditional food price stabilization efforts seems counterproductive. The price volatility is higher in countries with the most active intervention to stabilize maize prices.

3. Methodology.

We aim to study the correlation between the maize prices and the food security conditions prevailing in sub-Saharan countries. To achieve this goal, we initially follow the steps of Chauvin, Mulangu & Porto (2012). The authors chose the indicator termed per capita consumption of kilocalories (Kcal) per day to measure the nutritional status of 21 African countries over the last 50 years.

Furthermore, Belton & Taylor (2004) pointed out that the major grains cultivated in Africa are: maize (27.2 million tonnes yearly), sorghum (18.1 million tonnes yearly) and millet (13.1 million tonnes yearly). The sorghum and the millet are mostly produced and consumed on the African continent itself. Given this regional character, these cereals have not suffered major price fluctuations in the last two decades (Minot, 2014). However, in the case of maize, the bulk of the consumption occurs in developed countries, especially in the USA. Thus, the international prices shocks were transmitted to domestic markets, thereby affecting

the food security of millions of people across Africa (Chauvin, Mulangu & Porto, 2012).

Considering these stylized facts, we examined the volatility of maize domestic prices in 20 sub-Saharan countries: Botswana, Cabo Verde, Cameroon, Congo, Cote d'Ivoire, Ethiopia, Gambia, Ghana, Guinea-Bissau, Kenya, Madagascar, Malawi, Mali, Mozambique, Niger, Nigeria, Rwanda, Senegal, South Africa and Tanzania. For the same countries, we also collected information on the consumption of kilocalories per day and the per capita income. The historical series were provided by the FAOSTAT platform. The databases start in the year 2000 and end in 2013.

The FAOSTAT database of foodstuff prices has some limitations. Several African countries have missing data for the entire period covered by the study¹³. In the case of the 20 countries belonging to our sample, we identify some erroneous data entry that led to outliers. According to Schoeber, Boer & Schwarte (2018), the nonparametric Spearman's coefficient is a robust alternative to the Pearson's correlation coefficient in presence of outliers. Therefore, we use the Spearman's correlation coefficient to identify statistical relationships between the maize domestic price and the daily kilocalorie intake in each sub-Saharan nation.

4. Results

In this section, we investigate two stylized facts pointed out by specialized literature: i) international food price shocks were transmitted to domestic markets, thereby affecting several African countries; ii) the poorest countries in Africa are more vulnerable to food price crises. To address the first stylized fact, we examine the volatility of maize prices in 20 sub-Saharan nations (Table 1).

Table 1. Maize domestic prices 2000-2013 (US dollars/tonne)

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Peak1*	Peak2**
Congo	262	232	282	304	495	655	823	1074	1338	1448	1675	1614	1642	475.0%	593%
Ethiopia	119	79.	66	126	117	144	138	268	350	246	169	139	237	341%	76.4%
Niger	118	117	129	149	195	225	258	315	511.4	480	422	457	477	336%	290%
Cabo Verde	247	240	253	303	334	334	337	368	825	890	851	893	805	242%	271%
Mozambique	52.	91	126	105	121	151	139	145	279	231	162	226	254	204%	147%
Cameroon	175	177	186	238	276	284	306	363	472	373	315	407	418	166%	129%
Cote d'Ivoire	119	135	142	219	239	232	237	302	348	320	315	379		157%	181%
Senegal	130	156	205	239	174	185	242	298	377	324	290	328	354	140%	109%
Tanzania	119	119	123	150	165	158	214	144	265	282	298	276	163	121%	130%
Ghana	171	209	169	172	235	366	254	289	443	382	340	429		111%	104%
Malawi	111	156	279	128	144	185	198	135	327	332	228	193	218	109%	23.0%
Kenya	190	169	141	157	193	201	213	232	353	309	217	281	401	108%	66.0%
Rwanda	213	178	124	183	202	243	279	292	364	409	313	376	410	104%	111%

¹³ We exclude the following countries: Angola, Burkina Faso, Benin, Chad, Eritrea, Guinea, Mauritius, Namibia, Sierra Leone, Sudan, Zambia, Zimbabwe.

Nigeria	198	341	383	294	335	477	438	419	695	169	333	340	349	103%	-0.2%
Gambia	134	156	247	216	250	311	219	263	293	239				87.7%	
Botswana	126	87	112	188	202	171	151	151	150	141	154	292	262	72%	236%
Guinea-Bissau	842	818	860	1028	1133	1165	1141	1329	1382					69%	
Madagascar	143	139	135	109	113	143	169	253	226	220	215	216		63%	55%
Mali	107	111	170	132	100	163	137	154	169	175	205	360	299	51.1%	222%
Burundi	253	219.8	187.5	181.5	236.9	314.3	291.8	313.5	323	346.9	382.3	407.8	386.8	47.0%	85%
South Africa	78	103	129	123	129	205	201	154	137	210	240	207		33.3%	101%

Source: FAOSTAT; * maize price change between 2008 and 2001; ** maize price change between 2011 and 2001

Table 1 shows that the maize price shocks were a widespread phenomenon. In a six-year span (from 2001 up to 2007), the domestic prices doubled in at least 13 countries. The most dramatic cases were Congo, Ethiopia and Niger, where the increases exceeded 300%. Since the 2007-2008 peak, the prices fell sharply in only 3 countries (Ethiopia, Malawi and Nigeria) while in most nations, the maize prices remained high, or even continued to rise, as occurred in Congo, Côte d'Ivoire, Botswana and Mali. In sum, our results reinforce the first stylized fact presented above.

However, the evidences to support the second stylized fact were far less robust. As shown in Table 2, only 3 African nations—Niger, Rwanda and Guinea-Bissau—recorded significant negative correlations ($P < 0.05$) between the maize domestic price and the daily consumption of kilocalories.

Table 2. Correlation between the maize domestic prices and the daily consumption of kilocalories

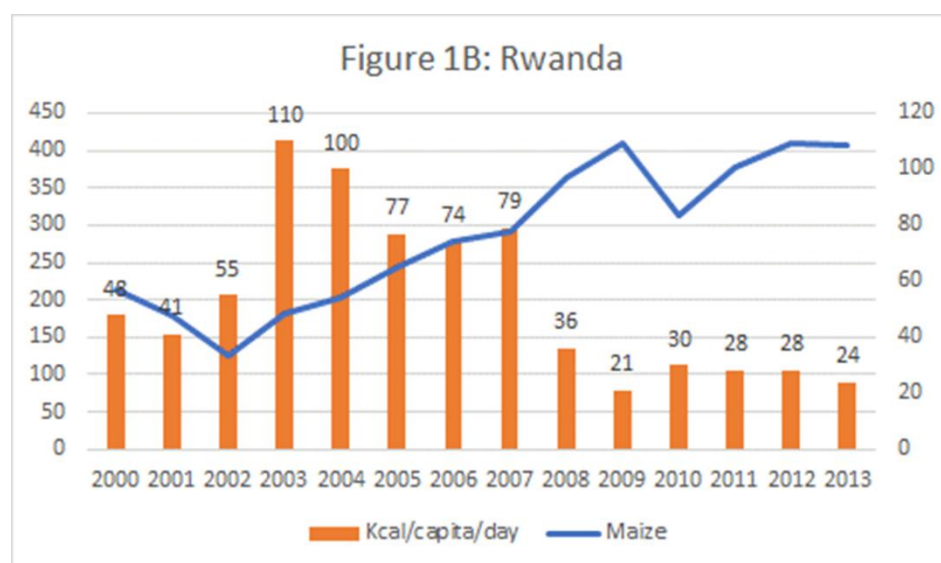
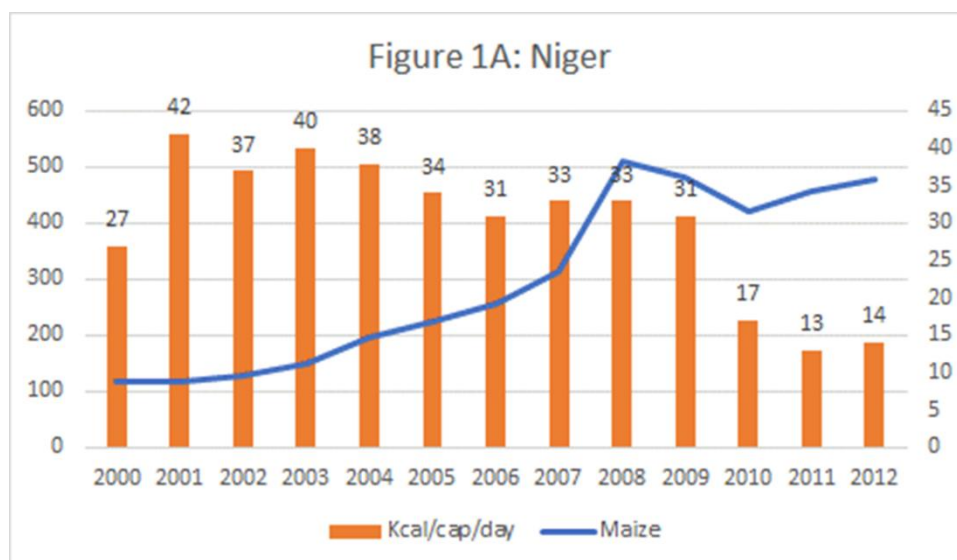
Country	Spearman's Rho	P Value	Average income * (2000-2013)
Niger	-0.595	0.0319	793.67
Mozambique	0.3223	0.2611	800.55
Ethiopia	0.3612	0.2044	876.42
Malawi	-0.3789	0.1816	917.49
Rwanda	-0.7437	0.0023	1157.29
Guinea-Bissau	-0.8439	0.0042	1340.10
Madagascar	0.5245	0.0800	1405.03
Gambia	-0.4549	0.1022	1554.56
Mali	0.5245	0.0015	1749.97
Tanzania	0.4044	0.1515	1888.46
Senegal	0.4287	0.1261	2086.74
Kenya	0.1014	0.7301	2327.45
Ghana	0.4903	0.1056	2650.06
Cote d'Ivoire	-0.021	0.9484	2716.82
Cameroon	-0.4466	0.1260	2836.57
Nigeria	0.3718	0.1905	4276.84

Congo	-0.1584	0.5886	4825.46
Cape verde	0.4532	0.1036	5062.22
South Africa	0.3727	0.1894	11120.82
Botswana	-0.6121	0.0600	12442.67

Source: FAOSTAT; Hypothesis tests were performed on Stata 10; * Average income measured in US dollars.

We sort the African countries according to their average income over a thirteen-year span (2000-2013). The countries that recorded a significant negative correlation are among the poorest African nations, with average annual incomes of less than 1,400 dollars (Table 2).

The deterioration of the food security conditions in Niger, Rwanda and Guinea-Bissau¹⁴ reinforces the second stylized fact. As shown in Figures 1A and 1B, Niger and Rwanda experienced an increasing calorie intake during the first half of the 2000s. However, the maize price shocks not only aborted this progress but also halved the consumption of calories in comparison to the early-2000s levels.



¹⁴ We do not include Guinea-Bissau in Figure 1 because the country has several missing data (see Table 1).

Figure 1. Maize domestic prices (US dollars/tonne – left axis) and daily consumption of kilocalories (right axis) in Niger (1A) and Rwanda (1B).

5. Conclusions.

This paper first discussed the main factors which have caused imbalances between food supply and demand in the 2000s. We contend that income growth in Asian countries, especially China, is the major cause behind the global rising demand for food and so the increases in the international food prices. On the other hand, from a supply perspective, several economic and environmental factors have hampered the growth of food production. The increasing limitations to the extensive exploitation of natural resources (water, land, biodiversity, energy) present a huge challenge for modern agriculture. Moreover, trade barriers have also contributed to reducing the food supply in the poorest countries.

We also analyze whether the sub-Saharan countries are vulnerable to food price shocks, as often pointed out by specialized literature. A strong negative correlation was therefore expected between the maize domestic price - the most cultivated and consumed grain in Africa—and the consumption of kilocalories. However, this has not occurred; only 3 African nations—Niger, Rwanda and Guinea-Bissau—have recorded significant negative correlations for both variables. To some extent, the limitations inherent to the African databases seem to have compromised the robustness of the correlation coefficients calculated by the study.

On the other hand, it is also important to note that Niger, Rwanda and Guinea-Bissau are among the poorest countries in Africa. This finding reinforces the proposition that the poorest nations have suffered most from international food price shocks.

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A Tale of Two Nicaraguas: 8 de marzo's *Ser como el aire quisiera* and Lapta Yula's *La vida sigue* Dramatizing Nicaragua's Cultural Schizophrenia

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Abstract

*An examination of two Nicaraguan dramatic texts exemplifies the tension between first world white feminism and a feminism that rejects the hierarchies often replicated in the first waves of feminism. Women's collective 8 de marzo's *Ser como el aire quisiera* rejects the hegemonic femininity that often oppresses transgendered women and neglects to embrace the multiplicity of sexual expressions. Lapta Yula's *La vida sigue* enfatizes solidarity, not just amongst women, but all those vying for a more equitable, just society whose mission is to promote the greater good of all. While both texts indirectly problematize the traditional concept of feminism, *La vida sigue's* dramatic stance against hegemonic performativities is a step further from *Ser como el aire quisiera's* primary dramatic thrust.*

Introduction

The artificial boundaries of Nicaragua mask the historical tension between the primarily mestizo Nicaraguan Pacific Coast region and the indigenous, Afro Atlantic Coast.¹ The Atlantic Coastal region gained autonomy in 1987, after decades of cultural and political tension, whose differences will be exemplified in two women's collectively written plays: Managua's 8 de Marzo's *Ser como el aire quisiera* [I would like to be free like the air] and the from the Atlantic Coast, Lapta Yula's *La vida sigue* [Life continues]. French feminists Hélène Cixous and Catherine Clément theorize that "feminine writing" as "defining a feminine practice of writing is impossible with an impossibility that will continue; for this practice will never be able to be theorized, enclosed, coded, which does not mean it does not exist. But it will always exceed the discourse governing the phallogocentric system; it will place and will take place other than in the territories subordinated to philosophical-theoretical domination" (402). Neither group is feminist in the traditional, Eurocentric use of the term "feminist. Activist Angela Davis reminds us: "the category women is so internally racialized. We always have to ask ourselves, well, who are we talking about when we see women? Women have always been categorized from the general category women, which has been about white, middles class women." Both plays rally for deconstructing systems that oppress women; Lapta Yula's dramatic text has the most radical and least Eurocentric approach.

Ser como el aire quisiera forces Shante, who stumbles across a group of women rehearsing a play, to accept that her husband, Fidencio, abuses her physically and psychologically. She encounters Sharitín, Natasha, and Morocha, who, initially, wonder why Shante is there. While Shante watches them rehearse,

she starts to empathize with the play for which they are rehearsing, one dealing with abuse, as the female actresses play the roles of men, using such classic lines as: “human beings aren’t perfect and I come home drunk and you provoke me. Forgive me. Shut up, bitch. You know that I love you, but I can’t love you the way you want me to love you. If you aren’t mine, you aren’t going to be anyone else’s, etc.” (4)² It is only when the women are pretending to be men that they use such discourse. In Nicaraguan Spanish, *puta* is a very offensive word, as violence is directed explicitly towards the feminine, which is always a site of violence.³ This gendered violence on the discursive level seems to condone violence against the feminine, against the female body. During the rehearsal, Shante admits: “my Fidencio is just like that. He always says ‘forgive me, ‘I apologize,’ ‘I am sorry’” (6). While these issues are often dramatized by both women’s collectives, Davis reminds us that “so many of the issues we construct as women’s issues: domestic violence, intimate violence, sexual violence, gender violence, they are by and large men’s problems.” Anthropologist Roger Lancaster echoes Davis in his research on machismo. “Machismo, no less than capitalism, is a system. Like racism, homophobia, and other forms of arbitrary power, arbitrary stigma, machismo is resilient because it constitutes not simply a form of consciousness, but a field of productive relations” (19). Men’s behavior is judged by other men, lauded or ridiculed and subsequently castigated by other men, and women are seemingly, at best, an afterthought under machista ideology. Chante is initially complicit in the system, as Sharitín asks her: “Chante, does he yell at you? Humiliate you? Treat you badly?” (7). But she keeps saying that “I know that he loves me. I only want him to change, that he goes back to being my Fidencio” (7). She does have an epiphany at the end; the entire play she has been tied to a stool, and, as the play’s close, she unties herself from it. Whether or not the men discussed in this play are transformed or not is irrelevant, reverberating Davis’ notion that these issues are men’s problems, but, in Shante’s case, perhaps her life can be spared.

Sexual abuse and alcoholism are prevalent in the actresses’ depiction of machismo. Sexual abuse, in particular, alludes to the fragile construction of masculinity and the ownership of the female body. If a woman does not own her own body, then who does? During their rehearsals, lines in passing like “at night he puts himself on top of me, he forces me to...” or “I am going to buy you lots of bras and panties and a ton of cloth so you can make your own clothing because your body is mine, no one else can see it. It is mine, or “all you will do is think of me” dramatize the construction of machismo (11). Marital rape isn’t even addressed in the play, demonstrating to what degree sexual violence has become the norm.⁴ Whether in theater or television or music, woman symbolically are more of a body than men, as their body parts and bodies themselves are valued or devalued on their potential usefulness to machismo. Bodies are compartmentalized, objectified, often animalized, while, the male body, always present, is seldom alluded to. The female body and its sexual organs are discursive sites of violence, the male sexual organ symbolizes power, violence itself. A man’s member can connote pleasure, as a man is permitted to engage in unlimited sexual conquests. Even during these sexual acts, as a man penetrates the female body, he is asserting his power over the feminine. In the worse scenario, his sexual member is a violent weapon. A man, thus, should be violent, always seek pleasure as the expense of the feminine, and try to augment his power. As the women dramatize roles as men, they justify this with the time old response: “you should be grateful that we allow you to live in our world. Here exist laws that protect women, laws that exist and others that we are creating” (8). How useful are these laws as cases of domestic violence appear to be increasing? Would

laws be necessary if men came to realize that physical abuse is never justified? Since women should be grateful they are even allowed under machismo, which is resilient because it is a field of productive relations, not just an ideology. They must tolerate devalued linguistic signs such as “pretty little doll and bitch.” Drunkenness, which is also alluded to in Lapta Yula’s play, is considered an intrinsically masculine behavior, but, certainly not appropriate for a woman, which may lead to sexual promiscuity, the epicenter of proving manliness while simultaneously defaming the notion of a “good woman.”

While this play is radical in its emphasis on female solidarity, the character Morocha represents the possibility of bisexuality or lesbianism as a viable social expression as an escape from machismo.⁵ In a scene where Sandra plays the role of a priest, during the enactment of a confession, Cristina unwillingly admits to the priest: “I fell in love with another woman, father, ANOTHER WOMAN. And, how can this be, if God created a man for a woman, and a woman for a man? But, what I feel for her is absolutely unbelievable” (11). The priest’s response: “God made us in his divine image.. he accepts us all the same. This sensational feeling you have is because God is speaking to you through him. Remember where there is love, there is God” (11). While his reaction is in contradistinction to Catholic theology, lesbianism as a viable sexual practice, the promotion of lesbianism forces the system to be problematized, especially if, as Judith Butler reminds us, “the loss of gender norms would have the effect of proliferating gender configurations, destabilizing substantive identity, and depriving the naturalizing narratives of compulsory heterosexuality of their central protagonists: ‘man’ and ‘woman’” (146). The women in this play portray a variety of performative behaviors, as Natasha is described as bossy, Morocha is sweet, Sharitín, as whiney, Chante, has a hidden strength, as, she has taken the first step to flee from her abusive household. If, as Davis has written, “the roots of sexism and homophobia are found in the same economic and political institutions,” homophobia, by extension, cannot be maintained if the goal is to eradicate racism and sexism.

While often called colorism instead of racism, this institution has a particularly interesting tension between the lighter Nicaraguan Pacific coast, and the Atlantic Coastal region, populated by indigenous and Afro Nicaraguan communities. In fact, according to Lancaster, “in popular discourse, blackness becomes a sort of semiotic sponge, absorbing the entire range of possible negative connotations... essentially *whiteness* dominates *blackness*” (231). The women’s collective, Lapta Yula, whose name in Miskitu, is one of the indigenous groups in the Atlantic Coastal regions. The group is a venture of RAAN (North Caribbean Coast Autonomous Region). During the Sandinista 1980s, the Sandinista government’s failure to include the Atlantic Coast region in the socialist program is highlighted by the fact the Atlantic Coastal region became autonomous into the North and South Atlantic Autonomous Regions, created in 1987, that both have had their own regional governments since 1990. Lapta Yula, founded in 2010, is composed primarily of farmers, teachers, craftswomen, and students from the Waspam and Puerto Cabezas region. The group was founded to collectively create and communicate the urgency of revitalizing and protecting the indigenous and Afro Caribbean cultures. They also aim to help men work together to eradicate violence, problematizing hegemonic masculinity.

“Life goes on” (in Spanish *La vida sigue*, or Iwan gka, as Spanish and Miskitu are inextricably linked in their plays, as these linguistic systems are on the Atlantic Coast), dramatizes the devastating effects of a flood on crops. The Atlantic Coastal region, unfortunately, is an extremely impoverished region; most earned money is spent on food staples, and a flood or a drought can literally mean a meal or hunger. “*La*

vida sigue” and “*Ser como el aire quisiera*” dialogue and share many similar themes: the emphasis on collectively, on solidarity. But, in *La vida sigue* there is a male character, the father, Atas, whose worries start the play: “it hasn’t stopped raining for three straight days. I am worried about the crop of beans that I had to pick. What am I going to do?” (1). The male voices portrayed by 8 de marzo focus on the negative behaviors associated with masculinity to empower women, collective action between men and women is shown as a means of survival. His wife, Samlita, and his daughter, Pancita, try to assure and calm him throughout the play, even suggesting that “maybe it is better for you to look for work in another place” (1). In desperation they sing to the sun, a reference to the group’s name, as well as the significance the sun has in indigenous cultures. Miskitu, often the language used at home, is interspersed in the text: *lapta, lapta, lapta, yan sika wis kat luhpia.*” Atas, much as we saw in *Ser como el aire quisiera*,” initially gets drunk to escape the impending doom his family will surely encounter if food isn’t found soon. Why is the consumption of alcohol by men prevalent in both plays? Derek Iwamoto correlates the relationship between traditional masculinity and the consumption of alcohol. According to his study, “masculine norms may indirectly affect alcohol use through heightened psychological distress. Men who attempt to adhere to strict male codes experience heightened psychological strain and psychological burden. To reduce this strain, they might engage in avoiding coping methods, such as drinking as a means of regulating their negative mood. Numerous studies have supported this notion – masculine strain related to trying to fulfill dominant gender role expectations, have been found to be positively associated with heavier alcohol use and alcohol-related problems among men.” (245). Atas’s wife asks him “why did you come back home drunk? Why?” (2). While it is no secret that men lose under machismo, albeit differently and not to the degree as women, at the very least on the biological level, the damage to one’s kidneys and liver is not averted simply because one embraces hegemonic masculinity. But, while Fidencio verbally and physically abuses Chante, Atas drowns his frustration in alcohol and, the female members in his household are spared any violence. While Shante is too afraid to confront her husband, Atas and Salmita confront the male head of the household about his drinking. Why? To encourage an audience to change the narrative, change history, as long as it was being used. Irigaray minds us that “if we speak the same language to each other, we will reproduce the same story. Being the same stories all over again. Don’t you feel it? Listen: men and women around us all sound the same. Same arguments, same quarrels, same scenes. Same difficulties, the impossibility of reaching each other. Same.. same.. always the same” (69). By speaking back, by questioning, in this case the story isn’t the same, it has changed.

The differences between *Ser como el aire quisiera* and *La vida sigue* highlight the different historical realities between the Coasts. For many Nicaraguans who occupy the Pacific side, the Atlantic Coast is often referred to as the “other Nicaragua,” separated by nearly impenetrable terrain, and, the necessity to fly from Managua to get to Bluefields, for example, attests to this literal and figurative othering. Nicaraguans of primarily mestizo descent occupy the “better side” of Nicaragua, while three primary indigenous groups (Miskito, Sumas, and Ramas) and Afro-Nicaraguans occupy the Atlantic side. *La vida sigue* ends with the emphasis on collectivity, as Atas was able to find work and returns home with gifts. Pancita joyfully says to him: “you arrived home just in time to celebrate Christmas, let’s go celebrate the el urah li with the entire community” (51).⁶ Seemingly there are several instances of neoliberal, capitalist influences on “*Ser como el aire quisiera*” that do not exist in *La vida sigue*. Lapta Yula’s text emphasizes the “we,” not a radical first

world feminism that is often hostile to women of color, non-heterosexual, transgendered women, but a “we” that includes all “women,” being careful to avoid the traditional racialized sign that word conjures up as a result of white, bourgeoisie, middle class feminism. It also includes progressive men, men who are willing to partake in the struggle against individualism and work towards the the collective good. In *Ser como el aire quisiera*, for example, Natasha exclaims “I think that each woman has to make her own way, find herself, but count on us, the “us” being the female “nosotras” in Spanish (13). Even though Shante’s individual struggle is a struggle, by extension, to all women suffering any type of abuse, it is still portrayed as a “she” versus “him” and then a “she” helped by “a female them.” *La vida sigue* uses a slightly different paradigm: a “me” should always be a “we,” the “communal” we. Women are more likely to be victims of abuse, as acknowledged in the groups’ goals, as well as criticisms of men who refuse to allow women in positions of authority. Atas’s constant drinking appears to a larger criticism of machismo as an ideology, one that is perhaps a vestige of Eurocentrism. This speaks to the colorism or racism towards those in the Atlantic Coast, and this sexism, albeit not as explicit in *La vida sigue*, has been a necessary foundation for the racism/colorism that enabled (and continues to enable) the destruction of the indigenous cultures that the Miskito have been desperately trying to eradicate. Cynthia Enloe, in fact, posits that it is machismo that helps maintain classism and colorism in place: “the colonially seeded culture of machismo serves to legitimize class and racial stratifications; that is, the subjugation of all women helps perpetuate the inequalities among the country’s men. Many men who are denied access to decent jobs or to public decision-making continue to feel powerful as long as they can control women in their daily lives” (428). Fidencio classically fits this paradigm, as Shante, who is economically dependent on him for survival, allows a psychological festering, a neocolonization of her mind that manifests itself in her justification and borderline need for this abuse. Perhaps for fear of this same microcosmic model, Atas’ wife chides him for drinking, and, he ceases this destructive behavior eventually and heeds his wife’s warnings.

In *La vida sigue* the emphasis on solidarity is seen in the grandmother, who resides with the family and is portrayed, as someone who is respected and revered. This may be an allusion to the notion of time in traditional indigenous cultures. Capitalism compels us to measure the world in a small, individual way. Under capitalism, thinking about one’s great-great-great grandparents seems foreign, but, six generations is not a long time for many traditional native groups. These struggles are communal struggles, and, their focus is not necessarily on the here and the now. Davis touches upon this when she discusses the concept of the “imaginary:” “activists cannot measure the work that we are doing by our own selves, by our own individual selves, by even our own lifetimes, because I would like to think that today we are living the imaginaries of those who have been long gone. We are living the world they wanted. And therefore we can expect that others will be inhabiting a world that we imagine, a new world that is impossible if we do not engage in the kind of activism required today.” While, for the Miskito, the somewhat idealized imaginary may be, on some level, a more contemporary pre-Columbian time period, as the residues of Spanish colonization have forever altered the structures of these Caribbean societies. “Somewhat” because, while it is doubtful the pre-Columbian societal structures were free of oppression, it can be argued that the Eurocentric, neoliberal ideologies, such as machismo, sexism, racism, homophobia (and it should be remembered that many native cultures recognized the existence of third genders), are the structures to be

dismantled. *La vida sigue* begins and ends with explicit references to Miskitu, the title of the play “Iwan gka,” and a reference to the song “el urah li” that the entire community celebrates at the end.

While it is easy to emphasize the failure of capitalism (individuality, Cedric Robinson’s racialized capitalism, reminding us that these concepts are inseparable, they co-exist), the socialist project in Nicaragua has failed in its own right. The Reagan administration is rightfully blamed for the failure of the socialist model in the 1980s, as U.S. funding destabilized Nicaraguan society, forcing the Nicaraguan government to spend nearly half of its budget on the military defeat of U.S. funded Contras. That said, the Sandinistas failed on many levels. While the marginalized (women, the indigenous, the poor) were certainly given a voice, and gays and lesbians were not the scapegoat for any failures, the ambitious socialist project failed. The Sandinistas ultimately let the Atlantic Coastal region become autonomous: following the Sandinista revolution, indigenous groups’ rights to communal property became law, protected under the Constitution and the Autonomy Statute of 1987. Article 36.1 of this statute states “*The communal lands are indissoluble; they cannot be donated, sold, leased or taxed, and they are eternal.*” The Atlantic Coastal region continues to be the least developed, most impoverished region of Nicaragua, as Nicaragua itself has become under socialist Daniel Ortega’s rule. *Ser como el aire quisiera* and *La vida sigue* both, to varying degrees, propose dismantling current societal structures: in the first play, sexism and homophobia, in the second, neoliberal system. The perennial question remains: if capitalism is inherently racist, and thusly, it must be abolished, with what system can or should it be replaced? A similar structure that tries to eradicate racism, sexism, and homophobia? Or, a more indigenous focused post-colonized structure that rejects colorism? Both projects are ambitious yet, as seen in these plays, do not seem radical enough. How can we tell a different story?

NOTES

1. The people who live in the Atlantic coastal region of Nicaragua are referred to as *costeños* in Nicaraguan Spanish.
2. All translations are mine.
3. Luce Irigaray seems to imply that there is always an element of violence when the male penetrates the female. She describes this act as follows: “the brutal separation of the two lips by a violating penis, an intrusion that distracts and deflects the woman from self-caressing she needs if she is not to incur the disappearance of her own pleasure in sexual relations” (74).
4. Irigaray posits that “rape has become the model for the sexual relation” (70).
5. Adrienne Rich defines lesbian existence as “a reality and a source of knowledge and power available to women, or, with the institution of heterosexuality as a beachhead of male dominance” (229).
6. The *el urah li* is a traditional Christmas song and dance.

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Antioxidant effect of *Physalis angulata* fruit on cells exposed to 2,4-dichlorophenoxyacetic acid

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Abstract

Several in vitro studies have described the erythrocyte toxicity mechanism response to the 2,4-dichlorophenoxyacetic acid (2,4-D) and its metabolites, strongly related to oxidative stress. Compounds such as ascorbic acid and flavonoids, present in various fructiferous plants like Physalis angulata L.-Solanaceae, are exogenous sources of antioxidants, which have aroused interest because of its beneficial biological effects to health by capturing oxygen reactive species. Here, was investigated the cytotoxic effects of the 2,4-D in human erythrocytes exposed to this herbicide and treated with the juice of P. angulata fruits. Analyzing the oxidant and antioxidant mechanisms in these cells in vitro, was demonstrated that the damage mechanism by the Physalis juice occurred at the level of cellular proteins and membranes, altering levels of endogenous antioxidants components such as reduced glutathione and uric acid, and exogenous like vitamin C. Our results indicate new insights into the mechanism of human erythrocytes response exposed to the P. angulata juice, providing wayforward to future studies of cytotoxicity.

Keywords: 2,4-dichlorophenoxyacetic acid; Oxygen reactive species; Physalis.

1. Introduction

The application of herbicides for weed control has been a common activity in global agriculture, aiming to increase crop productivity. However, when these compounds are employed in an uncontrolled manner, they can impact non-target organisms such as those living in the environment, including humans (Nwani et al., 2010).

Herbicide levels in water, food and soil have increased considerably, which accentuates the risk of environmental and toxicological problems. 2,4-Dichlorophenoxy acetic acid (2,4-D) is commonly used for annual weed control, preemergence of broadleaf in cereals, corn, pasture, rice and non-agricultural (Bongiovanni et al., 2012). According to the National Health Surveillance Agency (ANVISA), 2,4-D is a hormonal herbicide belonging to toxicological class I due to the acute effects it can produce in a single exposure (Anvisa, 2018).

Prolonged inhalation of 2,4-D in humans may cause acute effects such as dizziness, coughing, weakness and even temporary loss of muscle coordination, as the main and most recurrent effects are due to improper

handling of the product, which may lead to skin and eye irritation (Macedo Neto, Froehner and Machado, 2012).

In addition, some studies show that 2,4-D alters cellular energy metabolism and redox balance, favoring the occurrence of Oxidative Stress (OS) in humans (Bongiovanni et al., 2011; Liu et al., 2017). OS can be caused by increased production of Reactive Species (RSs) or decreased antioxidant system action that is activated to prevent the buildup of RSs that damage cells and molecules by attacking the body's lipids, proteins, polysaccharides and nucleic acids (Gelatti et al., 2018).

For this reason, erythrocytes, being anucleated and unable to repair damage through synthesis of new components, become an excellent research model for oxidative damage, since any modification that occurs cannot be masked by the repair mechanism in these cells. Nicotinamide Adenine Dinucleotide Phosphate (NADPH) is used as a cofactor in the reduction of Oxidized Glutathione (GSSG) in Reduced Glutathione (GSH), which is the primary protective mechanism against oxidative stress (Greer et al., 2003; Zhou et al., 2017).

Erythrocytes have a hemoglobin solution essentially surrounded by a lipid bilayer complex containing about 42% lipids, 52% protein and 7% carbohydrates. These membrane components can be highly damaged when oxygen (O₂) is reduced and generates Reactive Oxygen Species (ROS), such as the hydroxyl radical (OH⁻), which acts as an oxidant (Furman, 2011). Oxidative damage can be counteracted by endogenous antioxidants such as GSH (free thiol group tripeptide) and uric acid (metal ion chelator from the capture of ROS by its urate group) or exogenous as Ascorbic Acid (ASA), which despite being at levels lower levels within erythrocytes (0.043 mol/L) is essential for action synergism along α -tocopherol (vitamin E), which acts as a chain reaction terminator, preventing the spread of ROS (Furman, 2011; Vaos and Zavras, 2017). In this context, certain nutrients and food components have stood out due to their antioxidant activity, ie, with the ability to transform and/or reduce the oxidation action of RSs, preventing their harmful effects on the body (Tureck et al., 2017). Phenolic compounds such as simple and glycosylated flavonoids, present in various fruits, are also exogenous sources of antioxidants, which aroused interest due to their beneficial health biological effects (Camlofski, 2014). Thus, the present research carried out experiments with a fruit widely marketed and cultivated in southern Brazil, called *Physalis angulata* L., an annual branched shrub belonging to the Solanaceae Family, known by various names as Mullaca, camapu, gooseberry cape, wild tomatoes, among others, widely distributed in tropical regions and their extracts or infusions have been used in many countries in folk medicine to treat a variety of diseases such as malaria, asthma, hepatitis, dermatitis and rheumatism (Rathi et al., 2017). Therefore, the present study aimed to evaluate the cytotoxic effects of 2,4-D on human erythrocytes exposed to this herbicide and treated with *Physalis angulata* L. fruit juice.

2. Method

2.1 Ethical Aspects

This project was submitted to the Ethics Committee of the University of Cruz Alta and was approved under protocol number: 15510413.3.0000.5322. Included in these subsections the information essential to comprehend and replicate the study. Insufficient detail leaves the reader with questions; too much detail

burdens the reader with irrelevant information. Consider using appendices and/or a supplemental website for more detailed information.

2.2 *Physalis angulata* cultivation and 2,4-D preparation

The *Physalis* were planted in the experimental area of the Vegetal Multiplication Laboratory, University Campus of Unicruz - Technological Pole Alto Jacuí in the town of Cruz Alta, located in the Northwest of Rio Grande do Sul state. The soil is characterized as Typical Dystrophic Red Latosol, type A moderate and medium texture (Embrapa, 2006). The climate, according to the Koeppen classification is subtropical, type cfa 2a, with rains uniformly distributed throughout the year. Samplings of fruits were obtained after 60 days from lab seedlings transplantation to the field (approximately February 20, 2014). For the production of the juice, the fruit were picked in the end of maturation and weighed (250g), followed by grinding of the fresh fruit and dilution with water to obtain the concentration of 250g/L, while the other concentrations (50 and 100g/L) were made from the initial solution. For the 2,4-D preparation, 1.1 grams of 2,4-D were measured, followed by dilution to one liter, to achieve the concentration of 1.1g/L.

2.3 *Physalis* Fruit characterization

Measurements of total polyphenols and condensates tannins were performed using 50mL *Physalis angulata* juice at a concentration of 250g/L lyophilized.

2.3.1 Determination of Total Phenolics

The determination of the total phenolics was made according to the method described by Chandra and Mejia (2004). Infusion of 250g/L lyophilized *P. angulata* was diluted with distilled water to a concentration of 0.15mg/mL. To this solution was added sodium carbonate to 20% and after 5 minutes was added 2N Folin-Ciocalteu reagent. This reaction mixture was incubated for 10 minutes and the spectrophotometer readings taken in visible 730nm. The tests were performed in triplicate and for calculating the dosage of total phenolics used was a standard curve of gallic acid. The results were expressed as mg gallic acid/g dry weight.

2.3.2 Determination of Condensed Tannins

The determination of condensed tannins was carried out using the method described by Burns (1971). Infusion of 250g/L lyophilized *P. angulata* was diluted with methanol to a concentration of 25mg/mL. To this solution was added methanol, vanillin solution 0.01g/mL and 0.08M hydrochloric acid. The mixture was heated at 60°C for 10 minutes. Readings were taken in visible spectrophotometer at 420nm. The tests were carried out in triplicate to calculate the assay was condensed tannins using a catechin standard curve. The results were expressed as catechin mg/g dry mass.

2.3.3 Blood collection, isolation of erythrocytes, exposition and treatment

Blood samples were obtained from 20 healthy volunteers, the blood was collected after fasting for eight hours by intravenous puncture into Vacutainer® tubes with ethylenediaminetetra acetic acid (EDTA). The study protocol was executed in conformity with the guidelines of the Institutional Ethical Committee. After

the measurement of hematocrit and hemoglobin into total blood, the samples were centrifuged at 3000rpm for 10 minutes and the plasma removed. Erythrocytes were washed three times with isotonic saline (0.9%) at 37°C, centrifuged and suspended with some adjustments (Catalgol et al., 2007). The hematocrit was diluted at 5% and the suspensions of erythrocytes were divided into five different groups with the same patients' samples:

- 1) Control, not exposed to 2,4-D nor treated with *P. angulata* juice
- 2) Exposed to 1.1g/L 2,4-D for one hour;
- 3, 4 and 5) Exposed to 2,4-D for one hour and treated with *P. angulata* juice at 50g/L, 100g/L and 250g/L for one more hour, respectively.

After exposure and processing the suspension of erythrocytes at 5% hematocrit were hemolyzed by vortexing, followed by centrifugation and separation of the supernatant, where a new hemoglobin measurement was performed and the remaining stored in the freezer for subsequent biochemical analysis.

2.3.4 Analytical determinations

2.5.1 Determination of hemoglobin and hematocrit

The measurement of hemoglobin levels was performed using a commercial kit Labtest®, according to the manufacturer's instructions. The hematocrit was determined by the microhematocrit method for the sealing of the capillary tubes followed by centrifugation at 11.500rpm for 5 minutes. With the aid of the hematocrit reading card, each microtube was read to obtain the percentage of cells relative to the total volume of solution.

2.5.2 Determination of total protein carbonylated proteins and uric acid

The dosage of total proteins and uric acid were done by use of a commercial kit Labtes[®], according to the manufacturer's instructions. The carbonylated proteins were analyzed according to the methodology described by Levine (1990) with some adjustments. 250µL of 10 mM 2,4-dinitrophenylhydrazine (DNPH) to 250µL of 2M hydrochloric acid were added, followed by incubation in the dark, and washing with the solution containing ethanol and ethyl acetate. 1500µL of the denaturing sodium dodecyl sulphate buffer (3% SDS, pH 8.0) were added and the samples were incubated for 10 minutes in a water bath at 37°C. After formation of colored product, the mixture was measured spectrophotometrically at 370nm and expressed as nmolcarbonyl/mg total protein.

2.5.3 Determination of Reactive Substances Thiobarbituric Acid (TBARS)

For the quantitative assessment of lipid peroxidation, the determination of TBARS was performed by the formation of malondialdehyde (MDA) following the procedure described by Stocks and Dormandy, (1971) with some adjustments. 200uL of supernatant were added to 550µL of water and 1mL 28% trichloroacetic acid (TCA). After centrifugation at 2000rpm for 15 minutes, the supernatant was collected and added to 500µL of 1% thiobarbituric acid (TBA). The solution was subjected to heating in a boiling bath at 95°C for 15 minutes. After cooling, the samples were read at 532nm through the pink color formation and the results expressed as nmol MDA/Hb.

2.5.4 Determination of Reduced Glutathione (GSH)

850uL of potassium phosphate buffer (TFK) 1M pH 7.4 and 50uL of 5,5-dithio-bis-2-nitrobenzoic acid (DTNB) 10 mM were added to 100uL of the supernatant. The mixture was read by a spectrophotometer at 421nm and the results were expressed in $\mu\text{mol GSH/Hb}$ (Ellman, 1959).

2.5.5 Determination of Ascorbic Acid (ASA)

Quantification of Ascorbic Acid (ASA) was performed with the addition of 50uL of supernatant into water at 150uL, 300uL of 13.3% TCA and 75uL of DNPH. Incubation was performed at 37°C for 1 hour and 30 minutes with the formation of colored product. The reaction was stopped by the addition of 500uL of sulfuric acid (H_2SO_4 65%), followed by centrifugation for 10 minutes at 3500rpm reading on a spectrophotometer at 520nm and the results expressed as $\mu\text{mol ASA/Hb}$ (Roe, 1954).

2.6 Statistical analyses

Data normality was assessed by the Shapiro-Wilk test. Nonparametric results of GSH, TBARS, carbonylated proteins and ASA were analyzed statistically by the Kruskal-Wallis test followed by the Dunns post-test. Parametric data of total protein, uric acid and hemoglobin were analyzed by 1-way ANOVA repeated measures followed by the Tukey post-test, considering significant differences at $p < 0.05$, through analyses using the statistical program GraphPad Prism 5 and results showing the mean $\pm$ standard error of the mean (SEM).

3. Results

3.1 Phytochemical characterization of the fruit of *P. angulata*

There was a concentration of $5.5 \pm 0.24 \text{ mg/g}$ of total phenolics and $1.5 \pm 0.48 \text{ mg/g}$ of condensed tannins in *P. angulata* juice at a concentration of 250g/L, which indicates that the plant has a low concentration of compounds with antioxidant potential compared with other juices (Vargas et al., 2008; Rocha et al., 2011).

3.2 Haematologic assessments by hematocrit and hemoglobin

The mean ($\pm$ SD %) hematocrit (Ht) of the subjects' total blood was 39 ± 2.0 , while the average ($\text{g/dL} \pm \text{SD}$) hemoglobin (Hb) was 14.8 ± 2.1 demonstrating the absence of pathologies associated with these parameters.

3.3 Induction of formation of ROS

The data demonstrate that the cells that have been exposed to 1.1g/L of 2,4-D did not alter the total protein (TP) levels and the carbonyls levels. However, there was a decrease of TP in cells exposed to *P. angulata* juice (Figure 1 A) and increased protein carbonylation in the group treated with 50g/L of juice (Figure 1 B). These data suggest that the lowest concentration tested appears to be toxic. We believe that TP reduction occurred by the increase of protein carbonylation generated by oxygen reactive species.

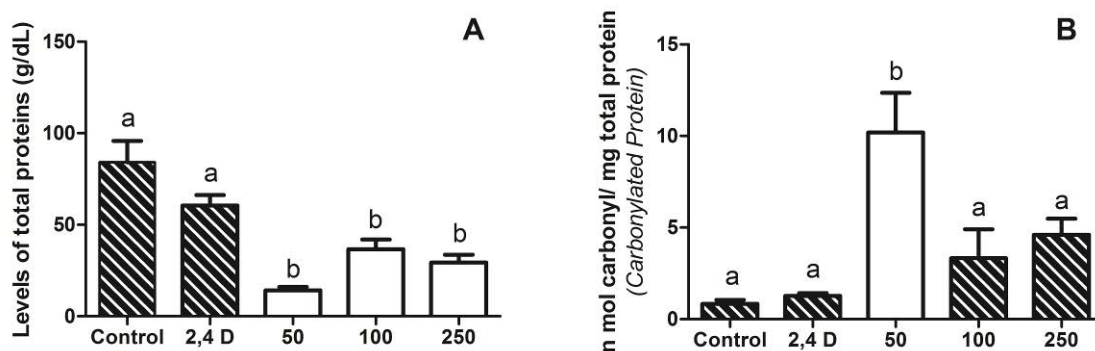


Figure 1 A. Levels of total proteins (g/dL)

Figure 1 B. Carbonylated protein (nmol carbonyl/mg)

3.4 Activation of the antioxidant system against damage in the cell membrane

The data suggests that *P. angulata* juice has a dose-dependent effect, therefore, the uric acid levels increased as the juice concentrations increased (Figure 2 B). Declining levels of TBARS (Figure 2 A) in concentrations may be occurring in proportion to the amount of uric acid, in other words, the higher the antioxidant levels the better to reduce the damage in cell membranes. The results demonstrate a greater cytotoxicity level of cell membranes exposed to concentration of 50g/L of *P. angulata* juice, suggesting an increase in the ROS generation, confirming the carbonylation protein levels presented in this study.

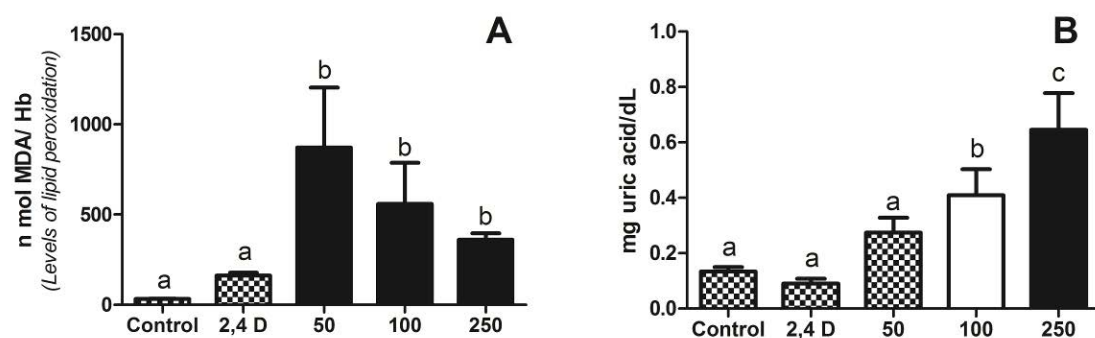


Figure 2 A. Levels of lipid peroxidation (nmol MDA/Hb)

Figure 2 B. Uric acid (mg/dl)

3.5 Increased GSH activity concomitant with consumption of ASA

The results show that the erythrocytes exposed to concentration of 50g/L *P. angulata* juice had higher consumption of ASA and GSH activity (Figure 3 A; B) which possibly happened due to increased oxidative damage already described in this study.

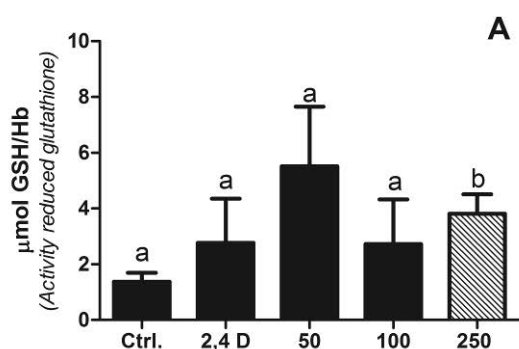


Figure 3 A. Activity Reduced Glutathione

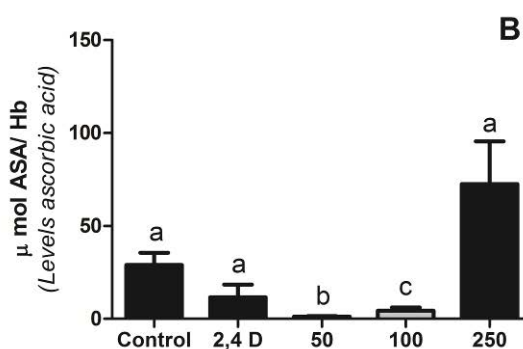


Figure 3 B. Levels Ascorbic Acid

4. Discussion

The aim of the present study was to evaluate the antioxidant or oxidative action of *Physalis angulata* L-Solanaceae in human erythrocytes exposed to the herbicide 2,4-D. The choice of this plant was due to phytochemical studies according to Lashin and Elhaw (2016) that revealed constituents with a wide range of biological activities presented by the genus *Physalis*, possibly due to the metabolic and structural diversity of its compounds with pharmacological properties such as alkaloids, flavonoids, glycosides, saponins, tannins, steroids, among others, attributed to these many of the documented anti-cancer, anti-tumor, and anti-leukemic actions, also considered as an effective immune stimulant with antimicrobial properties (Rathi et al., 2017). However, in the present study a low concentration of compounds with antioxidant action was demonstrated.

Phenolic compounds (including flavonoids) can react with RSs in the cell, conferring antioxidant properties that have the potential to inhibit pathological and degenerative processes. Consequently, these antioxidant properties confirm the therapeutic potential of this plant (Ferreira et al., 2019).

In this context, it was possible to verify that the toxicity of *Physalis* juice is dose dependent since, according to the concentration tested, there was an increase in lipid or protein damage, and in the case of treatment with 50 and 250 g infusions/L there was an increase in both lipid peroxidation and protein oxidation. These findings corroborate the results found by Conceição et al. (2017), which shows in their research that the toxicological effect caused by herbal extracts may be dose dependent.

In addition, it is noteworthy that in this study the damage was greater in lipids, probably because the membrane is one of the most affected structures due to oxidative stress due to lipid oxidation, a process in which ROS attack phospholipid polyunsaturated fatty acids cell membranes, disintegrating them and thus allowing these species to enter into intracellular structures. Phospholipase, activated by toxic species disintegrates phospholipids, releasing unsaturated fatty acids, resulting in deleterious actions of lipid peroxides (Kleniewska and Pawliczak, 2017; Thapa and Carroll, 2017).

The entry of toxic substances in the biological system generates RSs, which when not removed by the antioxidant defense system end up generating cellular damage such as oxidation of biomolecules through lipoperoxidation and protein carbonylation, enzymatic inactivation, exaggerated consumption of endogenous antioxidants, excessive activation of proinflammatory genes (Petiz et al., 2017).

From the degradation of aldehydes lipid peroxide products are toxic to cells. Malondialdehyde is a highly

reactive molecule, being a dialdehyde capable of reacting with primary amines in proteins or DNA to form crosslinks. The covalent modifications made by this secondary liporexidation messenger can alter the structure and function of proteins and nucleic acids and are responsible for the cytotoxicity of these molecules (Gaschler and Stockwell, 2017).

Regarding proteins, they are biomolecules that are present in abundance in the biological system, being the main oxidative targets in oxidative stress, due to the high affinity with ROS. Protein carbonylation derivatives (aldehydes and ketones) are formed by residues of methionine, cysteine, proline, histidine, arginine, lysine, tryptophan, tyrosine, phenylalanine and valine. As a consequence, carbonyl compounds, nitrated products, disulfide bridges, crosslinking, peroxides, among others are generated (Barreiro, 2016). Direct reactions of proteins with ROS may also lead to the formation of lipid peroxidation fragments containing highly reactive protein carbonylation. In addition, secondary reactions of primary amino groups of lysine residues with reducing sugars or their oxidation products (glycation and/or glyoxidation reactions) may also generate reactive carbonylation in proteins. Changes in protein oxidation may produce carbonyl groups (ketones and aldehydes) in their side chains leading to impairment of protein functions (Dalle-Donne et al., 2017; Zhou et al., 2017).

Protein carbonylation are typically dysfunctional or nonfunctional, having a major influence on cell viability, tissue and even complete organ dysfunction. It is likely that protein dysfunction after carbonylation may depend on the quantitative level and/or location of the protein-bound carbonyl group (s) (Dalle-Donne et al., 2017).

GSH levels increased at the concentration tested with *Physalis* juice (50 g/L), which in turn may be related to the increase in TBARS and protein carbonyl in this same treatment. Suggesting that the plant led to excessive production of RSs that have a widespread action on cellular homeostasis, causing biochemical changes on lipids, proteins and DNA (Murussi et al., 2014).

However, on the other hand, the plant also increased the production of the body's main antioxidant agent to probably reduce the damage generated on lipids and erythrocyte proteins exposed to 250 g/L concentration of *Physalis* juice, but without success, taking into account the damage continued to increase at this concentration.

At the moment was exposed the plasma of the samples with the herbicide an imbalance of this system was caused. Therefore, it was found in this study that although the plant increased GSH production, damage to lipids and proteins were predominant in treatments with *Physalis* juice, greater damage than exposure to 2,4-D, which shows a high toxicity of *Physalis* juice at concentrations 50 and 250 g/L on human erythrocytes.

The major non-enzymatic antioxidant is GSH, a tripeptide formed from glutamic acid, cysteine and glycine, and is present in millimolar concentration (2-10 mmol/L) in all eukaryotic cells. To prevent radical-mediated toxicity, specific enzymes and low molecular weight substances, GSH has the function of eliminating reactive species and helping to maintain cellular redox balance, being involved in various biological functions, playing a central role in biotransformation and elimination of xenobiotics, which are present in large quantities in agricultural pesticides, insecticides, plastics, cleaning products and pharmaceuticals (Kleniewska and Pawliczak, 2017; Oga, Camargo and Batistuzzo, 2014; Vaos and Zavras, 2017).

ASA has the characteristic of enhancing the activity of GSH and also vitamin E within the cells, through an electron donation of vitamin E molecule for the ASA molecule, generating a radical, which in turn oxidizes GSH. In contrast, when the ASA is in fluids it catches and neutralizes ROS (Picchi, 2010).

The increase in ASA levels in erythrocytes exposed to a concentration of 250g/L juice may be due to the higher concentration of *P. angulata* used in this group, as quantified by Camlofski (2014), the ASA content in fruit of *P. angulata* (~ 26 mg/100g fruit) confirming the presence of this antioxidant in fruits. Thus, the possible mechanism of action in reducing the levels of lipid peroxidation in this group may be occurring by the concomitant action of uric acid and ASA.

Only hemolysis and antioxidants, in particular the end-product of purine metabolism, uric acid, could bias the measurement of ROS generation. Uric acid is recognized as a potent antioxidant by removing ROS, particularly in combat lipid peroxidation protecting the lysis of erythrocytes. In addition, there is an inverse relationship between uric acid and lipid peroxidation (Peluso et al., 2016).

5. Conclusion

Our study has shown that *P. angulata* juice in concentrations of 50 and 250g/L caused cytotoxicity in human erythrocytes damaging cell membranes and altering proteins. The results presented here provide new knowledge about the erythrocytic response machinery against the damages caused by the *P. angulata* juice. Such mechanisms clarified here provide subsidies for future studies of cytotoxicity.

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Abbreviations: 2,4D, 2,4-dichlorophenoxyacetic acid; ASA, ascorbic acid; ROS, oxygen reactive species; GSH, reduced glutathione; UA, uric acid; GSSG, oxidized glutathione; EDTA, ethylenediaminetetra acetic acid; DNPH, 2,4-dinitrophenylhydrazine; SDS, sodium dodecyl sulphate buffer; TBARS, reactive substances thiobarbituric acid; MDA, malondialdehyde; TCA, trichloroacetic acid; TBA, thiobarbituric acid; TFK, potassium phosphate buffer; DTNB, 5,5-dithio-bis-2-nitrobenzoic acid; Ht, hematocrit, Hb, hemoglobin; TP, protein levels; GO, glutathione oxidase; GSH-Px, glutathione peroxidase; GR, glutathione reductase.

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An Example of Abet Accreditation Practice of Mechanical Engineering Program at UAE University

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Abstract

This paper focuses on the Mechanical Engineering Program (MEP) at United Arab Emirates University (UAEU) as a case study in terms of consistent accreditation by the internationally recognized Accreditation Board for Engineering and Technology, Inc. (ABET), where significant proportions of the study give attention towards the recent records of accreditation; granted in 2016. The paper describes the program educational objectives (PEOs), the student learning outcomes (SOs), and the curriculum, direct and indirect assessment tools of the SOs and it's mapping to the PEO, and the level of attainment achieved is addressed through a case study example.

Keywords: Accreditation, Assessment, ABET, Educational Objectives, Program Outcomes.

1. INTRODUCTION

ABET (Accreditation Board for Engineering and Technology) accreditation, is a voluntary, periodically renewable review process performed by an external team of professional experts from the academic and industrial discipline to determine if the education program meets a defined global standard of quality and if these educational programs are maintained. The ABET accreditation is a processed that developed and refined over 80 years of continuous dedication of educators to provide the highest standards of quality assurance. The ABET review process guaranteed significant commitment to quality that helps interest both students and faculty. Diversity is a common term when used with fields where the limit of the applications cannot be gauged. In this case mechanical engineering is one the most renowned fields that have been so widely perceived as engineering itself. For a discipline so broad it requires a certain form of qualification that is accredited by regulated bodies that can pertain the level of skill and knowledge to ensure the outcome and future of the field. This also carries forward towards being able to prove an Engineer's skill when it comes to a global standard and also their ability to benefit any organization in all countries. This kind of certification can easily be considered a passport between nations and a key that helps set in motion a graduate's or student's chances at pursuing graduate studies at world class academic institutions. Program accreditation is a major step for any institution. It ensures high quality level of education and makes it easier for students and their guardians to select the right program and institution. It is beneficial so employers can recruit good quality graduates and it gives the colleges and universities a structured mechanism to assess, evaluate; and improve the quality of their programs. An academic institution that sets acquiring accreditation as one of its standards ensures the education staff and the

program that satisfy global standards for all professions that are encompassed by the qualification. This is proven by the ample collection of publications that set the precedent that accreditation on an academic basis is a requirement for any institution. [1-7].

Maintaining high education standards of engineering education depends solely on the followed accreditation and assessment process the institution is implementing. Arun et. al. [8], in this article, the authors focus on identifying the important issues of accreditation and quality assurance in engineering education worldwide. They outline a research project on the design and development of a scientific accreditation model that can be implemented to assess engineering and technology courses. The authors also include the strategy of a multiple study case design in order to investigate important issues of accreditation and assessment.

Warren Roane; [9], reported the history and the objectives of accreditation in USA in his paper. He examined its basic elements, and noted its tendency to encompass an ever-increasing geographical area. The study compares the accreditation process in USA with Uruguay within MERCOSUR in term of engineering standards.

In this paper a case study on the accreditation process of the Mechanical Engineering Program (MEP) offered at UAEU is of interest and in the subsequent discussions some of the relevant details related to this process and assessments tools and its attainments will be highlighted.

HISTORY OF ABBET ACCREDITATION AT UAEU

One very prominent source of accreditation is ABET which is widely known as a nonprofit, non-governmental organization that is recognized in the United States by the Council for Higher Education Accreditation. It has since become worldwide, accrediting academic institutions that show interest in the initiative. United Arab Emirates University's (UAEU) Engineering programs became one of the aforementioned institutes in the year 1998 and have since then kept a successive record of maintaining ABET accreditation.

UAEU held the inauguration of the College of Engineering in 1980. The first batch to enter Mechanical Engineering Program (MEP) was a male batch in 1981. Five female students joined the program in 2001, which in number has greatly increased ever since. The spanning of MEP-UAEU continued from 1992-1998. In 1998 the MEP was granted a substantial equivalency by the ABET. Recognition was granted to the MEP in 2004. At the time, ABET was only granting a substantial equivalency recognition to institutes that were outside the US. In 2004 ABET altered the rules and finally expanded their full-accreditation to overseas. The MEP-UAEU received full ABET accreditation recognition in 2010 and in 2016. Maintaining the accreditation and keeping in line with the accreditation criteria helped MEP-UAEU upgrade to modern trends and adopt to international standards of the Mechanical Engineering Education (MEE). This motivated the graduates to join industries and graduate studies programs, both nationally and internationally. Since the first ABET accreditation in 1998, the MEP has witnessed various stages of evolvement. A consequence of these evolvement stages were to form a set of effective program learning outcomes (POs); (in 2013-2014 POs was replaced to "Student Outcomes (SOs)" by ABET). These SOs statements were designed to lead to the well satisfaction of the broadly stated

goals of the Program Educational Objectives (PEOs). During accreditation, MEP carried out revisions of SOs and PEOs to keep the statements consistent with the ABET criteria, both the mission and the vision statements. To ensure a well-established quality assurance (QA) system was set in place tools were required (direct and indirect) to measure the attainment level of the SOs and PEOs. This QA system led to the success of the MEP program since the measures taken prevent sources of potential deficiency, as well as predicts future technology demands.

2. THE NEED FOR ACCREDITATION PROCESSES

In order to ensure the quality of the engineering program and a high standard of the program's graduates UAEU's management works hard to seek accreditation from international organizations, such as ABET. The benefits of the educational assessment and accreditation process for engineering and technology affect two main constituents directly; namely academic (student) and administrative (institutional), [8]. The student's benefits can be summarized by:

- Design and implement advanced curricula, courses and laboratory works to meet international standards;
- Measure and assess the learning outcomes of students and identify strengths and weaknesses;
- Foster all national constituencies of the program such as industrial, governmental interactions and the appointment of students;
- Identify and develop the professional development of students;
- Design quality educational programs in engineering and technology, etc.

The administration benefit can be summarized by:

- Improve the institution infrastructure such as: classroom and laboratory facilities;
- Develop and implement faculty resources;
- Strengthen the communication tools and facilities between institutions and related partners;
- Attract funding resources and agencies to secure funding;
- Enhance national and international networking.

3. ME UAEU STUDENT LEARNING OUTCOMES (SOS)

Before 2014, the naming adopted by ABET for the currently named "Student Outcomes; SOs" was the "Program Outcomes; POs". The student outcomes (SOs) describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire as they progress through the program. Up to 2004, the mechanical engineering department at UAEU had in place eighteen SOs. These were mapped to ABET outcomes 3a-k and to previous program specific criteria which was effective at the time. Since the time of their inception in 2005, these SOs (in conjunction with the PEOs), were periodically reviewed and discussed with the constituencies in different capacities and different opportunities. Just prior to the previous ABET accreditation visit in 2009, the SOs were revisited one more time in the open house day held in 2009 and they were found by the program constituencies to still be a good match with the university and departmental mission. Recently, and based

on feedback and extensive discussions with one of our major constituencies namely the Academic Advisory Board (AAB); who visited the ME department in a mock ABET accreditation visit in Fall 2014, a trigger for revisiting our SOs was made. These new SOs are explicitly the exact ABET 3a-k which were effective at the time. The department also decided to retain in the new list of SOs an SO from the previous twelve SOs namely SO12, that addresses one of our program educational objectives that is related to entrepreneurship skills. The twelve SOs are reported by the following statements:

- SO1. An ability to apply knowledge of mathematics, calculus based sciences and engineering to Mechanical Engineering.
- SO2. An ability to design and conduct experiments as well as to analyze and interpret data.
- SO3. An ability to design thermal and mechanical systems, component or processes to meet desired needs.
- SO4. An ability to function on multi-disciplinary teams.
- SO5. An ability to identify, formulate and solve engineering problems.
- SO6. An understanding of professional and ethical responsibility.
- SO7. An ability to communicate effectively with written, oral and visual means.
- SO8. The broad education necessary to understand the impact of engineering solutions in a global and societal context and knowledge of contemporary issues.
- SO9. A recognition of the need for and ability to engage in life-long learning.
- SO10. An Ability to use modern engineering techniques, skills and computing tools necessary for engineering practice.
- SO11. Familiarity with statistics and linear algebra.
- SO12. A recognition of the need for and an ability to engage in entrepreneurial activities.

4. THE UAEU PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

In the pursuits towards maintaining reputable international recognition for its MEP by consistently securing ABET accreditation, the ME Department at UAEU was keen to develop and maintain a well-defined set of Program Educational Objectives PEOs. These PEOs undergo a continuous review and modification to assure the quality of our program and graduates and at the same time compliance with the university mission and vision statements. Our review process employs feedback instruments such as surveys and other assessment tools. Up to September 2014, the PEOs of the mechanical engineering program were stated as:

- PEO1. Serve UAE industries with a broad-based knowledge of mechanical engineering, related principles, theories, and applications.
- PEO2. Provide UAE industries capacity in designing, analyzing, testing, and implementing mechanical systems and processes.
- PEO3. Meet industry expectations with a set of professional skills including communication skills, the use of modern engineering tools, an ability to perform well in teams, and a commitment to life-long learning.

- PEO4. Be committed to the highest standards of ethical practice and to social and environmental issues relevant to the engineering profession.
- PEO5. Be aware of the tools and skills necessary for participating effectively in graduate education, building a healthy, diverse and sustainable UAE economy.

5. SELF-STUDY REPORT (SSR)

The ABET made it clear that meeting the ABET international criteria is a direct responsibility of the accredited institution. The ABET summarized the program criteria which demonstrates clearly that the program educational objectives and outcomes are met and achieved. The ABET caritas are summarized by the following areas:

- Criterion 1: Students.
- Criterion 2: Program Educational objectives.
- Criterion 3: Program Outcomes.
- Criterion 4: Continuous Assessment/Improvement.
- Criterion 5: Curriculum.
- Criterion 6: Faculty.
- Criterion 7: Facilities.
- Criterion 8: Support.
- Criterion 9: Program Criteria.

6. ME PROGRAM OUTCOMES ASSESSMENT TOOLS

The program's direct and indirect tools used for assessing the SOs and the level of attainments of PEOs are briefly described in the coming paragraphs based on ME-UAEU SSR, [26]:

Course Assessment Form (CAF): The main assessment tool that is currently used in the course level assessment to collect quantitative and qualitative data is the course assessment form (CAF). The CAF consists of a mapping between the student outcomes (SOs) and course outcomes (COs). Mapping the course outcomes to the department's student outcomes also proved at the time.

Mid-Study Exam: It is a form of a test that students should undertake in the middle of their study. The exam comprises three separate sheets each includes about 40 questions that are mapped to a number of student outcomes. Each exam sheet covers questions related to one focus group and is performed within a course where the exam contributes to the grade of that course.

Exit Exams: It is a form of a test that students should undertake in senior year. The exam comprises questions that are mapped to a number of student outcomes.

Open House: The open house is an important event that brings together, in a very effective and fruitful framework, the program constituencies and gives them the chance to share, discuss, and exchange ideas with ME Faculty on matters of importance for the program that contribute to continuous improvement pursuits.

Surveys: Collected questionnaires from graduating students, industrial employers, open house, industrial training supervisors, and alumni are compiled in a single folder. The received feedback is used for assessment of the level of attainment of the SOs and to achieve continuous improvement.

Tool for GPs and Industrial Training: To gain a more direct way of evaluating the attainment of the SOs, the ME department developed a direct tool for assessing Graduation Projects (GP) and Industrial Training (IT) students. This was in the form of an evaluation compiled by ME faculty members serving on the oral exam jury of ME students while defending their graduation projects theses or their final industrial training report.

Student Exit Survey: The student exit survey is conducted at the end of their tenure in the department and it provides input to the level of attainment of each of the twelve SOs.

IT supervisor Survey: The IT unit assesses the industrial training at the three levels of evaluation of the students. The first level is a survey filled by the industrial supervisor, the second level of evaluation adopted at the industrial training and graduation projects unit is for a report and the third level is the presentation by the student at the end of the training period.

Alumni Day and Alumni Surveys: ME faculty and ME alumni exchange and share ideas about different aspects that may result in improving the ME program and the way it is delivered. Recent Alumni surveys on the level of attainment of the PEOs and the SOs have been conducted.

Employer Survey: The ME department conducted surveys seeking the opinion of the employers of our graduates regarding our SOs and PEOs via open house meetings, and mail correspondences.

Faculty Opinion: Faculty members are all requested to complete a survey which requires an opinion on how they believe is the performance and level of attainment of the SOs by our students.

Academic Advisory Board (AAB): It is composed of academicians from different engineering schools in the United States with extensive experience with ABET Engineering Programs accreditation that enables them to provide us with valuable input and feedback on UAEU engineering programs.

Industrial Advisory Board (IAB): The College synthesized a board composed of leading members from the different industrial sectors in the country. Many of them might even be alumni of the college who already graduated some time ago and assumed leading positions in the local industry and institutions in UAE. The board's feedback to the college on issues and matters related to the college and its different engineering programs is expected to be of great value and help for us to attain continuous improvement.

6. EMPLOYED PROGRAM ASSESSMENT MODELS

Figure 1, [26] summarizes the QA process and demonstrates how and when different assessment tools (direct and indirect) and the interaction with the different constituencies, are being used at all three levels: Course, Curriculum, and Program levels. A brief description of each level of assessments are described below:

6.1 Course Level Assessment

The department developed two stages in assessing each course. The first stage is by the faculty teaching the course and the second stage is by a focus group consisting of faculty members in the field of that course. Each of the course's outcomes is mapped to relevant student outcomes. Each faculty member

assesses his/her course and submits a course assessment form (CAF) at the end of the semester. Table 1 summarizes the components of the course level assessment system. It outlines the objectives of the course level assessment, defines the entities in charge, the assessment tools used and their nature (direct and indirect), and the frequency at which the assessment is done.

6.2. Curriculum Level Assessment

The curriculum level assessment is an intermediate level between the course level and the program level assessments. The curriculum level assessment leads the efforts of improvement of the ME curriculum. The focus groups then report the recommendations to the assessment committee and the curriculum committee who evaluate the proposed improvements and their relations to the overall curriculum. In this process the assessment committee interacts with the curriculum committee. The curriculum committee is the link between the department and the college where all suggested curriculum changes are carried to the college curriculum committee for discussion and recommendation. Table 2 gives more details of the curriculum level assessment. The objectives of the system are listed and the reporting chain is outlined along with the body in charge.

6.3 Program Level Assessment

The program level assessment provides the highest level of assessment to evaluate the overall attainment of the program educational objectives (PEOs) and the students' outcomes (SOs). The objectives of the assessment, person in charge, constituencies, assessment tools and frequency of evaluation are all outlined in Table 3.

7. CASE STUDY: SOS AND PEOS ASSESMENT ATTENMENT

In the following section an examined case study is to be reported where data was collected from all listed assessments tools, the assessment tool's data are required to provide a score on a scale from 1- 5, where 5 is the highest attainments and 1 is the lowest. A three-level scale is used to assess the extent of attainment of each student outcome. The first level of SOs attainment is "excellent". In which "Excellent" means that the outcome has shown an excellent level of attainment of 4 or above, with this high level of attainment, the driver for improvement actions would not be the need to rectify deficiencies. Instead, it would be the longing for an ever continuing improvement at a high level. The second level of SO attainment level is "ability", which indicates that the average score is 3-4 and this means that an action to improve is required as soon as possible. The third level on the extreme case when a SOs outcome is attained at a "Fair" level, this means that the average score is less than 3 and in that case a serious action to rectify this deficiency is urgently required, [26].

7.1 Level of Attainment of the SOs:

The results of the assessment of the years, 2012, 2013, and 2014 are summarized in figures 2 to 7. In these cycles many assessment tools are used such as: Course Assessment Files CAFs, Mid-study exam, Exit exam, Faculty Opinion, Industrial Training Supervisory survey and GP Quantitative Measure. Figure

2 shows the summary of the attainment of CAFs over the years 2012- 2014, overall the CAF achieved all SOs in an excellent level, equal or above 4 for all examined years. Figure 3 displays the summary of the attainment of mid study exams over the years 2012- 2014, results demonstrate a level of attainment which vary between excellent and fair. Somehow, this result is anticipated since students have the mid study exam in all studied topics without any prior preparation. But at the same time these results expose the areas of weakness for the students to the faculty.. Figure 4 shows the summary of the attainment of exit exams over the years 2012- 2014, within the available data the students attained a level between ability and fair, which again is expected keeping in mind that students are taking the exam in the graduation year and the exam cover all studied subjects. Figure 5 illustrates the summary of the attainment of Faculty Opinion over the years 2012- 2014, the reported level of attainment is ability and this level was consistent over all previous cycles. Figure 6 and 7 illustrate the summary of the attainment of Industrial Training Supervisory survey and GP Quantitative Measure over the years 2012- 2014, as described earlier this data was collected from surveys and the attainments levels vary between excellent and ability.

7.1 Level of Attainment of the PEOs:

The mapping between the twelve SOs and the above PEOs is given in Table 4. A three-level correlation between the SOs and the PEOs is used. The solid square presents the strongest correlation (high correlation). The hollow square indicates a moderate relationship (reasonably correlated) while the lowest level of correlation (slightly correlated) is represented by an empty square. The table shows a well exposed and distributed correlation between any given PEO and the SOs, where each PEO maps to at least four SOs. The table can also assist in correlating the results of the assessments obtained for SOs to those of the PEO. Figure 8 illustrates the average results of the mapping for the available data of the SOs to PEOs over the reported period 2012-2014. A level of attainments between excellent to ability was demonstrated over all PEOs results. Reported results suggested a consistency between the mappings of the same SO to different PEOs.

8. CLOSING REMARKES

In this article a description of ME-UAEU practice through the ABET accreditation process was reported for one period cycle 2012-2014. Direct and indirect assessment tools were defined and briefly described. An examined case study was reported.

From the assessment results, the attainment of the SOs has been achieved. The results also show steadiness, which reflects robustness in the assessment tools, and improvement, which results from the continuous support and reflection. Generally, all tools have scores that are somewhat steady over the past terms. However, there are some discrepancies among the scores. With good degree of confidence on the tool results, we can conclude that our students have achieved SO1 with a high average score. This is evident from the agreement of the CAF, GPs course assessment, IT supervisor assessment, student exit survey, alumni survey and employer survey. Given the nature of the exit exam, 2.5 is considered to be satisfactory. The results show that attainments of SOs have been achieved at a satisfactory level. The assessment tools are found to be robust. The improvement noticed in the attainment of the SOs was driven by actions at

focus group levels and the feedback from program constituencies. The mapping of PEOs to reported SOs show a level of attainment that varies between excellent and ability.

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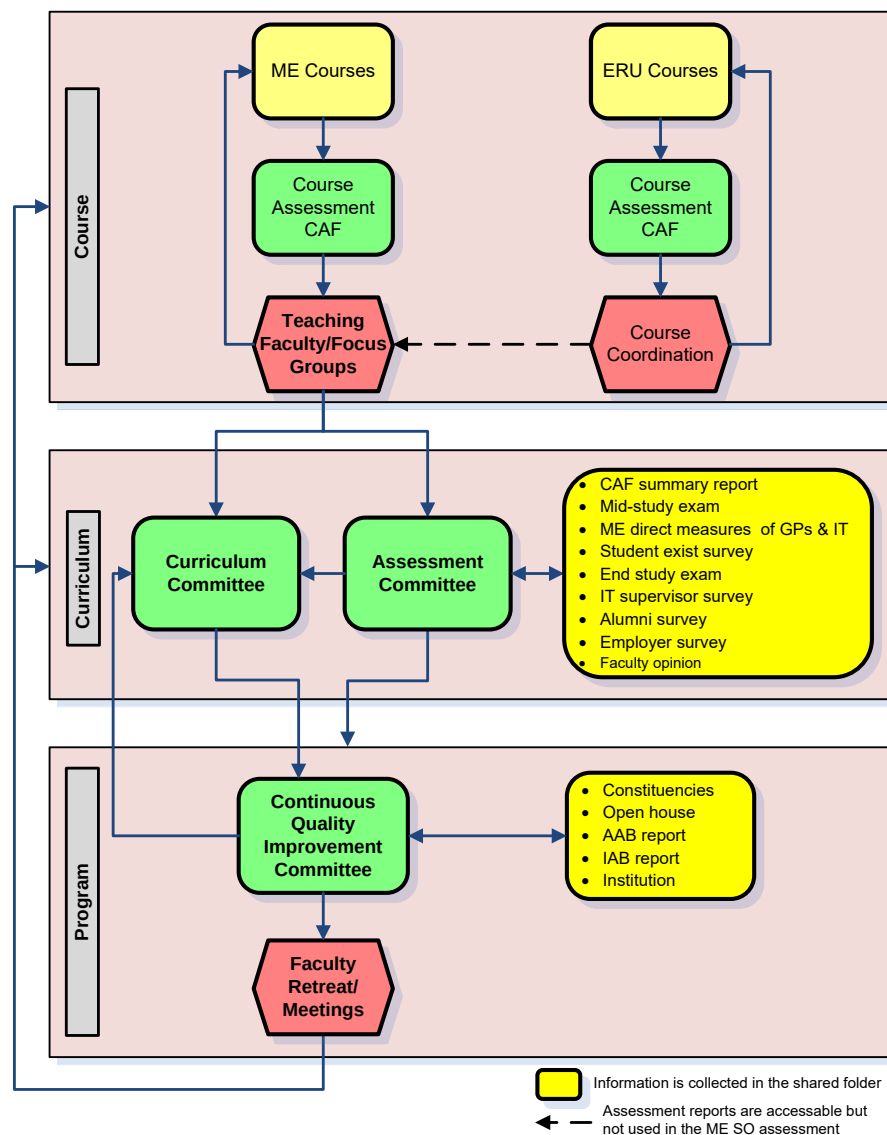


Figure 1. Program assessment and improvement process [26]

TABLE 1. COURSE LEVEL ASSESSMENT SYSTEM [26]

Objectives	Prepare objectives/outcomes	
	Conduct course assessment	
	Coordinate with focus group	
Person in charge	Teaching faculty	
Constituencies	Students	
	Faculty	
	Focus groups	
Assessment tools	CAF – Quantitative	Direct
	CAF - Student Course Surveys	Indirect
	GP I & II (course assessment)	Direct
	Focus Group Meetings	Indirect
Frequency	Every time the course is taught	

TABLE 2 CURRICULUM LEVEL ASSESSMENT SYSTEM [26]

Objectives	Ensure match between PEOs and SOs Design coherent learning tasks that meet the SOs Ensure that the courses serve their objectives in the curriculum Establish effective communication between faculty Implement improvement	
body in charge	Focus groups	
Assessment tools	CAF	Direct
	Mid-study exam	Direct
	ME direct measures of GPs & IT	Direct
	Student exit survey	Indirect
	Exit exam	Direct
	IT supervisor survey	Indirect
	Alumni survey	Indirect
	Employer survey	Indirect
	Faculty opinion	Indirect
Frequency	Every term	

TABLE 3 PROGRAM LEVEL ASSESSMENT SYSTEM [26]

Objectives	Develop PEO that meets the college and university missions Monitor overall program outcomes and graduation attributes Devise clear advising, monitoring and evaluation plans Implement well-structured curriculum Identify assessment tools Continuous monitoring and improvement of the program Collect and analyze assessment data Devise action plans for continuous improvement	
body in charge	CQI- committee	
Assessment methods	Open House	Direct
	Academic advisory board	Indirect
	Industrial advisory board	Indirect
	Institution	Indirect
Frequency	Major review every 2 years during the open house	

Table 4. CORRELATION BETWEEN THE TWELVE SOS AND THE PEOS IN PLACE UP TO FALL 2014 [26]

	SO1	SO2	SO3	SO4	SO5	SO6	SO7	SO8	SO9	SO10	SO11	SO12
PEO1	■	■	■		■		□	□	□	■	■	■
PEO2	■	■	■		■	□	□	■	□	■	□	□
PEO3				■		□	■	□	■	■		□

PEO4						■	□	■				□
PEO5				□		■	■	■	■	■		■

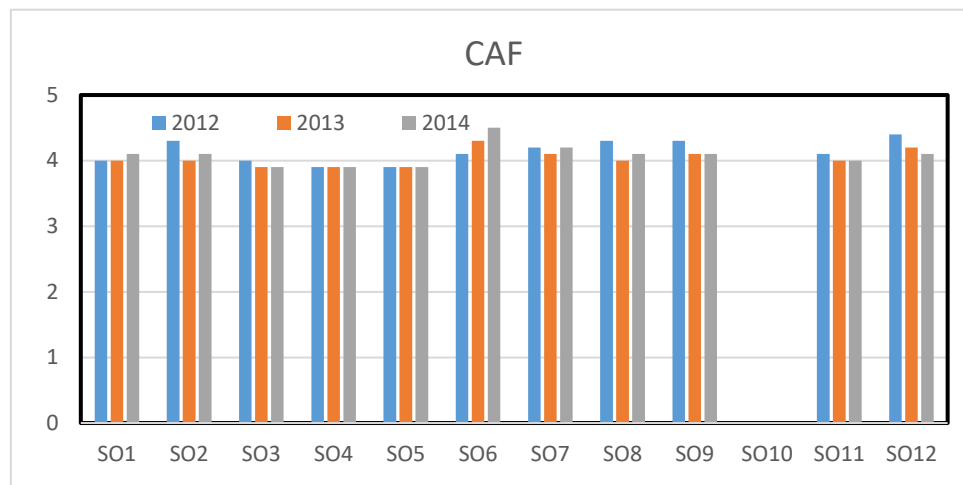


Figure 2. Summary of the attainment of CAFs over the years 2012- 2104. [26]

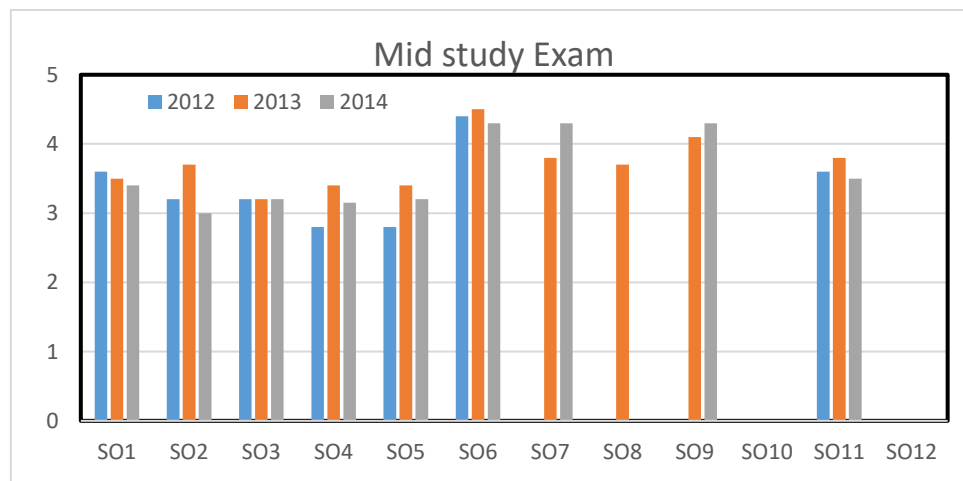


Figure 3. Summary of the attainment of Mid Study Exam over the years 2012- 2104. [26]

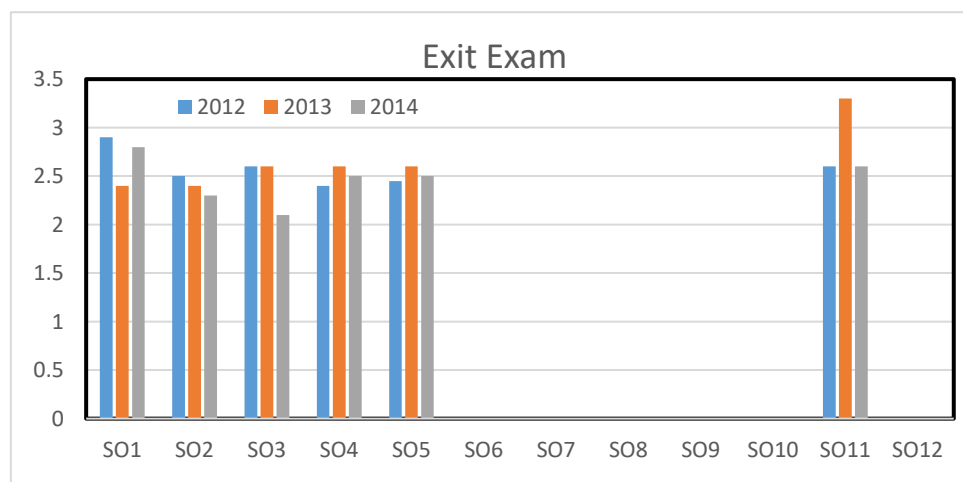


Figure 4. Summary of the attainment of Exit Exam over the years 2012- 2104. [26]

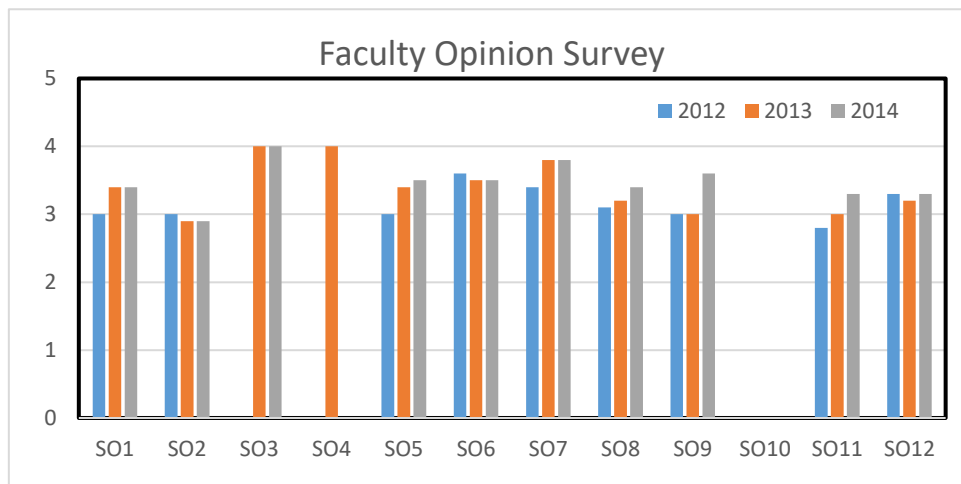


Figure 5. Summary of the attainment of Faculty Opinion years 2012- 2104. [26]

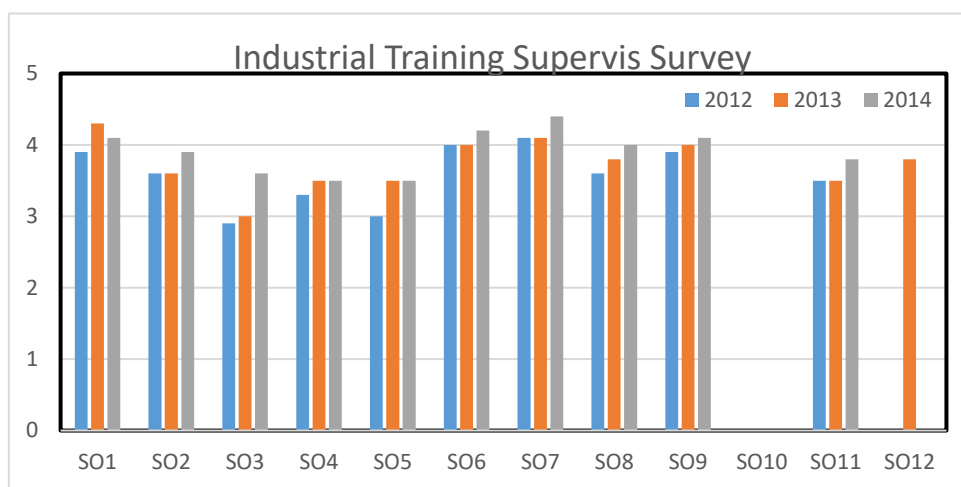


Figure 6. Summary of the attainment of Industrial Training Supervisory survey over the years 2012- 2104. [26]

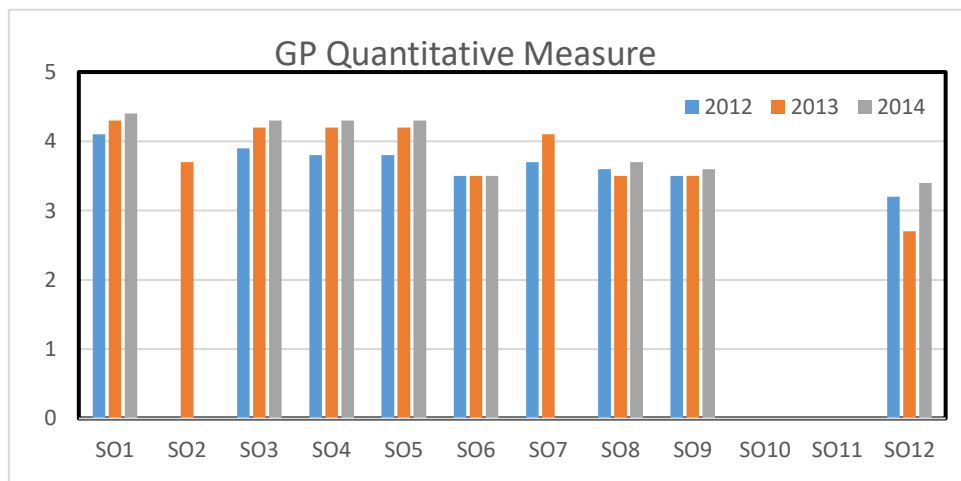


Figure 7. Summary of the attainment of GP Quantitative Measure over the years 2012- 2104. [26]

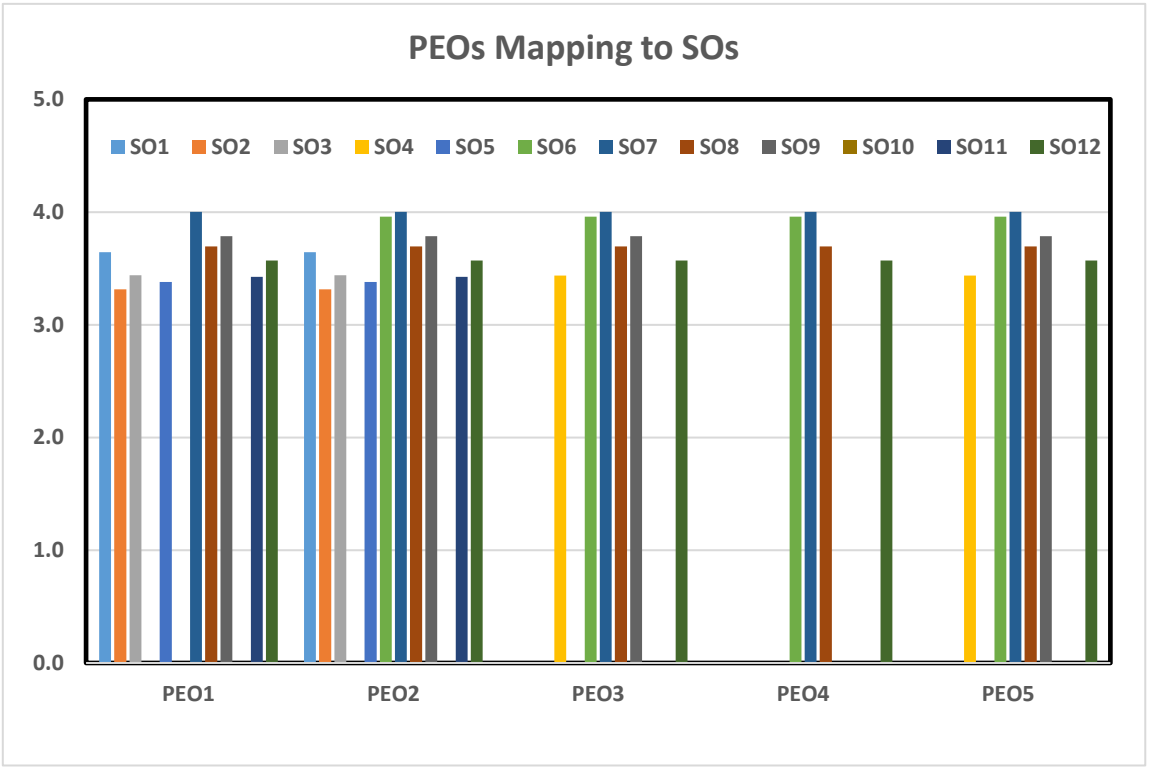


Figure 8. POEs mapping to the SOs displaying the average for the reported cycle 2012-2014

Basal cell carcinoma in the labial filter: surgical treatment and reconstruction with bilateral perialar advancement flap in ascending

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ABSTRACT

The bilateral perialar advancement flap in ascending is a good option for restoring complex upper lip defects. We report a patient presenting with a basal cell carcinoma in the upper lip filter, submitted to reconstruction with bilateral perialar advancement flap in ascending: a technique that is easy to perform, under local anesthesia and with excellent esthetic results.

INTRODUCTION

Basal cell carcinoma is the most common cutaneous malignant tumor, being the face the more common localization¹. It presents slow growth and rarely generates metastasis. It has unique clinical characteristics, and several clinical forms and the nodular variant form the more prevalent^{1,2}. Most of them come up without apparent cause, but there are factors considered predisposing, such as clear skin, chronic exposure to the sun, smoking, alcoholism, immunosuppression, chronic human papillomavirus infection².

Of the lip neoplasias, 5% involve the upper lip, where basal cell carcinoma predominates². They present a higher incidence in males, over 40 years. Female lips are supposed to be more protected due to the use of cosmetics and less exposure to aggressive factors³.

The metastases of basal cell carcinoma occur very rarely². Although a rigorous physical examination should be performed on all patients, seeking to rule out regional lymphadenopathy. If there are affected ganglia, excisional biopsy or fine-needle aspiration is indicated to rule out metastasis³.

The standard gold treatment is surgical; however, radiotherapy reveals good results when used in combination with surgery or palliatively in unresectable tumors³. Is reported, therefore, a case of surgical treatment with bilateral perialar advancement flap in ascending of a basal cell carcinoma in the upper lip region.

CASE REPORT

A 74-year-old male patient from Campo Grande (MS) had a tumor on the upper lip that had been slowly evolving for about three years. The dermatological examination was shown an infiltrated erythematous plaque with the presence of central ulceration located in the medial region of the upper lip. He underwent incisional biopsy (punch biopsy), and histopathological examination showed nodular basal cell carcinoma. After anatomopathological confirmation, surgery was performed, which consisted of tumor excision with a safety margin of 5mm, where all lateral and deep margins were compromised (Figure 1). Secondly, the margin was enlarged, with the removal of the total thickness of the tissue, including oral mucosa and musculature, to obtain a wedge defect, removing a lesion more extensive than one-third of the upper lip (Figure 2). The incision is then extended, and part of the base bases, nasal sills and the base of the columella are resected. It is also necessary to release the mucosa of the buccal sulcus (Figure 3). The reconstruction is then elaborated, and the result is a full-thickness cheek flap (Figure 4). The immediate postoperative period was uneventful (Figure 5) and the patient has been followed for six months after surgery, with no signs of relapse until the last consultation, with a very satisfactory aesthetic result (Figure 6).



Figure 1: Pre-procedure lesion marking



Figure 2: Exeresis of the lesion. Defect higher than one-third of the upper lip.



Figure 3: Release of the mucosa of the buccal sulcus



Figure 4: Immediate Postoperative



Figure 5: Seventh postoperative day



Figure 6: Postoperative for six months. Preserved functional aspect.

DISCUSSÃO

According to research from the National Cancer Institute, basal cell carcinoma represents 30% of the registered neoplasms in Brazil and 75% of cutaneous cancers^{1,2,4}. Despite these high rates, it is a tumor that rarely metastasizes and is usually curable with a single surgical approach^{2,3,4}. When located on the upper lip, reconstruction requires more considerable attention to the preservation, if possible, of critical

anatomical structures, i.e., attention to functional and aesthetic aspects^{3,4}. These structures include the positioning of the borderline lip line with the vermillion, the position of the filter, the maintenance of symmetry, and height concerning the nasolabial grooves^{3,4}. To this end, there are several techniques of excision and reconstruction, among them the flap presented in this report.

The choice of upper lip reconstitution technique should be taken into consideration by the functional and aesthetic aspects of the lips, as well as the size of the defect^{3,4}. In most individuals, can be resected a quarter of the lip, and the defect closed with primary synthesis without difficulty³. If primary closure without lip distortion is not possible, should be used a flap⁴. There are several techniques for reconstruction of large upper lip defects, but often challenging to perform. We report then a method of easy execution, under local anesthesia and with the good aesthetic result.

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