INTERNATIONAL JOURNAL FOR INNOVATION EDUCATION AND RESEARCH

ONLINE ISSN: 2411-2933 PRINT - ISSN: 2411-3123

INTERNATIONAL EDUCATIVE RESEARCH FOUNDATION AND PUBLISHER (IERFP)

Volume- 7 Number- 3

March Edition

About the Journal

Name: International Journal for Innovation Education and Research

Publisher: Shubash Biswas

International Journal for Innovation Education and Research
44/1 Kallyanpur Main road
Mirpur, Dhaka 1207
Bangladesh.
Tel: +8801827488077

Edition: March 2019

Publication fee: $100 and overseas.

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-3 of IJIER*** which is scheduled to be published on **31st March 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 screensed 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
Ass. Professor of Applied Linguistics
Department of Primary Education
University of Western Macedonia- Greece
Email: chiefeditor@ijier.net

Table of content

ACTIVE METHODOLOGIES AND DIGITAL TECHNOLOGIES: IN DEFENSE OF A DE-CENTERED PEDAGOGY

Joao Mattar
PUC–SP & Centro Universitário Internacional Uninter, *joaomattar@gmail.com*

Daniela Karine Ramos
Universidade Federal de Santa Catarina (UFSC), *dadaniela@gmail.com*

Abstract

The aim of this article is to explore how active methodologies and digital technologies can foster a more active participation of students in their learning process and suggests possible changes in pedagogical practices. Blended learning, conceived in a stricter sense as the mix of face-to-face and online activities, and in a broader sense as the mix of different methodologies and spaces, may be considered the future of educational activities. The following methodologies are discussed: flipped classroom, peer instruction, problem-based learning, project-based learning, and game-based learning. Research shows that these methodologies, when adequately combined with information and communication technologies, result in greater motivation and involvement of the students. Although these strategies do not generate improvement in immediate retention of knowledge, more complex skills are developed when compared to traditional education methods, such as: problem solving, the transfer of knowledge to reality, and retention of knowledge in the longer term. The article concludes with a critique of the contemporary discourses that position the student at the center of the teaching and learning process, claiming for a de-centered pedagogy, in which students interact with each other, teachers and other actors, in collaboratively groups where there is no need for a center, or in which each of these actors can alternatively perform a central function.

Keywords: Active learning; Blended learning; Cooperative learning; Educational technology; ICT in education; Teaching methods; Videogames.

1. Introduction

The use of Information and Communication Technologies (ICT) can be associated with new methodologies that modify the roles and the way knowledge is produced. Many of these methodologies are based on a more active posture of the student; however, this cannot be considered a new approach. Brazilian educator Paulo Freire (1921-1977), for example, even without discussing the use of ICT, already argued for a more active attitude of students in the learning process. What he calls "banking education" would imply in mechanic memorization of content, turning the students into "containers", "receptacles" to be "filled" by

the teacher: “The more completely she fills the receptacles, the better a teacher she is. The more meekly the receptacles allow themselves to be filled, the better students they are.” (Freire, 2005, p. 72). From this perspective education is characterized as an act of depositing, narrating, transferring and transmitting knowledge, in which learners assume the role of receiving, repeating, memorizing, and archiving contents. To this banking conception of education, antidialogic by nature, Freire opposes a humanistic and problematizing education, which presupposes the dialogue: “Whereas banking education anesthetizes and inhibits creative power, problem-posing education involves a constant unveiling of reality. The former attempts to maintain the submersion of consciousness; the latter strives for the emergence of consciousness and critical intervention in reality.” (Freire, 2005, p. 81).

But one can return much more in time, until the beginnings of Western thought in Athens. Socrates (469-399 B.C.), for example, exposed his interlocutors to a questioning process called “maieutic”, which may serve as a reference for many of the active methodologies currently used. The Greek philosopher used a method by which he did not intend to teach directly, but indirectly, using questions to take people to recognize that they did not know what they thought they knew, trying to point out a way and not just an answer.

In the contemporary context, the central position of the teacher in the teaching process began to be questioned more intensely from the moment ICT allowed the access to free information and content of quality, and in abundance, for any interested person, thus, space for the development of more active methodologies, in which the student becomes protagonist and assumes more responsibility about his / her learning process.

ICT have generated new forms of communication, thinking, work, relationships, learning and life (Coll & Monereo, 2008), creating communication alternatives and increasing the possibilities of access to information (Battro & Fischer, 2012). Thus, they exert influence on various aspects of everyday life, including teaching and learning contexts. Exponentially democratizing the access to information influences the relations established between the subjects involved, the roles played and the ways of learning.

Accessibility and flexibility related to digital technologies, which can be accessed by portable mobile devices, can provide students with greater opportunities to learn in non-classroom activity (Shin, Sutherland, Norris, & Soloway, 2012) and with a higher level of cognitive activity (Karmiloff-Smith, 2015). In addition to access, these mediums use words and images intensely to promote human understanding, since those who learn may be able to mentally integrate visual and verbal representations (Mayer, 2009), unlike methodologies based exclusively on words and verbal exposure.

The diversity of possibilities allows us to combine and create new teaching modalities, such as blended learning. In a stricter sense, it means the mix between face-to-face and distance education (more specifically online). However, there is at least another sense for the expression, which points to the combination of different learning spaces (inside and outside the classroom, for example), or even between formal and informal learning. In that sense, online would not be an essential element for the definition of hybrid.

Hybrid teaching enables students to learn online, experiencing some control over time, place, path and / or rhythm, and at other times in a physical location to learn in a supervised way, away from home (Horn & Staker, 2014).

In addition, classroom spaces have naturally been forced to reform, as the lecture room, chairs lined up, chalkboard and chalk, with the teacher in front of the class, is no longer the only way to teach and learn. The development of active methodologies has gone hand in hand with redesigning face-to-face learning environments, which now need to accommodate hardware, projectors, monitors, mobile furniture, simulation spaces and other technologies, all based on wi-fi, enabling more socialization, interaction and collaboration, even with students who are in other places, far away.

In this sense, one of the trends, especially in basic education, is what is called "makerspaces", directly associated with the maker movement. These constitute environments that provide tools and opportunities for hands-on and creative learning, located in community spaces and educational institutions. Cavalcanti (2013) differentiates the concepts of hackerspace (that originated in common spaces for programmers), makerspace (originated in public spaces for design and creation, connected to the maker movement), TechShop (for-profit network that offers manufacturing spaces) and FabLab (MIT-initiated network that includes tools for manufacturing).

This trend makes it clear that hybrid teaching is not synonymous with simply using classroom technology but involves a pedagogical change in which the student assumes more control over his / her learning. Blended learning, in this broader sense, is directly linked to less teacher-centered learning and more student-centered learning by doing.

In the interlacing of ICT insertion and the methodologies that conceive the students as active, this article aims to describe and analyze the combination of active methodologies and digital technologies, which generate the displacement of learners from their traditional passive position to an active posture in the learning process, to point out possibilities of changes in pedagogical practices. This active stance, as Clark and Mayer (2011) argue, can occur even when the student is watching an animation (or even a lecture) that provokes meaningful learning, in which new ideas begin to shift and combine with old ones. All the methodologies discussed in this article invite the students to abandon their receptive position and participate in the learning process by new and different perspectives, as decision maker, creator, player, teacher, actor, researcher and so on. Active methodologies analyzed include flipped classroom, peer instruction, problem-based learning, project-based learning, and game-based learning.

2. Active Methodologies

Although this section explores active teaching and learning methodologies, its presentation and discussion is, whenever possible, related to the use of new technologies.

2.1. Flipped Classroom

Flipped classroom is characterized by the proposition that events that used to occur traditionally in the classroom to be carried out outside the classroom and vice versa (Lage, Platt & Treglia, 2000; Bergmann & Sams, 2012). According to the Flipped Learning Network (2014), flipped learning moves the moment of instruction directly from the classroom to the individual learning space, so the group space becomes a dynamic and interactive learning environment, in which the educator guides the students as they apply concepts and engage creatively.

Since 1996, Lage et al. (2000) have already proposed the inverted classroom for introductory courses in Economics at Miami University, concerned with attending different students' learning styles. Such a reversal would have been made possible by the development of technologies, especially multimedia, such as the Web. Thus, students were expected to come to classes having previously accessed the content and asked questions, so the class was conducted with practical experiments or activities, ending with tests and review questions, answered in small groups. Teachers evaluated the experience positively, noting more motivation in the students, who generally also liked to work in groups and felt more comfortable asking questions during the lesson, and most of the students had a positive impression of the subjects, the practical activities, tests and group work (Lage et al., 2000). In its most recent version, which has become popular since the 2000s, Educause (2002) defines flipped classroom as a pedagogical model that alternates the typical elements of the classroom and the homework by making use of video lessons or pre-recorded audio that are watched at home, so the time of classroom is dedicated to performing exercises, projects or discussions.

Many researches have been evaluating the contributions of the use of the flipped classroom methodology in different areas of knowledge and teaching levels. Among the results described: the students' perception of achievement of learning objectives and performance in exams (Lombardini, Lakkalae, & Muukkonen, 2018), improved academic performance, improved self-learning skills, increased study satisfaction, increased expression of critical thinking, and problem-solving skills (Tan, Yue, & Fu, 2018). Comparing the flipped classroom with three different learning contexts, such as blended learning, traditional classroom and e-learning, in offering a course at a University in Vietnam, Thai, De Wever and Valcke (2017) noted that the learning performance was superior in the group that participated in the flipped classroom and observed a positive effect on the beliefs of self-efficacy and intrinsic motivation.

Flipped learning allows teachers to use various methodologies and activities in their classrooms (Flipped Learning Network, 2014). For this, the teacher needs to re-plan his or her classes using active methodologies such as cases, problems and projects. In this way, it is possible to say that flipped classroom is an active methodology, but, to materialize, it needs to include other active methodologies, characterizing itself as a meta-methodology for carrying, as a shell or a snail, other methodologies.

2.2. Peer Instruction

Peer instruction was systematized by Professor Eric Mazur in introduction physics courses in Science and Engineering at Harvard University. In 1990 he realized that his students were not learning to solve real-world problems, although they succeeded to solve the problems proposed by books and tests. So, he decided to change his teaching methodology, proposing that students talked to each other about an issue, instead of he, the instructor, trying to explain. In a situation where he tried to explain for ten minutes a question for a class, which was still confused, he suddenly did something for the first time: "I said, 'Why don't you discuss it with each other?'". The class became a chaos, but after three minutes the students said, "OK, we've got it, let's move on." (Lambert, 2012).

Since then, Mazur developed an interactive teaching style in which students actively participate in their learning process. The methodology has been refined and improved since its implementation in 1991, and

ten years later an important article took stock of this period (Crouch & Mazur, 2001). It was proposed that the textbook be read before the lessons; the reading tests that were answered in the classroom were replaced by open-ended questions that were answered before the classes; and cooperative learning was incorporated into the discussion moments during the lessons. These improvements were designed to help students learn more from reading and increase their involvement in discussion moments, which has led to better learning outcomes.

In the pedagogical practice there is the phase of discussion, in which the theme is resumed and the students begin to talk with their colleagues, encouraged by the teacher, trying to convince them that their answer is correct (hence the expression "peer instruction"), while the teacher circulates around the room, participating in some of the discussions, which should last between two to four minutes. This is a time of intense interaction between students and, in some cases, also with the instructor. Finally, students use the same resources to respond again to the same initial conceptual test.

In the peer instruction methodology, the simpler language used by the student during the discussion phase in comparison with an explanation of the instructor that tends to be more technical contributes to the better understanding of the concepts, which can be observed in the increase of the correct answers given by the students (Mazur, 1999). As Mazur reflects, sometimes it seems that students can teach each other concepts more efficiently than their teachers. One likely explanation is that students, who can understand the concept behind the given question, have just learned the idea and are still aware of the difficulties they had to overcome to understand the concept involved. Consequently, they know exactly what to emphasize in their explanation. Similarly, many experienced teachers know that their first lesson in a new discipline is often their best, marked by clarity and lightness that usually cease to exist in later, more polished versions. The reason behind this is the same: as time goes by and a teacher remains exposed to the same material, it seems that the conceptual difficulties disappear and, consequently, are no longer being examined carefully.

Researches have revealed contributions of this methodology, describing results that indicate greater motivation and involvement, improvement of conceptual reasoning and problem-solving skills, and increase of grades (Crouch & Mazur, 2011). One of the possible explanations for these positive outcomes may be the collaborative environment created when students study in groups, discuss various topics and even take on teacher roles. In addition, after answering a question (and making mistakes), a student would be more open to listen to both the teacher and his or her classmates. In comparison with more traditional teaching methods, a greater impact on learning is observed when using peer instruction (Balta, Michinov, Balyimez, & Ayaz, 2017). These impacts are identified, for example, in the best performance on difficult issues and the perception of higher student satisfaction (Michinov, Morice, & Ferrières, 2015).

The retention of knowledge is also greater with peer instruction, compared to traditional education, probably because active learning helps to move information from short-term to long-term memory. In addition, the improvement in learning outcomes among women was greater than among men in Mazur's (1999) led studies. The refinement of pedagogy, designed to help students learn more from pre-lesson readings and intensify their involvement in the discussions, helped to further increase understanding and learning outcomes.

In this type of methodology, it is also necessary to consider the resistance of the architecture: the classrooms are still, for the most part, inadequate not only for peer instruction, but for active methodologies in general. As stated by Mazur, they are built with a single goal: to focus the attention of many on the active teacher, while the audience simply sits, receiving information. Instead, we could abandon this format and set up rooms as we see in kindergarten schools, where children sit around a table looking at each other, and suggested activities to be performed in a group: this would truly mean active learning.

> It's no accident that most elementary schools are organized that way. The reason is, that's how we learn. For some reason we unlearn how to learn as we progress from elementary school through middle school and high school. And in a sense, maybe I'm bringing kindergarten back to college by having people talk to each other! (Lambert, 2012).

We must not only coax students out of their rooms, but into each other's minds: "If learning is indeed a social experience, then a "party school"—of a certain kind—just might offer the richest learning environment of all." (Lambert, 2012).

Lectures are a way of transferring the instructor's lecture notes directly to students' notebooks without passing through the brains of either, Mazur quips (Lambert, 2012). It is important to note that peer instruction also involves practical experiments in laboratories and art studios. Thus, active learners are constantly invited to apply new information and new knowledge, rather than simply taking notes. Students cease to be students and become managers of their own learning process and even teachers, which characterizes an active methodology of teaching and learning.

2.3. Problem-Based Learning

Problem-based learning is a methodology developed by the McMaster University School of Medicine in which students learn in small groups and with tutors from problems, which are patient cases, to identify and meet their learning needs.

The institution's website1 presents information about the methodology, noting that in 1969, the McMaster University Medical School introduced a practical approach to learning medicine. In problem-based learning the problem is used to help students identify their own learning needs as they try to understand it; they need to gather, synthesize and apply information to the problem and start working effectively to learn from group and tutors. Among the fundamentals of problem-based learning are: small-groups, teacher facilitation, use of patient-based cases, and the definition of learning objectives.

A study of dozens of teachers who used problem-based learning in their high school economics classes in California and Arizona found that their students scored higher on exams and activities that measured problem solving skills and application to world economic dilemmas than traditional students (Finkelstein, Hanson, Huang, Hirschman, & Huang, 2010). Yew & Goh (2016) conducted a review to examine the effectiveness of problem-based learning discussion on various naturalistic and empirical studies, concluding the methodology is effective in retaining long-term knowledge and in applying knowledge. When comparing to traditional teaching methodologies, Strobel and Van Barneveld's (2009) qualitative meta-analysis of meta-analyzes reinforces the greater effectiveness of problem-based learning. The results

1 http://mdprogram.mcmaster.ca/mcmaster-md-program/overview/pbl---problem-based-learning

indicated that problem-based learning was superior when it came to long-term retention, skill development and student and teacher satisfaction, while traditional methodologies were more effective for short-term retention, which can be assessed by standardized tests.

2.4. Project-Based Learning

Project-based learning is grounded in collaborative work on authentic real-world issues and problems, which are a guiding, challenging, and complex task involving the production of various artifacts and with rubrics for evaluation (Bender, 2012). Project-based learning methodology presupposes the participation of the student in several steps that go from the planning, the research and the application of the knowledge to the solution of some problem (Bender, 2012). And ICT makes it possible to access information to assist in the projects, facilitating the attribution of meaning.

Several studies have been developed to evaluate the contributions of this methodology. A quasi-experimental research developed by Eskrootchi and Oskrochi (2010) included 72 eighth grade students, divided into three groups: a first group had a traditional class; another group used a simulation model; and a third group used a simulation model and an experimental model. The results suggest that students learn best by actively building knowledge from a combination of experience, interpretation, and structured interactions with peers and teachers when using simulation in a project-based learning configuration.

One of the interesting models linked to project-based learning came from a partnership between the Harvard School of Education and Outward Bound2: expeditionary learning (EL Education)3. In a stricter sense, the learning process involves the study of a reality, the field visit (expedition) and the elaboration of projects by the students to solve the identified problems. More than 150 schools in the United States adopt the model. In expeditionary learning, students are expected to become critical thinkers, problem solvers, and efficient learners; develop the skills to deal with complex ideas, problems and texts; develop the character and habits necessary for success in college, in their careers and in life; and experience the curriculum through research and application.

In project-based learning it is possible to develop creative ideas, improve metacognition and improve cognitive skills (Sart, 2014). At the same time, one of the distinguishing characteristics of project-based learning from other methodologies is that its result is, in general, a product.

2.5. Game-Based Learning

In game-based learning we play extremely active roles because it is possible to choose how to learn to draw one's own learning goals; even when those goals are already predefined, players are usually free to hit them in the way they choose. For Lehto (2009), the need for participation defines a game, which is not simply read but also written by the player. The game constitutes an exploitable dynamic system, which can be built by the free choices of the player. The game reveals itself as an interactive immersion, in which we have a structure that is filled by the acts of the player (Lehto, 2009). Thus, the player of a game simultaneously

2 http://www.outwardbound.org/
3 https://eleducation.org/

assumes the position of an author, as it contributes to its construction. In addition to interpreting, the player of a game must strive to progress in the story (Juul, 2001).

Games are based on the aesthetics of experiences by presupposing interaction (with other players) and interactivity (with their own elements), i.e. their exploration should not be configured as a planned and guided visit, but must include the possibility of construction of the path by the user, freedom and a certain degree of uncertainty that reinforce his / her sense of immersion (Fortugno & Zimmerman, 2010). The interaction experiences with games favor active learning by exploring the game environment and solving challenges. The resulting learning involves different domains: cognitive, affective and psychomotor, because when playing it is necessary to participate and contribute to the construction of the game narrative, to plan and evaluate actions, to compare and explore the environment, to control impulses, and to attribute value to actions and behaviors (Kapp, Blair, & Mesch, 2014).

In addition, playing games develops the ability to manipulate complex systems and deduce rules by observation. For Johnson (2006, pp. 42-45), most videogames differ from traditional games, such as chess, for how they restrict information about the rules underlying the system. In the universe of videogames, on the other hand, the rules are rarely fully established before starting to play, ending up being presented in the manipulation of objects or characters, that is, many of the rules are revealed only from the exploration of the game.

In videogames, players can also assume different identities, build multiple virtual personalities (Gee, 2005), interact and experiment with different positions such as engineers, urban planners, journalists, architects, and other innovative professionals (Shaffer, 2008). McGonigal (2011) goes even further, arguing that multi-user games lead players to develop skills such as critical thinking, creative problem solving, and group work, generating thus solutions to social and environmental dilemmas and, consequently, changing the world.

The combination of the characteristics of games provides rich and fun learning experiences, which have been evidenced by many scholars and researches in different areas and contexts, highlighting them in the assimilation of content in a playful way (Herrero et al., 2014; Epstein, Noel, Finnegan, & Watkins, 2016); in the development of executive functions (Thorell, Lindqvist, Bergman, Bohlin, & Klingberg, 2009; Diamond & Lee, 2011) and in increasing motivation to learn (Hsiao, 2007).

Thus, it becomes evident how intensively the use of games is strongly associated with active methodologies. Games assumes an active student who exploits the environment and the possibilities, applying his / her knowledge to overcome the challenges, while still learning the consequences of his / her actions and receiving feedbacks.

3. CONCLUSION

What is possible to conclude from researches on some of the methodologies combined with digital technologies and discussed in this article, such as problem-based learning, project-based learning and game-based learning, is that active methodologies, although almost always result in greater motivation and involvement of the students in activities, do not generate learning improvement results when traditional assessments are performed, such as tests that attempt to measure the immediate retention of knowledge.

However, when assessing the development of more complex skills, such as problem solving and transfer of learning to reality, and even retention of knowledge in the longer term, the results of students using active methodologies combined with digital technologies are generally better than those who used traditional teaching methodologies. In the future, the adequate mix between active methodologies and technologies in blended learning tends to be an essential differential of schools, companies and educational institutions that will be able to lead their students to reflect on their own learning process, abandoning their position of vessels and positioning themselves as self-actors-observers.

Derrida (1989) discusses the obsession of Western civilization by the center in structures. Defining a center neutralizes and reduces the flexibility of the structure, relates it to a point of presence, to a fixed origin. If the center of a structure has the function of guiding, balancing and organizing the coherence of the system, it also ends up limiting what it calls freeplay – the transformation and the displacement of its elements are interdicted. The center guarantees a certain stillness that reassures, dominates the anguish involved in being immersed in the game, being involved in the game, starting to play. According to Derrida, successively and closely, the center receives different forms or names. The history of metaphysics, as well as the Western history, would be the history of these metaphors and metonymies on the foundation and principle: origin, end, arché, telos, eidos, energeia, ousia, aletheia, essence, God, man, and so on.

But we are now set to conceive a world without the law of a central presence, without the security of a fixed place. We are challenged to live in a world in which there is no more central, original or transcendental meaning, a de-centered structure. We are forced to abandon the references to a center, the obsession to look for a center, a subject, the rationality of instructional design by the threat of design thinking “chaos” in a decentering movement. Derrida explores some examples in the text: mythical or mythological discourse, ethnography, bricolage, the works of Freud and Heidegger, the innocence of becoming, and Nietzsche's jubilant affirmation of the free play of the world without truth, without origin, offered to an active interpretation. But it is not enough simply to admit the loss of the center – we are also forced to recognize that the philosophical or epistemological requirement of a center was a historical illusion, to admit the non-center. Playing without security, in a world of floating meanings.

Besides that, the ways of being, living and learning influenced by use of digital technologies lead us to a de-centering configuration, where the access to information is diffuse and available from various points and places and communication flows into various directions and multiple subjects in a simultaneous and connected way, with an interflow of senses and sharing that operates much more in a network style instead of a centered environment.

In the discourse on education, however, we still maintain the need for a fixed center. If we placed the teacher for a long time as the center of the teaching process, we replace him or her - following Derrida's reading - by the student “at the center” of the learning process. In fact, in the practice that we seek with the blending of active methodologies and digital technologies, which mimics learning in the real world, there is no center: there are students, there are groups, there are teachers (who can give lectures that generate active learning), there are tutors, there are designers, there are several anonymous contributors to the official academic practice and discourse (like doormen, cleaners and so on), there are technologies — increasingly human, there are robots ... If the word “teaching” is associated to the teacher at the center,

many argue that "learning" would represent today the student at the center. But there is a much older word, "education," which represents an active process of "teaching and learning", without obsession with centers.

References

Balta, N., Michinov, N., Balyimez, S., & Ayaz, M. F. (2017). A meta-analysis of the effect of Peer Instruction on learning gain: Identification of informational and cultural moderators. *International Journal of Educational Research*, 86, 66-77.

Battro, A. M., Fischer, K. W. (2012). Mind, Brain, and Education in the Digital Era. *Mind, Brain, and Education, 6*(1), 49-50.

Bender, W. N. (2012). *Project-based learning: Differentiating instruction for the 21st century*. Corwin Press.

Bergmann, J., & Sams, A. (2012). *Flip your classroom: Reach every student in every class every day*. International Society for Technology in Education.

Cavalcanti, G. (2013). Is it a Hackerspace, Makerspace, TechShop, or FabLab? *Make*. Retrived from http://makezine.com/2013/05/22/the-difference-between-hackerspaces-makerspaces-techshops-and-fablabs/

Clark, R. C.; Mayer, R. E. (2011). E-*learning and the science of instruction: proven guidelines for consumers and designers of multimedia learning*. 3rd Edition, Pfeiffer (Kindle Edition).

Coll, C., & Monereo, C. (Ed.). (2008). *Psicología de la educación virtual: aprender y enseñar con las tecnologías de la información y la comunicación*. Ediciones Morata.

Crouch, C. H.; Mazur, E. (2001). Peer instruction: ten years of experience and results. *American journal of physics, 69*(9), 970-977.

Derrida, J. (1989). Structure, sign, and play in the discourse of the human sciences. In D. H. Richter (Ed.), *The critical tradition* (pp. 878-889). 2nd ed. Boston: Bedford Books.

Diamond, A., Lee; K. (2011). Interventions Shown to Aid Executive Function Development in Children 4 to 12 Years Old. *Science, 333*(6045), 959-964, 2011.

Educause. (2012). 7 things you should know about... flipped classrooms. Retrieved from http://net.educause.edu/ir/library/pdf/eli7081.pdf

Epstein, J., Noel, J., Finnegan, M., & Watkins, K. (2016). Bacon Brains: video games for teaching the science of addiction. *Journal of child & adolescent substance abuse, 25*(6), 504-515.

Eskrootchi, R.; Oskrochi, G. (2010). A study of the efficacy of Project-based learning integrated with computer-based simulation – STELLA. *Educational Technology & Society, 13*(1), 236-245.

Finkelstein, N.; Hanson, T.; Huang, C.; Hirschman, B.; Huang, M. (2010). *Effects of problem based economics on high school economics instruction*. Final Report. NCEE 2010-4002. National Center for Education Evaluation and Regional Assistance, US Department of Education.

Flipped Learning Network. The Four Pillars of F-L-I-P. (2014). Retrieved from https://flippedlearning.org/wp-content/uploads/2016/07/FLIP_handout_FNL_Web.pdf

Fortugno, N.; Zimmerman, E. (2010). Learning to play to learn: lessons in educational game design. Retrieved from http://www.ericzimmerman.com/texts/learningtoplay.html

Freire, P. (2005). *Pedagogy of the oppressed*. Translated by Myra Bergman Ramos. 30th anniversary edition. New York: Continuum.

Gee, J. P. (2005). *Why video games are good for your soul: pleasure and learning*. Melbourne: Common Ground.

Herrero, D., del Castillo, H., Monjelat, N., García-Varela, A. B., Checa, M., & Gómez, P. (2014). Evolution and natural selection: learning by playing and reflecting. *Journal of New Approaches in Educational Research, 3*(1), 26-33.

Horn, M. B., & Staker, H. (2014). *Blended: Using disruptive innovation to improve schools*. John Wiley & Sons.

Hsiao, H. (2007). A brief review of digital games and learning. In: *Digital Game and Intelligent Toy Enhanced Learning*, 2007. DIGITEL'07. The First IEEE International Workshop on. IEEE, 124-129.

Johnson, S. (2006). *Everything bad is good for you: how today's popular culture is actually making us smarter*. New York: Riverhead.

Juul, J. (2001). *A clash between game and narrative: a thesis on computer games and interactive fiction*. Dissertation (Masters). University of Copenhagen.

Kapp, K. M., Blair, L., Mesch, R. (2014). *The gamification of learning and instruction: fieldbook. Ideas into practice*. San Francisco, CA: Wiley.

Karmiloff-Smith, A. (2015). Toddlers, TV and touchscreens. *Nursery World, 21*, September issue.

Lage, M. J.; Platt, G. J.; Treglia, M. (2000). Inverting the classroom: a gateway to creating an inclusive learning environment. *The Journal of Economic Education, 31*(1), 30-43.

Lambert, C. (2012). Twilight of the lecture: the trend toward "active learning" may overthrow the style of teaching that has ruled universities for 600 years. *Harvard Magazine*, March/April 2012. Retrieved from http://harvardmagazine.com/2012/03/twilight-of-the-lecture

Lehto, O. (2009). The collapse and reconstitution of the cinematic narrative: interactivity vs. immersion in game worlds. In: D. Compagno & P. Coppock (Eds.), Computer games: between text and practice. *Rivista on-line dell'Associazione Italiana di Studi Semiotici*, Serie speciale, Anno III, 5, 21-28.

Lombardini, C., Lakkala, M., & Muukkonen, H. (2018). The impact of the flipped classroom in a principles of microeconomics course: evidence from a quasi-experiment with two flipped classroom designs. *International Review of Economics Education*. https://doi.org/10.1016/j.iree.2018.01.003

Mayer, R. (2009). *Multimedia Learning*. 2nd ed. New York, NY: Cambridge University Press.

Mazur, E. (1999). *Peer instruction: A user's manual*. Harlow, Essex: Pearson Education.

McGonigal, J. (2011). *Reality is broken: why games make us better and how they can change the world*. New York: Penguin Press.

Michinov, N., Morice, J., & Ferrières, V. (2015). A step further in Peer Instruction: Using the Stepladder technique to improve learning. *Computers & Education, 91*, 1-13.

Sart, G. (2014). The effects of the development of metacognition on project-based learning. *Procedia-Social and Behavioral Sciences, 152*, 131-136.

Shaffer, D. W. (2008). *How computer games help children learn*. Palgrave Macmillan.

Shin, N., Sutherland, L. M., Norris, C. A., & Soloway, E. (2012). Effects of game technology on elementary student learning in mathematics. *British Journal of Educational Technology, 43*(4), 540-560.

Strobel, J., & Van Barneveld, A. (2009). When is PBL more effective? A meta-synthesis of meta-analyses comparing PBL to conventional classrooms. *Interdisciplinary Journal of Problem-based Learning, 3*(1), 44-58.

Tan, C., Yue, W. G., & Fu, Y. (2017). Effectiveness of flipped classrooms in nursing education: Systematic review and meta-analysis. *Chinese Nursing Research, 4*(4), 192-200.

Thai, N. T. T., De Wever, B., & Valcke, M. (2017). The impact of a flipped classroom design on learning performance in higher education: Looking for the best "blend" of lectures and guiding questions with feedback. *Computers & Education, 107*, 113-126.

Thorell, L. B., Lindqvist, S., Bergman, S., Bohlin, N. G., & Klingberg, T. (2009). Training and transfer effects of executive functions in preschool children. *Developmental Science, 12*(1), 106-113.

Yew, E. H., & Goh, K. (2016). Problem-based learning: an overview of its process and impact on learning. *Health Professions Education*, *2*(2), 75-79.

Research on optimal environmental tax, sub-optimal selection and influencing factors in China

Zhao Hechun, Ma Junran, Wang He
(Institute of accounting, North China University of technology, Beijing 100144)

Abstract

Considering the definition of the optimal environment tax, according to the sub-optimal choice under real conditions, Marginal cost of emission reduction is regarded as environmental tax payable and listed as a dependent variable. Through setting the independent variables, selecting samples and making empirical analysis, the conclusions of the paper are as follows: The actual environmental tax charged is positively correlated with government supervision and public participation, and negatively correlated with enterprise environmental investment, government environmental expenditure, upgrading of industrial structure and size of enterprise. At last, the paper puts forward some suggestions: strictly enforce the environmental tax, encourage public participation and increase the investment on environmental protection.

Keywords: Environmental tax; Optimal tax system; Marginal cost of emission reduction

1. Introduction

With the implementation of China's environmental protection tax law, a series of issues such as whether the construction of China's environmental tax system has clear goals and principles, whether the implementation path is clear, and whether the tax scope, the tax items, the tax rate are appropriate have been concerned by all parties. This paper intends to make a preliminary discussion on the meaning of the optimal environmental tax, the sub-optimal choice under realistic conditions and the influencing factors.

2. Literature review

The research on environmental tax is generally believed to be originated from the discussion on environment and taxation in <The Economics Of Welfare>published by Arthur Cecil Pigou, This book points out that the optimal pigou tax should be equal to the difference between marginal social cost and marginal private cost[1].

However, the assumption of the optimal Pigou tax is based on the idealized state. Bovenberg and Goulder [2] point out that, in fact, the government often relies on distorted tax system to increase fiscal revenue. When determining environmental tax in this sub-optimal situation, the actual environmental tax is generally smaller than the optimal environmental tax.

So, what are the factors that affect the actual collection of environmental taxes?

The government plays an extremely important role in environmental governance. Halkos and Paizanos [3] examined the data of 77 countries from year1980 to 2000. They concluded that the expansion of the government's financial expenditure on the environment can improve the quality of the environment. Based on the provincial panel data from 1998 to 2000, Guan Hailing and Zhang Peng [4] found that the increase of government expenditure can reduce the emission of environmental pollution to a certain extent. Dong Liying and Sun Yongjun[5] believed that industry associations can play a supporting role by supervising the operation of enterprises in reality. The public will also participate in pollution control activities in the form of direct communication with polluting enterprises or put pressure on polluting enterprises through the government. Li bin et al. [6] decomposed technological progress and structural change into 8 effects, demonstrating that technological effects play a leading role in the process of pollution reduction, while changes in industrial structure are not very obvious.

3. Research hypothesis

Although the actual tax is generally less than the optimal environmental tax, it can still stimulate enterprises to save energy and reduce emissions by increasing the pollution cost of enterprises. Therefore, this paper makes the following hypothesis based on the actual environmental tax.

H1: The actual amount of environmental tax is positively related to the government supervision.

In the course of China's rapid economic development, Environmental pollution and ecological destruction are becoming more and more serious. The intensity of government supervision is reflected in the levy and intensity of environmental taxes.

H2: The actual amount of environmental tax is negatively related to the investment in environmental protection.

With the development of economy, the environmental problem is getting more and more serious, more and more enterprises realize that taking the environmental responsibility initiatively can not only protect the environment, but also enhance competitiveness and create brand advantages of green production. When social responsibility is strengthened, the enterprise will invest more funds and manpower to reduce pollution.

H3: The actual amount of environmental tax is negatively related to the government's environmental expenditure.

The increase in environmental governance spending indicates that the government attaches more importance to pollution caused by the production process. Enterprises can use this funds to research technologies or directly add sewage treatment equipment, so that enterprises can reduce the emissions of pollutants.

H4: The actual amount of environmental tax levied is negatively correlated with the upgrading of industrial structure.

The industrial structure layout of a country has an inseparable relationship with the quality of its environment. After the upgrading of industrial structure, especially after the reduction of the number of secondary industry and the increase of the number of tertiary industry, the emission of pollutants will be reduced, and the actual amount of environmental tax levied will also be reduced.

H5: The actual amount of environmental tax is positively correlated with the degree of public participation.

The participation of the public reflects people's awareness of environmental protection. It can monitor the illegal discharge of pollutants by various means at anytime and anywhere, so as to urge enterprises to discharge pollutants according to legal channels and pay the environmental tax according to the amount of pollutants discharged.

H6: The actual environmental tax is negatively correlated with the size of the enterprise.

Compared with small-scale enterprises, large and medium-sized enterprises pay more attention to corporate image, they pay more attention to environmental protection. Therefore, as far as enterprise size is concerned, the larger the enterprise, the smaller the actual environmental tax, vice versa.

4. Variable setting and sample selection

(1) Y: The actual amount of environmental tax levied. This paper selected 30 provinces, municipalities and autonomous regions as the object of study (Tibet is not included). Since China began to implement the environmental protection tax law on January 1, 2018, the current environmental protection tax law came from the previous implementation of the "sewage discharge fee" system. This paper selected the 2007-2015 sewage discharge fee data to replace the actual environmental tax levied.

(2) G: The intensity of government regulation. This paper takes the number of environmental regulators as the indicator to measure government supervision intensity.

(3)R: Enterprise's environmental investment. In this paper, enterprises' investment in environmental protection is the embodiment of corporate environmental awareness.

(4) P: Government environmental expenditure. This paper uses the provincial and municipal governments' environmental financial expenditure data.

(5)F: Level of upgrading industrial structure. This paper describes the upgrading level of industrial structure by using the regional added value of the second and third industries/GDP.

(6)Pu: The degree of public participation. This paper uses the number of network/telephone complaints, the total number of letters and visitors in 30 regions to measure the degree of public participation.

(7)S: The size of the enterprise. This paper uses the number of employees in enterprises to represent the scale of the enterprise.

5. Model construction and empirical analysis

5.1 Model construction

In this paper, the linear model is adopted to study the influence of related factors on the environmental tax actually levied. In order to alleviate the fluctuation of data and the correlation of data series, and ensure the accuracy of the model, this paper take the actual amount of environmental tax and corporate environmental investment and government environmental expenditure as logarithms. The model established in this paper is as follows:

$Log(Y_{i,t})=c+\beta_1 G_{i\,t} +\beta_2 Log(R_{i,t}) +\beta_3 Log(P_{i,t})+ \ldots\ldots+\beta_5 Pu_{i,t} +\beta_6 S_{i,t} +\varepsilon$

c: Horizontal intercept β: Coefficient

ε: Random Error i: Region i t: time

5.2 Unit root test

LLC was used to test the sequences, and the results were shown in Table 1.

Table 1 LLC results

Variable	Single Order	Statistic	Prob.
Log(*Y*)	0	-3.8289	0.0001
Log(*P*)	0	-3.0300	0.0045
G	0	-4.4967	0.0008
Log(*R*)	0	-2.2306	0.0000
F	0	-0.9304	0.0047
Pu	0	-1.2482	0.0007
S	0	-5.7645	0.0000

After LLC test, it is found that the single integer order of all variables is zero, which shows that the sequence after scoring is stable.

5.3 Co-integration test

This paper adopts Pedroni co-integration test method, and the results are shown in table 2.

Table 2 Co-integration test results

	Statistic	Prob.	Weightde Sta.	Prob.
Panel v- Statistic	2.1127	0.0419	1.2118	0.0297
Panel rho- Statistic	-2.4538	0.0037	-3.0039	0.0021
Panel PP- Statistic	1.6679	0.0006	2.4936	0.0000
Panel ADF- Statistic	-3.3316	0.0000	-5.2155	0.0000

By observing the probability of the test results, they were all less than 0.05, indicating that there was a long-term stable relationship between the variables.

5.4 Regression analysis

After passing the co-integration test in the previous step, it is shown that the variables set in this paper have a long-term and stable relationship, and the residual error of the equation to be established is stable.

First, the mixed estimation model is established, and the analysis results are shown in table 3.

Table 3 The results of mixed model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
G	-0.7097	0.0980	-1.4133	0.0015
Log(*R*)	-0.4128	0.0387	-1.6594	0.0019
Log(*P*)	-0.1240	0.3317	-0.7328	0.0000
F	-0.0735	0.02273	-0.1774	0.0312

Pu	-0.7012	0.1199	0.8998	0.0000
S	-0.0018	0.0770	-0.2017	0.0268
C	5.8831	0.6413	6.5677	0.0207
R-squared	0.6130	Mean dependent var		3.3680
Adjusted-R-squared	0.6372	S.D. dependent var		0.1570
S.E. of regression	0.0959	Akaike info criterion		1.8325
Sum squared reside	2.3533	Schwarz criterion		1.7642
Log likelihood	244.1412	F-statistic		10.3801
Durbin-Watson stat	1.9375	Prob(F-statistic)		0.0000

Secondly, a fixed effect model is established, and the Redunent Fixed Effected test is performed to determine whether to abandon the mixed estimation model. The test results are shown in Table 4.

Table 4 The results of Redunent Fixed Effected test

Effect Test	Statistic	Prob.
Cross-section F	10.3086	0.0209
Cross-secrion Chi-square	25.5507	0.0187

The probability of the test result is less than 0.05, and the result indicates that the original hypothesis should be rejected, the fixed effect model should be abandoned, and the mixed estimation model should be retained.

Finally, the random effect model is established and the Hausman test is conducted to determine whether the random effect model should be selected. The test results are shown in table 5.

Table 5 The results of Hausman test

Test Summary	Chi-Sq.Statistic	Prob.
Cross-section random	23.5003	0.0018

The probability of the test result is less than 0.05, and the result indicates that the original hypothesis should be rejected and the random effect model should be abandoned, but the mixed estimation model is still retained because the fixed effect model is negated in the last step.

After the above steps, the final hybrid estimation model is determined. According to the results of the regression of table 3, the constructed model of determination coefficient is 0.6130, which shows that the actual environmental tax collected can be explained by 61.3% under the combined effect of the six independent variables. The F-test value of the model is 10.3801 and the corresponding probability is 0, which shows that the model has passed the overall significance test. In the mixed estimation regression model, the probability of t-test of six explanatory variables are small, it indicates that the model can be established at a significance level of 5%.

6. Research conclusions and suggestions

Based on the above analysis, the following conclusions and suggestions are drawn:

(1) The actual environmental tax collected is positively correlated with the intensity of government supervision and the degree of public participation, H1 and H5 are both established. This shows that strengthening government supervision and encouraging public participation are important to implement China's environmental protection tax law.

(2) The actual environmental tax levied is negatively correlated with enterprises' environmental investment and government environmental expenditure, H2 and H3 are both established. This shows that the environmental expenditure of enterprises and governments is conducive to promoting energy conservation and emission reduction. Therefore, we should take a series of measures, such as financial subsidies, tax relief and so on, to encourage and force enterprises to reduce pollutant emissions.

(3) The actual environmental tax levied is negatively correlated with the upgrading level of industrial structure and the scale of enterprises, H4and H6 are both established. This shows that accelerating the upgrading of industrial structure and promoting the development of large and medium-sized enterprises are conducive to promoting clean-low carbon production, reducing pollutant emissions.

References

[1]A.LansBovenberg,LawrenceH.Goulder,Environmental Taxation and Regulation[M].Handbook of Public Economics,2002: 1471-1545.

[2] A. Lans Bovenberg,Lawrence H. Goulder,Optimal Environmental Taxation in the Presence of Other Taxes: General Equilibrium Analysis[J].American Economic Review,1996，86(4): 985–1000.

[3]Halkos, Paizanos. The effect of government expenditure on the environment: An empirical investigation [J].Ecological Economics,2013, 10：48-56.

[4] Guan Hailing, Zhang Peng. Financial expenditure, public goods supply and environmental pollution [J]. Industrial technology and economy, 2013, 10:34-40.

[5] Dong Liying, Sun Yongjun. Environmental Protection Investment, Government Regulation and Air Pollution Prevention and Control - An Empirical Study Based on Provincial Panel Data [D]. Business Accounting, 2016, 6:16-22.

[6] Li Bin, Zhao Xinhua. Economic Structure, Technological Progress and Environmental Pollution - Analysis Based on Data of China's Industrial Industry [J]. Financial Research, 2011, 4:43-49.

What affects permanence in a MOOC about Chemistry?

Gabriela Trindade Perry (Corresponding author)
Graduate Program of Informatics in Education, Universidade Federal do Rio Grande do Sul (UFRGS),
Porto Alegre, Brazil.

Henrique Padovani Queiroz Machado
Department of Physics Engineering, Universidade Federal do Rio Grande do Sul (UFRGS),
Porto Alegre, Brazil

Napoliana Souza
Graduate Program of Informatics in Education, Universidade Federal do Rio Grande do Sul (UFRGS),
Porto Alegre, Brazil.

Paola Rosatto
Graduate Program of Applied Mathmatics, Universidade Federal do Rio Grande do Sul (UFRGS),
Porto Alegre, Brazil.

Abstract

In this paper we analyze what influences the permanence of 1606 students in a MOOC on General Chemistry, using navigation records (log files). Permanence – quantified as the amount of course items viewed and tests completed – was compared regarding the following parameters: (1) showing the correct answers after completing evaluative questionnaires; (2) offering certificates of completion; (3) allowing non-linear navigation (free browsing). Results from the Mann Whitney tests revealed that offering a certificate and showing the correct answer to test questions influence the permanence. However, when considering a smaller cut of students - those who completed at least 30% of the activities - none of the parameters influenced permanence. From these results, it can be argued that these two configuration parameters are relevant in relation to permanence, since they are an incentive for students who perform fewer activities, and therefore are those who are at greater risk of evading.

Keywords: MOOC; permanence; dropout

1. Introduction

The interest and dissemination of MOOCs (Massive Open Online Courses), has grown in recent years, whether due to the innovation aspect reinforced by the media (Pappano, 2012) or by the emergence of platforms developed with famous universities worldwide. In 2008, Siemens and Downes made the first

edition of the Connectivism course, which became known as the first MOOC, and was attended by approximately 2,300 students (Downes, 2012). This was the “first generation of MOOCs”, also known as “Connectivist” (cMOOC). For Downes (2014), traditional courses are designed as books; you have to follow the chapters by the end of the book, while the "connectivist" courses look more like magazines or newspapers. Siemens (2013) states that connectivist MOOCs are non-linear, and emphasize the importance of learner autonomy.

In contrast to cMOOCs are xMOOCs (the "x" suggests the "extension" of a university course), a model that has grown and attracted crowds to online course platforms. Rhoads et al. (2015), for example, points out that xMOOCs offered potential economic benefits in the form of a more automated and digitized version of university subjects. According to them, xMOOCs tend to be attractive to entrepreneurs, investors, policy makers and administrators seeking solutions to problems of access to higher education. In a matter of a few years the xMOOCs came to dominate the global scenario of this modality.

Anyway, MOOCs are articulated within this contemporary moment of enormous social, demographic, economic and technological changes in which universities reform and move. The next landmark in the recent history of MOOCs was in 2011, when three engineering professors from Stanford University offered computer science courses in the form of MOOCs. The Introduction to Artificial Intelligence course, offered for free to students from around the world, attracted 160,000 students from more than 190 different countries (Stacey, 2013).

From this moment on we see a turnaround in the development of online courses, with the entrance of new actors that form consortiums in robust platforms, offering a new model of MOOC which is pedagogically and philosophically distant from the connectivist ideals of the pioneers of MOOCs. The first letter O of the acronym MOOCs that carried the OPEN principle has undergone significant changes, keeping only the sense of being open to any participant, but no longer sustains itself while free access to the content..

Hollands and Tirthalli (2014) state there is no doubt that the entry of MOOCs into the educational landscape has led many higher education institutions to revisit their distance education strategies. Initially, the overwhelming majority of the MOOC courses came from American universities and was delivered through platforms like Coursera, EdX, Udacity, Udemy, but this picture has changed. Currently, there are platforms from many other countries such as FutureLearn (UK), MiríadaX (Spain), XuetangX (China), MexicoX (Mexico), EduOpen (Italy), ThaiMooc (Thailand). It is possible to see a strong tendency of universities around the world to offer MOOCs and attract the glances for themselves. Boal and Stallivieri (2015) argue that it is possible to say that MOOCs are influencing the process of internationalization of higher education institutions.

Brazil, despite its continental dimension and a network of higher education institutions, has a small production of MOOCs. Brazil does not have any high-impact MOOC platform, despite the potential of a country with continental dimensions and challenging educational needs. Brazilian platforms are Veduca, Unesp Aberta, Open Courses UEMA, and more recently, Lúmina.

On the other hand, the country has amount of students enrolled in courses in international platforms. Allione and Stein (2016) point out that the participants of the course researched by the authors represented 147 countries with the five largest being the United States, India, China, Brazil and Spain. In the University of

London report (2014), Brazil appears as the 5th country in number of participants in the Coursera platform, with 6% of this total.

2. Dropout and Permanence

At the end of any course, whether in person or at a distance, participants expect to receive a diploma, certificate or attestation of completion. Therefore, completing a course is traditionally a relevant moment in the study experience, and this is part of the expectations of all those involved in the process: institutions, teachers and students. Therefore, a relevant data in the evaluation of courses in general is the ration between how many students have entered and how many have concluded, because if the students begin the course and do not conclude, it is a sign that something is not going well. The Brazilian Minstry of Education points out, for example, that in 2014 there was a 49% droput from graduation courses. Regarding MOOCs, dropout and non-completeness of is one of its main characteristics and, consequently, one of its greatest criticisms. It is well known that MOOCs attract thousands of students, but only between 5 and 12% complete the course and earn a certificate of completion (Koller et al 2013, Clow 2013, Perna et al., 2014). Jordan (2015), in an extensive analysis of 221 MOOCs, presents completion rates between 0.7% and 52.1%, with the average being 12.6%, that is, a dropout higher than 80%. Comparatively, according to the 2016 ABED (Brazilian Association of Distance Education) census, dropout in formal ED courses offered by higher education institutions in Brazil ranged from 11% to 25%.

2.1 What influences dropout?

Onah et al. (2014) present some reasons for high dropout rates in MOOCs: no intention to complete the course, lack of time, difficulty level of the course, lack of support, lack of familiarity with technology, lack of study habits, negative experiences, wrong expectations about the course, late start and peer evaluation. Gütl et al. (2014) categorize dropouts in two groups: "healthy", which concerns a group of participants who are selecting course content and "unhealthy", with students who initially wanted to complete the course but fail for a number of reasons. Gomez-Zermeno and Aleman (2016) identified that the main characteristics of the participants who completed the course are: to have postgraduate degrees, previous online educational experience, commitment to the course, economic stability, proficiency in the use of information technology, advanced proficiency in digital resource creation, intermediate English skills, advanced proficiency in using techniques and methods to organize knowledge and active participation in research networks. On the other hand, those who decided to leave the course indicated problems with the structure and orientation in the course, limitations in the use of information technology or in English, besides the limited availability of time for family or work reasons. Eriksson et al. (2016) say time is the major limiting factor of course completion.

One of the conclusions of Ho's (2015) research is that courses whose participants paid for a certificate had a completion percentage of 59%, while those that did not require payment had completion rates of 5% - it suggests financial investment may be a factor influencing evasion in MOOCs. Ebben and Murphy (2014) argue that the fact that MOOCs are free and do not impose access difficulties often leads participants to start a course without having incentive to continue.

Kizilcec and Halawa (2015) conducted a systematic review about dropout, based on self-assessments and behavioral data from more than 100,000 participants in 21 courses. The research tested hypotheses on the role of psychological factors in self-attributed success by participants. The findings were: the existence of persistence and performance gaps among students of different genres and locations; the relationship between students who identify themselves as successful in online learning and higher levels of focus on goals, social belonging, and personal growth goals; the challenges faced by online learners, the most important of which was the lack of sufficient time, which often appeared related to low levels of willpower. Adamapoulos (2013) says the teacher has an important positive effect on the likelihood of a student successfully completing a course, as well as students' feelings about course tasks and materials. Forums have a partial positive effect on the probability of completion of a course. The difficulty level, the workload and the duration of a course have a negative effect. On the other hand, for the most difficult courses, having an open schedule and greater workload have a positive effect on the likelihood of completion. The authors also concluded that if a certificate is awarded upon successful completion of a course, this factor also positively affects retention of participants. The university's reputation also positively affects the likelihood of completion. The content is also pointed out as important when evaluating the possible reasons for the avoidance of courses. Hohe and El Said (2016) focused their research predominantly on participants' perceptions of MOOC resources rather than individual student characteristics. The findings of this investigation identified that the content of the MOOC has a significant effect on the retention of participants, based on the utility perceived by the participants. In addition, interaction with the teacher / tutor also has a significant effect on the participants' permanence.

3. Methodology

This research is a case study of a MOOC on General Chemistry, available on the Lúmina platform. The MOOCs available in Lúmina maintain log records (or log files) - according to Azevedo et al. (2013) this is a usual practice. In its user agreement contract , Lúmina warns about navigation data collection.

We compared three parameters focusing on permanence, which is conceptualized as the number of activities carried out in the course. It was decided to focus on permanence instead of dropout, because at first all students who do not complete 100% of the activities could be considered as evaded, while permanence refers to the degree of interaction with the course - and can be measured, for example, as time logged in and/or quantity of activities (as in this research).

The parameters in analysis were:

1. Blocking versus allowing non-linear navigation (free browsing). In the case of linear (restricted) navigation, the student should complete activity A1 before having access to the immediately following activity A2.
2. Showing versus not showing correct answers after submitting answers to evaluation questionnaires.
3. Offering versus not offering completion certificates.

3.1 The MOOC on General Chemistry

The object of study was a MOOC called "General Chemistry" (which had two editions). Both editions had

the same content - they only changed in relation to the configuration parameters analyzed in this research. Both editions were composed of 21 videos (one presentation video and twenty with video lessons), 17 pages with link lists and 17 evaluation questionnaires (between 2 and 7 questions). They also had a video and an introductory text, a student profile survey, a forum for questions and suggestions and a course evaluation survey. Table 1 shows the summary of these courses.

Table 1. Summary of General Chemistry courses

.

	First edition	*Second edition*
Release date	August 2016	June 2018
Closing date	June 2018	-
Enrollment	490	1116
Percentage of students with 80% to 100% of completed activities	1,24%	31%
Average time to complete between 80% and 100% of activities	78 days	24,5 days
Average scores of completed questionnaires	8,7	8,7

The course versions do not define the grouping of variables, but the dates on which they occurred.

3.2 Students' profile

It was not possible to obtain the profile of the 1606 students, because, due to a configuration error of profile survey, the questions were not marked as mandatory. Therefore, the quantities refer only to the individuals who answered the questions (summarized in Table 2).

Table 2. Profile of the respondent sample

	First edition	*Second edition*
Gender	37 (M) 19 (F)	406 (M) 674 (F)
Schooling	13 (UND) 35 (COL) 9 (POS)	275 (UND) 630 (COL) 140 (POS)
Do you plan to complete the course?	5 (N) 52 (Y)	61 (N) 991 (Y)

M= Male | F = Female
UND = Undergraduate school | COL = College | POS = Post-graduation
N = No | Y = Yes

3.3 Data wrangling routine

Lúmina is based on Moodle, which offers the following reports: activity completion, scores, navigation log and survey data. To obtain the data used in this research, we used only the activity completion report, which has 1 student per line. This log contained the following columns:

- Name and email.
- Date of completion for each activity.

The first step of the data wrangling routine was excluding students who had not performed activities (those

who only registered or just answered the profile search). Users with admin or teacher role were also removed. Finally, duplicate students (for example, students who unsubscribed and then re-subscribed) were also excluded. After this filtering, there were 1606 unique students. Next, the following columns were created:

- Number of completed activities (integer).
- Percentage of activities completed (float).
- Show response (boolean).
- Offer certificate (boolean).
- Free browsing (boolean).

The values of the last three columns – which represent the parameters under analysis in this research – were filled according to the date each parameter was set up.

The data wrangling and statistical tests (Mann-Whitney) were done using the R language. The Mann-Whitney test does not compare the mean, median, or any other distribution parameter, using the mean-rank concept: values are ordered incrementally, and the highest values occupy the highest ranks (when there are equal values, an average value is assigned for the ranks). The mean rank represents the sum of the ranks of each group - in the case of this survey there were three variables, with two groups each. According to Daniel (1990), the Mann-Whitney test has the following assumptions: (1) the data come from random observations; (2) the two samples are independent; (3) the observed variable is continuous (4) the distribution of populations differs only in relation to position - if they differ.

It should be noted that the effects of the configurations are not discriminated by the Mann-Whitney test. This is due to the date each parameter was set up in Lúmina. So, for example, every student who (could) earn a certification also could browse freely.

3.4 Research hypothesis

Before stating the hypothesis, it should be noted that the parameters under analysis were changed only once, so their effects were not separated. The dates of modification were:

- Free browsing was allowed after May 2017.
- Correct answers as feedback in evaluative activities were shown until June 2018 (after this date, no feedback was given).
- Certificates of completion begun in July 2017.

The hypotheses of this research refer to the difference between each of these three parameters, regarding permanence.

Hypothesis 1 - Navigation mode: There were no statistically significant (95% level) differences among the medians of the number of activities carried out by the students enrolled in the course version that did not allow free navigation versus the enrolled ones in the course that allowed free navigation.

Hypothesis 2 – Completion certificate: There were no statistically significant differences (at a 95% level) among the medians of the number of activities carried out by students enrolled in the edition of the

course that did not offer a certificate (and allowed free browsing) versus those enrolled in the one offered (and allowed free browsing).

Hypothesis 3 – Correct answers: There were no statistically significant differences (95% level) among the medians of the number of activities carried out by the students enrolled in the course edition that allowed the visualization of the correct answers after sending the evaluation questionnaires (and allowed free browsing and offered a certificate) versus the enrolled questionnaires in the one that did not allow (and allowed free browsing and offered a certificate).

4. Results

4.1 Free navigation (free browsing)

The difference between the amount of activities completed was compared. May 2017 defines the dates of enrollment for each group – restricted navigation (n = 336), and free navigation (n = 1270). Figure 1 shows the density plot of these two groups.

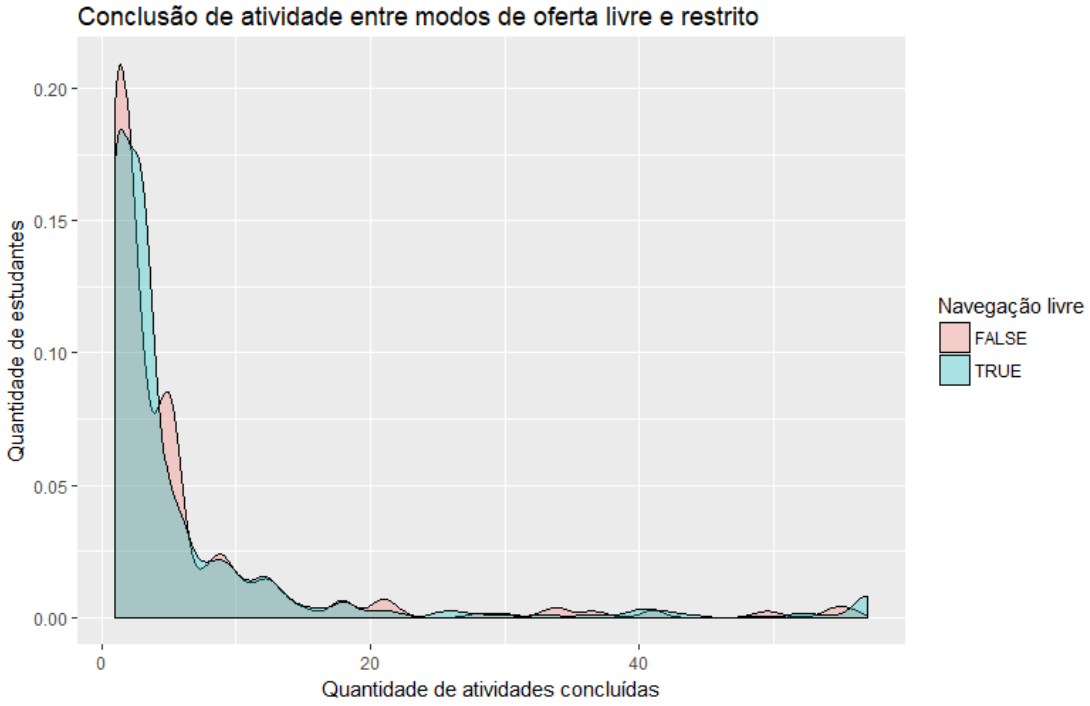


Figure 1 Density plot for the free and restricted browsing groups.

The plot in Figure 1 does not show difference in permanence - measured as the amount of completed activities. The Mann-Whitney (two-tailed) test confirms this observation ($p = 0.405$), so that the null hypothesis cannot be rejected (there is no difference between the samples). The average rank of the student sample that used linear navigation was 785, while the ranks of non-linear navigation students were 808.

4.2 Offering certificates

The difference between the amount of activities carried out by the students who registered before and after July 2017 (this date defines the change in the configuration of the certification offering), was compared.

Before this date, no certificate was offered (n = 437), and after it was offered (n = 1169). Figure 2 shows the density plot of these two groups.

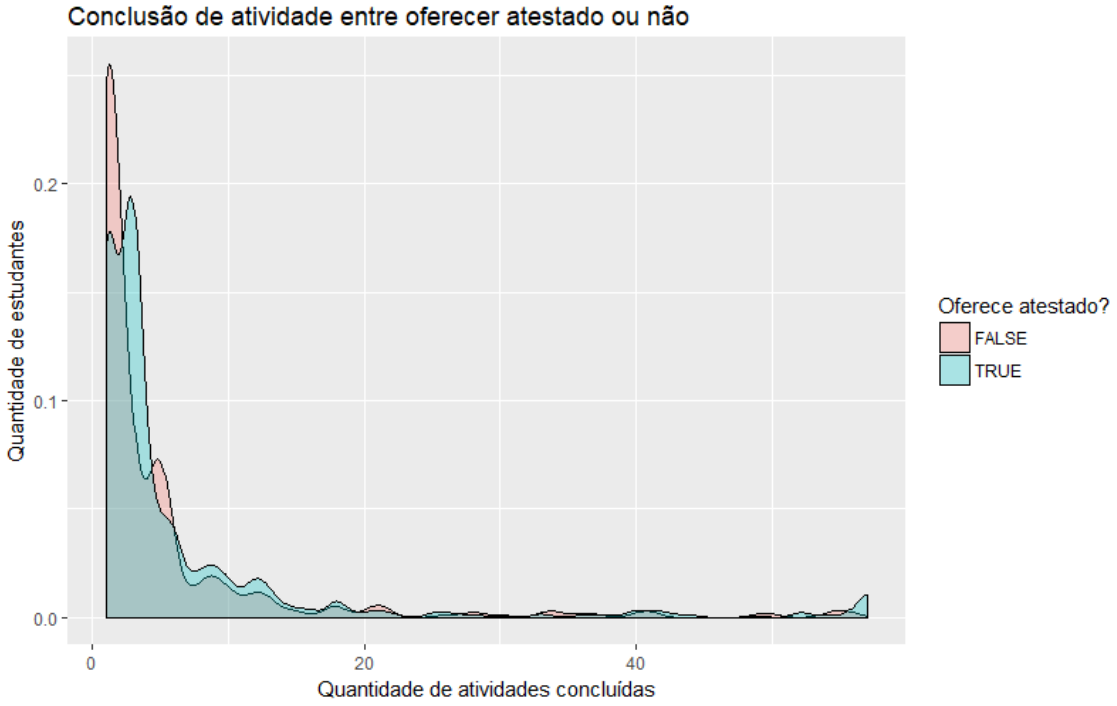


Figure 2 Density plot between providing and not providing certificate.

The plot shown in Figure 2 shows some difference in permanence - measured as the amount of completed activities – especially in the beginning of the course. The Mann-Whitney (two-tailed) test confirms this observation (p = 0.00), so that the null hypothesis is rejected (there is a difference between the samples). The average range of the sample of students who did not receive a certificate was 670, while the rank of the students that received was 843.

The same test was performed, however, considering a smaller cut, containing only the students who performed between 30% and 100% of the activities, that is, between 18 and 56 activities. This cut was arbitrary, and was not based in the literature (no similar study was found). The density plot was used as the criterion for defining these values. The new sample contained 28 students in the group that did not receive certificates and 92 in the group that received a certificate. The average range of the sample of students who did not receive a certificate was 51, while the rank of the students they received was 63. These values are considerably smaller than in the previous test because of the number of observations (sample size). As p = 0,113, the null hypothesis cannot be rejected for this group, which means: to offer or not a certificate does not influence permanence of students who completed at least 30% of the course.

4.3Showing the correct answer as feedback in evaluative activities

The difference between the number of activities performed by the students who enrolled before and after June 2018 was compared (the date that defines the change in the configuration of how to show the correct answers after submitting evaluative activities). Before this date, the correct answers were shown as

feedback (n = 103), and after they were not shown as feedback (n = 1503). Figure 3 shows the density plot of these two groups.

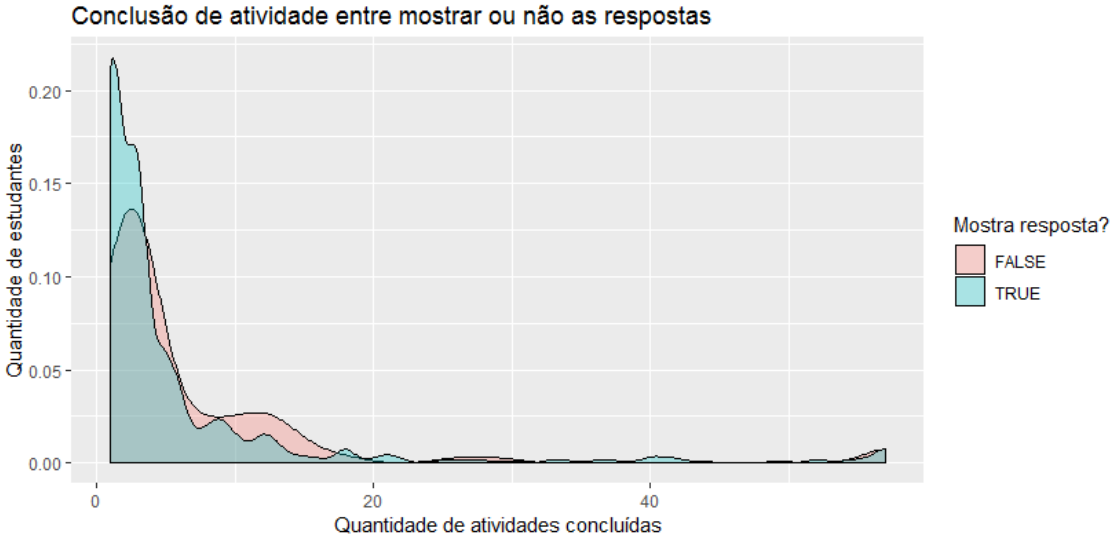


Figure 3 Density plot for to show or not correct answers as feedback

The plot in Figure 3 shows some difference in amount of completed activities in the beginning of the course. The Mann-Whitney (two-tailed) test confirms this observation (p = 0.035), so that the null hypothesis is rejected (there is a difference between the samples). The average rank of the student sample that viewed the answers was 895, while the rank of the students who did not visualize the answers was 797.

The same test was performed, however, considering a smaller cut, containing only the students who performed between 30% and 100% of the activities, that is, between 18 and 56 activities. This cut was arbitrary, and was not based on figures found in the literature (no similar study was found). The density plot was used as the criterion for defining these values. The new sample contained 6 students in the group that did not received feedback with the correct answers and 114 in the group that did. The average rank of the former group was 60, while the rank of the latter group was 72. These values are considerably smaller than in the previous test because they are a function of the number of observations (sample size). As p = 0.415, the null hypothesis cannot be rejected for this group, which means: to show or not the answer does not influence permanence in students who completed at least 30% of the course.

5. Conclusion

The results about the certificate and correct answers parameters were consistent with what was expected - after all, it is reasonable that whenever access is facilitated, permanence will increase. In the case of the navigation style, it was a surprise it did not make a difference.

Regarding showing the correct answers as feedback, it has some pedagogical implications, since it can be argued that when the correct answer is not shown, the student might not feel encouraged to continue. In this scenario, one can imagine that the feeling of failure would lead the student to give up - which seems

to have been the case when considering the total sample (i.e., who performed at least 1 activity). However, as the platform's administrators consider it is necessary to pay attention in class to be approved in the course – Lúmina is not showing this feedback anymore.

In relation to the certificates, it was expected that it would increase permanence. However, when considering the students who performed at least 30% of the activities, the results change, and none of the parameters had any effect. From these results, it can be argued that these configuration parameters are relevant factors in relation to permanence, since they are an incentive for students who perform less than 30% of the course activities, usually those that are at greater risk of dropping out.

6. Acknowledgement

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001.

7. References

[1] ADAMOPOULOS, P. What Makes a Great MOOC? *An Interdisciplinary Analysis of Student Retention in Online Courses*. Thirty Fourth International Conference on Information Systems, 2013, 1–21.

[2] ALLIONE, Gloria; STEIN, Rebecca M. Mass attrition: An analysis of drop out from principles of microeconomics MOOC. *The Journal of Economic Education*, Philadelphia, 2017, v. 47, n. 2, p.174-186.

[3] AZEVEDO, R.; HARLEY, J.; TREVORS, G.; FEYZI-BEHNAGH, R.; DUFFY, M.; BOUCHET, F.; LANDIS, R.S. Using trace data to examine the complex roles of cognitive, metacognitive, and emotional self-regulatory processes during learning with multi-agent systems. In: R. Azevedo & V. Aleven (Eds.), *International handbook of metacognition and learning technologies*, vol. 26, p. 427-449, 2013.

[4] BOAL, H., M., C.; STALLIVIERI, L. 2015. The influence of Massive Online Open Courses (MOOCs) on the internationalization process of higher education. *Digital Universities: Best Practices*, Roma, v. 2-3, n. 2015, p.21-36.

[5] CLOW, D. *MOOCs and the funnel of participation*. In: Third Conference on Learning Analytics and Knowledge (LAK 2013), 8-12 April 2013, Leuven, Belgium, pp. 185–189.

[6] DANIEL, W., W. 1990. *Applied nonparametric statistics*. Boston: PWS-Kent. 2ª edição.

[7] DOWNES, S. Connectivism and connective knowledge: essays on meaning and learning networks. National Research Council Canada, 2012.

[8] DOWNES, S. Like reading a newspaper. 2014. Half an Hour.

[9] EBBEN, M.; MURPHY, J. 2014. Unpacking MOOC scholarly discourse: A review of nascent MOOC scholarship. *Learning Media and Technology* 39(3).

[10] ERIKSSON, T; ADAWI, T; STÖHR, C. 2016. Time is the bottleneck: a qualitative study exploring why learners drop out of MOOCs. *Journal Of Computing In Higher Education*, [s.l.], v. 29, n. 1,

p.133-146,.

[11] GOMEZ-ZERMENO, M., G.; LAGARZA, L., A.. 2016. Research analysis on MOOC course dropout and retention rates. *Turkish Online Journal of Distance Education*, [s.l.], p.03-14, 1 abr. 2016.

[12] GÜTL, C.; CHANG, V.; MORALES, M. 2014. *Attrition in MOOC: lessons learned from drop-out students*. In: Learning technology for education in cloud. MOOC and Big data, 2014, pp. 37e48. Springer International Publishing.

[13] HO, A. D. et al. 2015. HarvardX and MITx : Two Years of Open Online Courses Fall 2012-Summer 2014. *SSRN Electronic Journal*, 2015. n. 10, p. 1–37

[14] HOLLANDS, F., M.; TIRTHALI, D. 2014. *Resource requirements and costs of developing and delivering MOOCs*. The International Review of Research in open and Distributed Learning, v. 15, n. 5.

[15] HONE, K. S.; SAID, G. R. El. Exploring the factors affecting MOOC retention: A survey study. *Computers & Education*, 2016. v. 98, p. 157–168.

[16] KIZILCEC, R; HALAWA, S. 2015. *Attrition and Achievement Gaps in Online Learning. Proceedings Of The Second*. ACM Conference On Learning @ Scale - L@s '15, [s.l.], p.57-66, 2015. ACM Press.

[17] KOLLER, D. et al. 2013. Retention and Intention in Massive Open Online Courses (New Horizons). *Educause Review*. p. 62–63.

[18] ONAH, D. F. O., SINCLAIR, J.; BOYATT, R. 2014.*Dropout Rates Of Massive Open Online Courses: Behavioural Patterns*. EDULEARN14 Proceedings, 5825-5834.

[19] PAPPANO, L. The Year of the MOOC. 2012. *The New York Times*, 1–7.

[20] PERNA, L. W. et al. 2014. Moving Through MOOCs: Understanding the Progression of Users in Massive Open Online Courses. *Educational Researcher*, [s.l.], v. 43, n. 9, p.421-432,

[21] RHOADS, R A. et al. 2015. The Massive Open Online Course Movement, xMOOCs, and Faculty Labor. *The Review of Higher Education*, [s.l.], v. 38, n. 3, p.397-424.

[22] STACEY, P. The Pedagogy of MOOCs.

Identifying student behavior in MOOCs using Machine Learning: goals and challenges

Vanessa Faria de Souza
Graduate Program of Informatics in Education, Universidade Federal do Rio Grande do Sul (UFRGS),
Porto Alegre, Brazil.

Gabriela Trindade Perry (Corresponding author)
Graduate Program of Informatics in Education, Universidade Federal do Rio Grande do Sul (UFRGS),
Porto Alegre, Brazil.

Abstract

This paper presents the results literature review, carried out with the objective of identifying prevalent research goals and challenges in the prediction of student behavior in MOOCs, using Machine Learning. The results allowed recognizingthree goals: 1. Student Classification and 2. Dropout prediction. Regarding the challenges, five items were identified: 1. Incompatibility of AVAs, 2. Complexity of data manipulation, 3. Class Imbalance Problem, 4. Influence of External Factors and 5. Difficulty in manipulating data by untrained personnel.

Keywords: Machine Learning; MOOC; Student behavior

1. Introduction

Industry 4.0 – characterized by automation and data exchange in manufacturing technologies - is bringing great changes to society, education and to scientific development, which strongly affect the way people act and think. One of the consequences is the growth of Distance Educationinitiatives in several countries. In Brazil for example, it has been established in a comprehensive way, as the Brazilian Association of Distance Education's 2016 Census shows 7.2% of students are benefiting from it (ABED, 2016). Perhaps the most recent innovation, regarding distance education, was the expansion of MOOC (Massive Open Online Course) offers which have been attracting thousands of students, with significant enrollment numbers in recent years (Romero & Ventura, 2016). In 2012, edX, a non-profit startup created by Harvard University and the Massachusetts Institute of Technology, had 370,000 students in their first official courses. Coursera, founded in January 2011, has reached 1.7 million registered students and is growing "faster than Facebook", according to Wang, Hu & Zhou (2018). A MOOC aboutArtificial Intelligence, Stanford offered in 2011, attracted 160,000 students (Wang, Hu & Zhou, 2018). Romero & Ventura (2016), Wang, Hu & Zhou (2018). Greene, Oswald & Pomerantz (2015) and Hew, Qiao & Tang (2018) emphasize MOOC is a model of

teaching and learning characterized by sustainable education.

Even so, this education model has failed to provide evidence to support its sustainability capability. More specifically, student attrition and dropout is the main limiting factor in consolidating MOOCs. An example is MOOC Introduction to Computer Science, offered by Harvard University in 2012, which had 150,349 students registered and 1388 students earning degrees (a 92% dropout). The MOOC Electronic Circuits course offered by MITx in March 2012 had 154,763 registered participants, and 7157 completed the course, (approximately 95% dropped out). This MOOC was offered again in September 2012 by edX, and had 46,000 registrations and 3008 conclusions, an average of 93% students leaving before completing [12]. The strong contrast between the registration fee and the abandonment rate increases skepticism about the sustainability of the MOOC. How to improve quantification is a key issue for the consolidation of this educational model (Wang, Hu & Zhou, 2018). We consider it would be noted that it is virtually impossible to provide the same quality of support in a class with thousands of students compared to ordinary classes with a few dozen students - even in classes with few students it might be difficult to know each student and identify their needs. Machine Learning algorithms might assist platform developers and teachers with this problem.

Nevertheless, there are benefits either for MOOC users – besides being mostly free and allowing access to world class specialists – and for providers. The large amount of data generated by the interactions opens up new possibilities for studying and understanding student behavior (Onah, Sinclair & Boyatt, 2014).There is a huge potential for studies with new and freely available methods and tools,which might assist in questions like these. For example, Educational Data Mining (EDM), an area of interdisciplinary research that deals with the development of methods to explore data originated in the educational contexts (Romero & Ventura, 2016). Learning Analytics (LA) is another emerging area of research. It stands for the measurement, collection, analysis and reporting of data about students and their contexts, with the objective of understanding and optimizing learning and the environments in which it occurs (Xing et al, 2015).

For this reason, our goal is toelaborate a literature to put togetherthe more prevalent goals and challenges regarding student behavior in MOOCs, using Machine Learning algorithms. The papers selected for this review were published from 2014 to 2018.

2. MOOCs

According to Hew, Qiao & Tang (2018), MOOCs are an opportunity for training and empowering the population, changing the way we teach and learn, thus requiring a new posture of educational institutions and professionals. However, one of the major challenges highlighted in this model is attrition and dropout. Although many enroll in the course, the number of completion is very small. Due to the peculiarities of these courses, Xing et al (2016) consider that calculating the dropout percentage over the total number of enrollees in snot the best way to measure MOOC efficiency, since the goals of students enrolled in face-to-face courses are generally the same, whereas students of MOOCs enroll for a multitude of reasons. This is another reason why identifying ways to reduce abandonment rates in MOOCs is a challenging task.

In the MOOC context, methods such as focus group, surveys, interviews and observations to collect data in this regard might not be very sufficient, because they are time-consuming and limited when the

population is so large and diversified (Xing et al, 2015).Nevertheless, groups of researchers in the field of computer science have implemented models using machine-learning techniques to identify trends in the behavior of MOOC students. They make predictions by means of computational systems more suited to the large scale of data they manipulate. Many Brazilians have dedicated themselves to such studies, such as Manhaes et al (2011), Rodrigues, Medeiros & Gomes (2013) and Gotardo, Cereda & Hruschka (2013), as well as international researchers such as Hew, Xiao & Tang (2018), Wang, Hu & Zhou (2018), Greene, Oswald & Pomerantz (2015), Xing et al (2016) and Durksen et al (2016).However, due to characteristics and limitations of Machine Learning algorithms, this task, even with all current technological advances, is difficult to execute (Xing et al, 2015). Thus, the greatest challenge is to develop a method capable of predicting students' behavior, to enable the intervention of teachers, tutors, administrators and others, in order to rescue the student before he or she leaves the course (Wang, Hu & Zhou, 2018).

Thus we argue for the need for a study that lists the main studies carried out in the area in recent years and to describe the main advances and their respective challenges.

3. Machine Learning

Machine Learning is a subfield of Artificial Intelligence, dedicated to the development of algorithms and techniques that allow the computer to improve its performance in a given task. It is closely linked to Data Mining and Statistics. This area of research focuses on the properties of statistical methods, as well as their computational complexity (Sing & Purohit, 2015). Amongst its application are natural language processing, search engines, medical diagnostics, bioinformatics, speech recognition, handwriting recognition, computer vision and robot locomotion and prediction systems (Sing & Purohit, 2015).

A category of algorithms with wide use is classifiers, which are useful to classify unknown cases (Wu et al, 2008). According to Wu el at (2008), the most used classifier algorithms are: Naive Bayes, Support Vector Machines, Tree-Based Methods (such as C4.5 and Random Forest), IBK, Adaptive Boosting (Ada-Adaptive Boosting), Logistic Regression and Rule Based Method.

4. Research procedures

According to Vosgerau & Romanowski (2014), in a literature review the researcher gathers scientific documents obtained from a bibliographical survey, with the purpose of carrying out analyzes, contextualizing the problem under investigation. In this sense, in this research, a review of the literature was conducted with an emphasis on identifying studies that used Machine Learning to predict student behavior in MOOCs.

The databases used as source were IEEE Xplore Digital Library and Springer. We also look for paper in the journal Computers in Human Behavior, because it is well ranked and list MOOC, distance education and computational techniques in its scope. The databases, as well the journal, were chosen because they index papers related to Computer Science, Informatics in Education and Distance Education. The time frame was from 2014 to 2018. We used the strings "MOOC" and "MOOC" AND "Machine Learning" as search terms. The inclusion criteria were: (i) contain the terms "MOOC" or "Massive Open Online Course"

in the title of the article; (ii) be available in English or Portuguese; (iii) contain the term "Machine Learning" in the title or in the keywords; (iv) present the use of machine learning in the prediction of student behavior in MOOCs. Exclusion criteria were: (i) using another idiom; (ii) do not present information about behavior prediction.

5. Results

Using the words "MOOC" and "MOOC" AND "Machine Learning", 55 papers were found. These papers were analyzed, and 11 were selected because they were in accordance with the fourth inclusion criterion, which established that they should present the use of Machine Learning in predicting student behavior in MOOCs. In the Journal Computers in Human Behavior 2 papers were found, and one paper that was not in English or Portuguese language was excluded. In the IEEE Xplore Digital Library 8 papers were found and Springer database 1 paper. The papers we analyzed and detail in the next sections are listed in Table 1. A summary of each paper can be found in Table 2.

Table 1 Papers selected for the literature review.

IEEE Xplore Digital Library	R. S. Baker, D. Lindrum, M. J. Lindrum, D. Perkowski, "Analyzing early at-risk factors in higher education e-learning courses". Students at Risk: Detection and Remediation, 2015.
	Y. Chen, Q. Chen, M. Zhao, S. Boyer, K. Veeramachaneni, H. Qu, "DropoutSeer: Visualizing learning patterns in Massive Open Online Courses for dropout reasoning and prediction," in IEEE Conference on Visual Analytics Science and Technology (VAST), Baltimore, MD, USA, 2016, pp. 111–120.
	N. Periwal, K. Rana, "An Empirical Comparison of Models for DropoutProphecy in MOOCs," in International Conference on Computing, Communication and Automation (ICCCA), Greater Noida, India, 2017, pp. 906–911.
	L. Wang, G. Hu, T. Zhou, "Semantic Analysis of Learners Emotional Tendencies on Online MOOC Education," Sustainability V. 10, N. 192, 2018.
	K. F. Hew, C. Qiao, Y. Tang, "Understanding Student Engagement in Large-Scale Open Online Courses: A Machine Learning Facilitated Analysis of Student's Reflections in 18 Highly Rated MOOCs,"International Review of Research in Open and Distributed Learning, V. 19, N. 3, 2018, pp. 69-93.
	J. Liang, C. LI, L. Zheng, "Machine Learning Application in MOOCs: Dropout Prediction," in 11th International Conference on Computer Science & Education (ICCSE 2016), Nagoya University, Japan, 2016, pp. 752–57.
	B. Hong, Z. Wei, Y. Yang, "Discovering Learning Behavior Patterns to Predict Dropout in MOOC," in 12th International Conference on Computer Science and Education (ICCSE), Houston, TX, USA, 2017, pp. 700–704.
	S. Jiang, A. Williams, K. Schenke, M. Warschauer, D. O'dowd, "Predicting MOOC performance with week 1 behavior," in 7th International Conference on Educational Data Mining, 2014.
Springer	S. Halawa, D. Greene, J. Mitchell, "Dropout prediction in moocs using learner activity features," in Proceedings of the European MOOC Summit (EMOOCs 2014)Lausanne, Switzerland, 2014.
Comp	J. A. Ruipérez-Valiente, p. J. Muñoz-merino, d. Leony, c. D. Kloos, "ALAS-KA: A learning analytics extension for better understanding the learning process in the Khan Academy platform", Computers in Human Behavior,

	V. 47, 2015, pp. 139-148.
	W. Xing, Chenx., J. Stein,M.Marcinkowski, "Temporal predication of dropouts in MOOCs: Reaching the low hanging fruit through stacking generalization,"Elservier, Computers in Human Behavior V. 58, 2016, pp. 119-129.

Table 2 Summary of each paper.

Authors	Number of students	MOOC platform	Machine Learning algorithm	Goal	Challenges
Jiang et al. (2014)	37.933	Coursera	Logistic regression	Dropout predictor	Influence of external factors
Halawa, Greene & Mitchell (2014)	Not informed	Not informed	Logistic regression	Student classification/grouping	Influence of external factors
Ruipérez-Valiente et al. (2015)	564	Khan Academy	Not informed	Student classification/grouping	Complexity of data manipulation
Baker et al. (2015)	70.000	Soomo Learning Environment	Logistic regression	Dropout predictor	Influence of external factors
Liang, Li & Zheng (2016)	200.904	XuetangX	Decision Tree	Feature Engineering	Complexity of data manipulation
Xing et al. (2016)	Not informed	Coursera, edX, Udacity,	Naïve Bayes, Decision Tree	Student classification/grouping	Complexity of data manipulation
Chen et al. (2016)	Not informed	Coursera, edX	Logistic Regression, Random Forest, Nearest-Neighbors, with cross validation	Student classification/grouping	MOOC platform incompatibility
Hong, Wei &Yang (2017)	96.529	XuetangX	Random Forest, Support Vector Machine, Multi Nomial Logistic Regression	Dropout predictor	Complexity of data manipulation
Periwal & Rana (2017)	235.772	MITx, HarvardX	K-Nearest Neighbor, Naïve Bayes, Decision Tree, Logistic Regression	Dropout predictor	Class Imbalance problem
Wang, Hu & Zhou (2018)	18.234	Chinese University (not informed)	Personalized algorithm	Dropout predictor	Data manipulation
Hew, Qiao & Tang (2018)	5.884	Coursetalk	K-Nearest Neighbor, Gradient Boosting Trees, Support Vector Machines, Logistic regression, Naive Bayes	Dropout predictor	Influence of external factors

5.1 Advances in student behavior prediction in MOOCs

The following the research goals were identified in the literature review.

5.1.1 Student classification/grouping: Chen et al (2016) created a system called DropoutSeer based on Machine Learning, which helps instructors and researchers to analyze the relationship between student performance and dropout. By grouping students with similar performance, the authors seek to identify

students in need for assistance. Ruipérez-Valiente et al (2015) also developed a visual module. It extends the learning analysis support for the Khan Academy platform, so the information could be used to group students. Xing et al (2016) present a grouping generalization approach for constructing more robust and accurate forecasts about temporal prediction of dropouts in MOOCs, based on classification algorithms. In the research by Halawa, Greene & Mitchell (2014) an "integrated predictor" consisting of two components is presented. The “Predictor of the active mode” operates while the student is logged in and the “Predictor of absence mode” operates when the student has been absent for a certain period of time. The goal is to assist instructors and administrator to make appropriate interventions for each case.

5.1.2 Dropout predictors: Periwal & Rana (2017) described in their work four models using supervised learning algorithms with labeled data. Using these models, the authors were able to identify a range of characteristics that affect the prediction of dropout. In this sense, Jiang et al (2014) used logistic regression algorithms for predictions and developed a method to identify user interactions with online distance education platforms, using student's performance in the first week as a predictor of its permanence and success in the MOOC. The authors also report that one of the factors influencing the prediction of student abandonment is external factors, which are difficult to identify. In this perspective, Baker et al (2015) report the elements they characterized as early predictors of student success, thus defining the information that is worth investigating for the study of dropout in MOOCS, providing hints for interventions of teachers and instructors. The work by Hew, Qiao & Tang (2018) also brings an insight into the factors that affect student participation in MOOCs. Similarly, the authors rely on the application of machine learning classifiers to analyze sentences posted by the students. Wang, Hu & Zhou (2018) developed a SMA to predict students' emotional tendencies in order to analyze the acceptance of the courses based on data such as tasks, comments, forums and other information in MOOC platforms. The method can recognize students' emotional tendencies through semantic analysis, which provides an effective solution to personalized MOOC teaching, which can help those involved, achieve a reduction in dropout. Hong, Wei & Yang (2017) proposed a technique in which they apply two-layer cascade classifiers with a combination of three different classifiers to predict dropout. Experimental results indicate that this technique is promising, reaching 97% accuracy. Finally, Liang & Zheng (2016) used the rather unique procedure called “Feature Engineering”, an aid in the application of Machine Learning algorithms. This rationale is to create new data from collected data, which leads to improved forecasting and performance, via application of mathematical functions to the data vector. An analogy can be made with the Body Mass Index, which uses existing data to construct new data (not physiological, and therefore not part of the original database).

5.2 Challenges in student behavior prediction in MOOCs

Regarding the challenges of the prediction process, the results of the literature review pointed to the following items.

5.2.1 MOOC platform incompatibility: The main challenge highlighted by Chen el at (2016) concerns the structure of the MOOCs and student evaluation metrics, which are very diverse and evolve fast. For this reason, a unified solution, which could be used by several MOOC providers, is not yet possible.

5.2.2 Complexity of data manipulation: Hong, Wei & Yang (2017) and Liang & Zheng (2016) indicate that one of the main obstacles to prediction of abandonment in MOOCs is the available data, which need to be worked on before being used in algorithm training and in the process of prediction. Ruipérez-Valiente et al (2015) assert that dealing with the great diversity of student actions that can be captured by online platforms (for example, posting a question in a chat room and watching a video) is a complex task. In this perspective Xing et al (2016) add it is difficult to deal with the variability of data collected from MOOCs.

5.2.3 Class Imbalance problem: According to Periwal & Rana (2017), one of the major challenges of working with data from MOOCs is the issue of class imbalance. As the number of dropouts (major class) is much larger than the number of students who finish the course (minority) there is a need for a model that mitigates the effect of unbalanced data and predicts which students will actually dropout.

5.2.4 Influence of external factors: Jiang et al (2014) explain that external factors have a strong influence in the students' decision to leave – and it cannot be identified via interaction with the platform. Halawa, Greene &Mitchell (2014) say that such factors are quite heterogeneous and difficult to treat. In this same line of reasoning, baker et al (2015) report that one of the obstacles is that data on updated student profile is not available to the online MOOC platform. The work by Hew, Qiao & Tang (2018) corroborates these statements, noting that there is great complexity in determining why students drop out of MOOCs.

5.2.5. Difficulty in manipulating the methods by untrained personnel: According to Wang, Hu & Zhou (2018), Machine Learning algorithms are hard to understand by untrained personnel, such platform administrators, instructors and teachers. This is a challenge because to design a prediction routine using Machine Learning algorithms it is important to understand the problem, the users and the context – and this knowledge might not be available to programmers.

6. Conclusion

MOOCs have potential to be a sustainable model of education, providing students with a variety of possibilities and benefits. However, this scenario still seems distant, and the most worrying factor is the low completion rate. In, in this sense if those involved with MOOCs, such as platform administrators, teachers and tutors, could identify which students are most likely to give up, they could take actions to mitigate these dropouts or provide individualized assistance - Machine Learning algorithms could be useful in this sense. The process of identifying students at risk of leaving, even with all technological advances, usually is manual, subjective and not informed by data, depending mostly on the experience of teachers. This method is unable to meet the demands of MOOCs.

Through the literature review, 11 studies were identified, which presented relevant applications and results, showing that there are many researchers trying to improve MOOCs and make better use of the massive data generated by online platforms. The review reveals two important aspects: goals and challenges regarding application of Machine Learning algorithms in the MOOC context. Identifying goals in important to contextualize research questions and methods, while recognizing obstacles is important to foresee difficulties and avoid pitfalls.

In this scenario, Machine Learning is very opportune for treating data and extracting information in the large volume of data generated by student interactions with the MOOCs platforms. Even in the midst of large amounts of data, one can have a fairly accurate picture of student behavior, as shown by Jiang et al. (2014). These authors used Logistic Regression and developed a method that guaranteed that the performance of the student already in the first week could be a predictor of its permanence and success in the MOOC. In addition to predicting behavior, another frequent goal is grouping students, which may be the key to offering personalized assistance.

Difficulties were also encountered in the review. The first one is cross-platform incompatibility, which prevents data from being shared. Besides these platforms belong to different institutions, the course formats vary greatly, which makes proposing a general model very difficult. An unfolding of this problem is the complexity of data manipulation, requiring extensive treatment before used as input in prediction algorithms. Another obstacle refers to Class Imbalance Problem, characterized by one category being much larger than another. This disparity causes the algorithms to learn in a biased way, generating incorrect predictions. Another difficulty is the influence of external factors in student behavior, which is difficult to detect and that interferes with the students' attitudes. The last obstacle is the difficulty in manipulating the methods by untrained personnel, which indicates the need to develop systems that are more intuitive, so that the proposed solutions are not restricted to people with Computer knowledge.

References

[1] ABED - CENSO EAD 2016 [Online]. “Relatório analítico da aprendizagem a distância no Brasil”, Available: http://www.abed.org.br [Acesso em 30 de setembro de 2018]

[2] A. Singh, A. Purohit, “A Survey on Methods for Solving Data Imbalance Problem for Classification,”International Journal of Computer Applications, V. 127, N.15, 2015, pp. 0975 – 8887.

[3] B. Hong, Z. Wei, Y. Yang, “Discovering Learning Behavior Patterns to Predict Dropout in MOOC,” in 12th International Conference on Computer Science and Education (ICCSE), Houston, TX, USA, 2017, pp. 700–704.

[4] C. Romero, S. Ventura, S. “Educational data science in massive open online courses,” Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery, V. 7, N. 1, 2016.

[5] D. F. Onah, J. Sinclair, R. Boyatt, “Dropout rates of massive open online courses: behavioural patterns,” in 14th, EDULEARN, EUA, 2014, pp. 5825-5834.

[6] D. S. R. Vosgerau, J. P. Romanowski, “Estudos de revisão: implicações conceituais e metodológicas,” Revista Diálogo Educacional. Curitiba, vol. 14, n. 41, 2014, pp. 165-189.

[7] J. A. Greene, C. A. Oswald, J. Pomerantz, "Predictors of Retention and Achievement in a Massive Open Online Course," American Educational Research Journal, V. 52, N. 5, 2015, pp. 925–955.
[8] J. Liang, C. LI, L. Zheng, "Machine Learning Application in MOOCs: Dropout Prediction," in 11th International Conference on Computer Science & Education (ICCSE 2016), Nagoya University, Japan, 2016, pp. 752–57.
[9] J. A. Ruipérez-Valiente, p. J. Muñoz-merino, d. Leony, c. D. Kloos, "ALAS-KA: A learning analytics extension for better understanding the learning process in the Khan Academy platform", Computers in Human Behavior, Volume 47, 2015, pp. 139-148.
[10] K. F. Hew, C. Qiao, Y. Tang, "Understanding Student Engagement in Large-Scale Open Online Courses: A Machine Learning Facilitated Analysis of Student's Reflections in 18 Highly Rated MOOCs,"International Review of Research in Open and Distributed Learning, V. 19, N. 3, 2018, pp. 69-93.
[11] L. M. B. Manhaes, S. M. S. Costa, J. Zavaleta, G. Zimbrao, "Previsão de Estudantes com Risco de Evasão o Utilizando Técnicas de Mineração de Dados," in Proceedings of the 22th, SBIE, Campinas, Brasil, 2011, pp. 1500-1510.
[12] L. Wang, G. Hu, T. Zhou, "Semantic Analysis of Learners Emotional Tendencies on Online MOOC Education," Sustainability V. 10, N. 192, 2018.
[13] N. Periwal, K. Rana, "An Empirical Comparison of Models for DropoutProphecy in MOOCs," in International Conference on Computing, Communication and Automation (ICCCA), Greater Noida, India, 2017, pp. 906–911.
[14] R. Gotardo, P. Cereda, J. E. Hruschka, "Predição do Desempenho do Aluno usando Sistemas de Recomendação e Acoplamento de Classificadores," In Proceedings of the 24th, SBIE, Campinas, Brasil, 2013, pp. 2202-2212.
[15] R. L. Rodrigues, F. P. A. Medeiros, A. S. Gomes, "Modelo de Regressão Linear aplicado à previsão de desempenho de estudantes em ambiente de aprendizagem," in 24th, SBIE, Campinas, Brasil, 2013, pP. 607-616.
[16] R. S. Baker, D. Lindrum, M. J. Lindrum, D. Perkowski, "Analyzing early at-risk factors in higher education e-learning courses". Students at Risk: Detection and Remediation, 2015.
[17] S. Halawa, D. Greene, J. Mitchell, "Dropout prediction in moocs using learner activity features," in Proceedings of the European MOOC Summit (EMOOCs 2014)Lausanne, Switzerland, 2014.
[18] S. Jiang, A. Williams, K. Schenke, M. Warschauer, D. O'dowd, "Predicting MOOC performance with week 1 behavior," in 7th International Conference on Educational Data Mining, 2014.
[19] T. L. Durksen, M. W. Chu, Z. F. Ahmad, A. L. Radil, M. L. Daniels, "Motivation in a MOOC: a probabilistic analysis of online learners basic psychological needs," Springer, Soc. Psychol Educ., 2016.
[20] W. Xing, R. Wadholm, E. Petakovic, S. Goggins, "Group learning assessment: developing a theory-informed analytics". Journal of Educational Technology & Society, V. 18 N. 2, 2015, pp. 110-128,
[21] W. Xing, Chenx., J. Stein,M.Marcinkowski, "Temporal predication of dropouts in MOOCs: Reaching the low hanging fruit through stacking generalization,"Elservier, Computers in Human Behavior V. 58, 2016, pp. 119-129.

[22] X. Wu, V. Kumar, J. R. Quinlan, J. Ghosh, Q. Yang, H. Motoda, A. Mclachlan, B. Liu, P. S. Yu, Z. Zhou, M. Steinbach, D. J. Hand, D. Steinberg, "Top10 algorithms in data mining. Knowledge and Information Systems," Springer, Knowl Inf Syst, V. 14, 2008, pp. 1–37.
[23] Y. Chen, Q. Chen, M. Zhao, S. Boyer, K. Veeramachaneni, H. Qu, "DropoutSeer: Visualizing learning patterns in Massive Open Online Courses for dropout reasoning and prediction," in IEEE Conference on Visual Analytics Science and Technology (VAST), Baltimore, MD, USA, 2016, pp. 111–120.

VALUES AND PROFESSIONAL ETHICS IN THE LEADERSHIP MANAGEMENT OF DIRECTORS OF EDUCATIONAL ORGANIZATIONS

Ana M. Winfield-Reyes
ESCOM, Instituto Politecnico Nacional

Carlos Topete-Barrera
ESCA S.T., Instituto Politecnico Nacional

Fernando N. Winfield-Reyes
Facultad de Arquitectura, Universidad Veracruzana

Abstract

This document aims to identify the factors of the ethical formation of directors in educational organizations by analyzing the practices and kind of values promoted in the moral issue's decision during their managerial work.

The educational research has found that there is a close relationship between an efficient management and the manager's leadership. An organization lingers through time due to the ethical principles scheme it has for the development of its management and leadership. Leadership does not only comprise technical and political competencies, but also ethical ones.
The approach of this work is the one of the analysis of the challenges found in the crucial actions in the managers' decision-making process, and how these moral situations affect the quality of the managers' work. This research uses the qualitative methodology, which includes case studies, interviews of experts and former directors, and the analysis and interpretation of ethical factors involved in the solution of moral conflicts.

Some moral dilemmas or conflicts found are: Loyalty to the institution or the boss, following up the norm or the personal interests, loyalty to the institutional mission or to the political group, co-workers selection, fair treatment for the different stakeholders of the educational community, and other training elements for facing such conflicts, as: Development of moral convictions, accountability and co-accountability, learning from other leaders and voices and communication establishment.

Keywords: Educational Leadership, Ethical Formation, Ethical Management, Ethical Training of Directors, Moral Dilemmas.

About this work

This work consists of five sections, to know: in the first one, "Benchmark, context and background of values, training and professional ethics of directors of educational organizations" is shown the general context and the background of the problem, as well as the main studies carried out in Mexico; in the second section a brief theoretical framework about ethical training and leadership is shown through the review of some authors who have studied the subject matter; in the third section, the methodology -this is a exploratory, qualitative research - and the field work are described; in the fourth section the main findings regarding ethical challenges in the director's management of moral conflicts resolution are shown; and, finally, in the fifth section, some categories which emerge from the qualitative analysis, such as the critical moral conflicts that are more common in the director's work, the decision making criteria in the management, necessary values, relevant experiences and recommendations on the ethical training of directors, are shown as conclusions.

It is worthy to mention that the research in process carries out the codification and construction of hermeneutical units, which allows explaining the underlying concept map in the identification of ethical factors in the resolution of moral conflicts of the leadership in the educational organizations.

Context and background of values, training and professional ethics

The moral conflict starts in the individual when s/he experiments difficulty to define the way s/he should behave in a certain situation where conflicting interests, values or points of view lead to diverse behaviors which require making decisions so to safeguard that which is deemed to be more important.

The concern on the Mexican education values was, for the first time, addressed in the International Forum on Education and Values, which was sponsored by the UNESCO and held in Mexico City in 1994. Several experts and scholars attended to this forum.

In Mexico, the most advanced research on values, with field sources, is the one of Latapí, who in his work "The Debate on The Mexican School Values" includes five definitions of the value concept, i.e. as appraisal judgment, as affective predisposition, as cause of action, as an instinct dynamic assimilated in the personality or as a behavior norm (Latapí, 2003).

In the moral or ethical dilemmas, the nature of the situation of conflict that questions the personal decision and behavior does not only have moral implications, but also expresses itself as a quandary, in such a way that the possible alternatives are mutually exclusive (Fierro, 2006).

The values are an inner power that defines and characterizes the individuals, as well as provides identity to and unites human groups. The values have guided the mankind creations and the heroic actions of peoples, human groups or some individuals; and affect the inner self of the individuals, represented by its conscience, and by its moral, individual and social accountability sense (Álvarez, 2008).

This research explores the factors of ethical training and its influence on the development of educational management by promoting values, because it is deemed that a performance that is coherent with ethical principles will redound to the benefit of the institution. The benchmark we present here holds that idea.

Theoretical framework on ethics and leadership

Although the bibliography on values and ethics is extensive, for purposes of this work we will focus in three theoretical pillars: The model for developing management skills of Cameron and Whetten (2005), the four training dimensions of Teresa Yurén (2005) and the theory of Paul T. Begley (1999) on the values in the educational management.

The model for developing management skills of Cameron and Whetten proposes three education pillars, i.e.: Self-awareness, interpersonal relationships and intergroup relationships. The first pillar is where the ethical training of the school directors is located. Four core aspects of self-awareness are related to each other, i.e.: Values, attitudes, learning styles and interpersonal relationships. In their proposal for training directors, the authors suggest as the main pillar the self-awareness, which implies to learn from him/herself, his/her personal values and the director's self-regulation (Cameron y Whetten, 2005).

These authors take up again the work of Kohlberg, who classifies the moral judgment according to the three levels of the development stages, i.e.: Preconventional or self-centered level, conventional or conformity level, and post-conventional or principled level. In the post-conventional or principled level, the moral value lies in the commitment to freely choose standards, rights and obligations. (Kohlberg in Papalia, 1992).

On the other hand, the four dimensions of training (conceptual, procedural, ethical or socio-moral, and self-care) proposed by Yurén emphasize, in the ethical or in the socio-moral dimension, the knowledge that the directors should have for developing an ethical management. An experience is educational when what was lived and thought can break the balance between experiences and identifications. So, the professional *ethos* is the set of elements such as internalized ethics, motivation and self-care, in the form of self-regulation and ideals sought by the individual, in relation to the problems of the professional field and to the activities oriented towards the practice of the profession (Yurén, 2005).

The difference between ethics and moral is that the moral laws protect the institution, while the individual who is applying those does it in a critical manner: not only following the institutional moral law, but according to its inner moral law. This inner moral law is nothing else but the ethics. In other words, moral is the set of norms that the society establishes, while ethics is the personal way the individuals apply such norms from their inner selves, values and free will (Rivero, 2004).

The Begley's theory regarding the values in the educational management places the concentric categories of self, motives, values, behaviors and actions into a terminological syntax of values (Begley, 1999).

Lucia Garay in Argentina, has generated a program with a methodology called "*bond clinic",* where he mainly works with directors in order to analyze the type of bond (relationship or union) struck up by them with knowledge, work, other individuals and, finally, law, norms and institutions. When critically analyzed, Garay's methodology can show the value scheme and the ethical training used by the directors at his/her job (Garay, 2008).

A qualitative and exploratory research

The question we care about is which are the values and professional ethics of directors during their educational management when they solve critical moral conflicts?

In order a moral conflict to be critical, it is necessary the manager's decision making, knowledge or behavior be questioned.

The question mentioned herein above has give rise to other questions, such as: Which moral dilemmas do the directors face during their educational management? How do they solve them? Which values do the directors promote by solving the problems? Which results are obtained? Which actions are important for the ethical training and performance during the educational management?

Then, with a qualitative exploratory research, we tried to understand the phenomenon of value or ethical training in the managerial functions, from the experience of stakeholders such as the directors of schools, the directors of public schools of primary education, and experts in the field of ethical training and educational management.

So, interviews with former public schools directors -who have administrative experience ranging from nine to fifteen years-, were carried out in the first stage of this work.

In the second part the research includes in-depth interviews with educational research experts in the areas of professional management, leadership and education and who have more than twenty years of experience in the management research field.

In the third part, moral conflict experiences were reviewed with 25 directors acting in the public sector. These directors, through short narratives, show the problems in the leadership management and tell us about a critical event and provide a general context, the problems development, possible solutions, and final decisions.

It is important to mention that the sample used for this investigation was selected according to the recommendations of the case method.

The tools used for identifying the factors that have an influence on solving the director's moral conflicts, and asked to former directors, included the following questions:

1. How did you reach the director position?
2. Which are the main difficulties you dealt with during your management?
3. Which are the main moral dilemmas you faced as director?
4. How did you solve them and which results did you obtained with your decision?
5. Mention a negative experience, related to ethical aspects, that you lived during your management.
6. Which are the most important values you think are necessary for the work as a director?

On the other hand, the questions asked to management, leadership and directors' training experts were the following:

1. Which are the main moral dilemmas or crucial aspects that you consider a director might face during its managerial work?
2. Which elements do you think are important for training the directors in order to face such dilemmas?
3. Mention a relevant experience related to moral dilemmas faced by the directors during their work.
4. Which are the values that, hierarchically, must be part of any work?
5. Which actions or strategies do you think are important for the future training and ethical performance in the educational management?

Finally, the questions asked to the acting managers were the following:

1. Tell us about a crucial moral incident that you faced and where your authority, knowledge or behavior was questioned.
2. In such incident, what solution options did you have and which one did you choose?

After transcribing the interviews of experts and former directors, the case research methodology and the qualitative analysis of Atlas TI were used for analyzing and interpreting the ethical factors involved in the solution of moral conflicts.

With the information obtained from the acting directors, the types of problems were compared with the possible solutions. As a result, a typology of conflicts was created and it was observed that the decisions made by the director do have an impact on the educational organizations.

Main findings: Ethical challenges for the resolution of moral conflicts in the managerial work

From the analysis of the interviews made, it was possible to discern the challenges faced by the managers for the resolution of crucial issues during their professional practice, as well as to determine how these challenges affect the professional educational work.

It is important to take into consideration that, if the manager does not have prior professional ethics, it is probable that s/he acquires it in the course of his/her duties; although, it is always possible to appeal to the manager's conscience in order to create an ethical sense during the managerial work.

With the evaluation and processing of the interviews done to former directors, were found the following analytical categories related to the factors of ethical training that have an influence on the managerial work: Difficulties during their work, negative experiences or obstacles and positive experiences, critical incidents and moral dilemmas faced, and values which are necessary for carrying out their managerial work.

They also mentioned other elements which are more related to skills than to values, such as to be able to negotiate and leadership. Although it is true that negotiation and leadership play an important role in the values and that they are linked to the necessities and their hierarchy, the directors only mentioned one element related to hiring the most adequate candidate.

In the tables 1 and 2 are synthesized the contributions of former directors regarding management and solution of dilemmas.

Regarding the interviews made to the management experts, some of the results have been reorganized and gathered in the following categories: Most common moral dilemmas, elements to face such dilemmas (understanding dilemma not only as a predicament but also as a critical incident in which the manager's decision, knowledge or behavior was questioned), decision criteria during the managerial work, meaningful experiences, values which are necessary for the directive work and recommendations for strategies of education.

Some data of the interviews with the experts is presented in the tables 3 to 8. This data is sorted into categories, which show some of the moral conflicts or dilemmas faced by the directors during their work.

Likewise, the main values which are necessary for developing a managerial work based on values are shown, and some proposals for the ethical training of managers are laid down. Such proposals do not only imply a technical knowledge, but also (as Lickona says) imply to recognize, wish and do well (Lickona, 1995).

Table 1. Factors that impact the ethical management of directors

Factors / Years the director has in his/her position	**Difficulties during their work**	**Negative experiences (obstacles)**
9 years	* Lack of willingness and commitment from their co-workers. * Lack of personnel. * Lack of support from the authorities for creating infrastructure. * Lack of personal quality in their manners (arrogance)	* Abuse of authority from their immediate boss. * Lack of flexibility of the norms. * Lack of freedom to manage and request resources from the parents. * Denial of confliction situations. * Backing up of corrupt co-workers.
15 years	* Technical-pedagogical difficulties (work with underprivileged students). * Regarding the lack of support from the system to have infrastructure or administrative problems (85%)	* Use of past speeches in detriment of the speaker.

Table 2. Most frequent dilemmas and necessary values

Dilemmas and values / Years the director has in his/her position	**Moral dilemmas faced**	**Necessary values**
9 years	* Apply the norm on a co-worker who didn't comply with it. * Create political alliances with the personnel. * Corrupt personnel and mistreatment of students.	* Honesty, justice, respect, commitment, leadership, tolerance, love, freedom. * Select directors with a determined psychological profile.

14 years	* Who backs up the director?	* Responsibility, credibility, humbleness. * Practice what one preaches.
15 years	* Conciliate the school's interests with the ones of the parents after a prior authoritarian leadership. * Management problems with the authorities, co-workers and parents.	* Coherence * Set the example * Union * Credibility Be able to negotiate.

Some of the main training strategies are stressed in the tables, such as having training programs backed up by the analysis of management cases, negotiate management internships, changing the education priorities and recover professionalization above the work-related politics career, proposing reflexive lines of education and development of the individual, carrying out conflict analysis and using tools to establish a dialog and resolve problems, as well as promoting new systems for hiring and appointing managers that more centered in the individual's high moral values and technical and management skills.

Next, the moral dilemmas -seen from the point of view of experts- are shown in the table 3. The information has been sorted into personal relationships, teaching performance, regulatory schemes and administrative issues.

Table 3. Main moral dilemmas identified by the experts

Moral Dilemmas / Experts	Personal relationships and loyalty	Teaching performance	Regulatory schemes	Administrative issues
Expert 1	Loyalty to the institution, the policies or the academics.	Select co-workers. Reward the person who hire him/her o his/her friends.	Predominance of old regulations, personal interest or the institutional mission. Comply with the norm, but bribing.	
Expert 2	Whom does it protect to? Conciliate the interests of different stakeholders. Personal issues.	Management of children with special educational needs.	Intervene or not.	What is his work? Solve situations or obtain resources?

				Management of official documents.
Expert 3	Conflicting relationships between co-workers and supervisors. How to talk with the teachers so to tell them how to improve their performance.	Organize, train y give performance results to the teachers.		Prioritize administrative issues above other important issues.
Expert 4	Conciliate the educational organization demands with the ones of the individuals. The challenge of dealing with the position's power and the authority's power.		Have a double interpretation of the norm and its practice.	

The table 4 shows the decision making criteria in management, which are sorted into: knowledge of self and others, training and actions, and regulatory schemes.

Herein below are shown the elements needed to face dilemmas, sorted in the categories of ethics, support, environment, communication and regulatory schemes (table 5)

Next, in the table 6 are shown the positive and negative experiences which are relevant for ethical training, according to the experts.

In the table 7 is shown a synthesis of the values which are necessary for carrying out the directive function and for managing the educational institutions.

Finally, in the table 8 are shown some important recommendations regarding the training strategies. Such recommendations arise from the interviews made to the management and managers' training experts. These experts emphasize the selection of the director; other experts emphasize the analysis ability of the director, but all agree that there should be several training lines.

Table 4. Decision making criteria in the ethical management

Criteria **Experts**	**Knowledge of self and others**	**Training and actions**	**Regulatory schemes**
Expert 1	a) The director knows him/herself and others. b) Know who is who in the institution and what they can offer.		

Expert 2	a) Reflexivity b) Analytical, critical, and judgmental skills.	Training of the individual.	
Expert 3	a) The individual comes first. b) The "directors' culture"		The list of local principles or expectations.
Expert 4	The pedagogical function with regard to other institutional stakeholders.	Manage, administer and take decisions.	Comply with the law with a fair management.

Now, in the tables 9 to 13 are shown some of the most representative problems that the acting managers face, told by them and synthesized. Also, the results, strategies used, the underlying values, and a consequence analysis are included in the tables.

In the table 9 are shown the problems regarding the managers' relationship with the authority, where the managers' power is overcoming by unionism, corruption and the unjust use of power.

The table 10 shows some incidents of the manager with the supervisor, where authoritarianism and inflexibility in the norm hamper the managerial work and the communication.

Table 5. Elements for facing the dilemmas during the decision taking of the director

Elements / Experts	Ethics	Support	Environment & communication	Regulatory schemes
Expert 1	High moral values. Accountability and co-accountability	Listen to other intelligent leaders	Communication skills	To bear in mind the institutional mission. Free-space policy. Do not rig the consensus.
Expert 2	Co-accountability	Team work	Real conversations. Understand the other. Conflict analysis.	
Expert 3	Acknowledge there are moral issues.	Create a supportive environment for the director. Consult other individuals.	Define key issues and ensure a respectful understanding.	To be consistent with the laws and regulations. Examine their reasons when taking action.
Expert 4		Share management experiences with colleagues.	Analyze the bonds the director starts: with the knowledge, with the task and with other individuals.	Be thorough and egalitarian when applying the regulations.

Other aspects to take into consideration are the critical incidents that take place between directors and the educational organization stakeholders, i.e., teachers and students. The manager needs to conciliate the interests of each and all stakeholders and find the main solution strategy in the decision-making tasks, as shown in table 11.

In the table 12 is shown the lack of recognition suffered by the director from the parents. It is pivotal to convince the parents of the importance of the director, which can only be done if the director gains the respect and recognition of his/her authority by working for and committing with the mission of the institution.

Other problems in the ethical management are related to issues of informality in the way the directors obtain the position, as shown in the table 13.

Table 6. Meaningful negative and positive experiences for ethical training

Elements / experts	Positive	Negative
Expert 1	Backs up co-workers. Delegate tasks to individuals with high moral values. Take into consideration the student, academic, and social leadership.	Delegate and let the co-worker die alone. Obtain the position without having prior training in educational management. Do not care about the institutional mission. See the details but forget the big picture.
Expert 2	The day to day of the school and each one of its stakeholders (children, parents, personnel).	Care of administrative, political and/or labor issues and not of pedagogical issues. Have an individualist vision of the work.
Expert 3	Training can change the values of the individual.	When the teacher is mistreating the students and the director has to talk to the teacher about it. The excessive pressure caused by people lying.
Expert 4	Feminization of the director's roll.	Try to obtain authority by being overbearing. The directors do not really know the people they have to lead.

Table 7. Values that are necessary for having an ethical management

Expert 1	Expert 2	Expert 3	Expert 4
The values are set according to the mission of the institution. High moral values and technical skills.	Accountability: as the ability to back up others. Respect: for the cultural diversity of each stakeholder.	Respect and justice. Have, from Kohlberg's proposal,	Commits himself as a life teacher. Democracy and justice in his/her performance as director.

Relationship and communication skills. Obtain resources. Promote and boost the community.	Fairness: as the different attention given to those who are vulnerable in order to compensate differences. Solidarity.	high moral values.	Pedagogical value.

Table 8. Strategies for the ethical training of directors of educational organizations.

Strategies	Selection	Analysis	Training
Expert 1	Promote other systems for the selection and appointment of directors, so to ensure that they have high moral values and technical and management skills.		Have training programs backed up by the analysis of management cases.
Expert 2	Review the selection systems.	Turn the eyes towards the historical, social and cultural environment where the director lives.	Change the educational priorities and recover the professionalization instead the work-related politics careers. Face the educational problems in a multilateral manner. Propose training and developing lines on conflict analysis and use of tools to establish communication.
Expert 3		Talk about ethical issues as the first step to develop ethics.	Evaluate the director during his first year in the position and analyze which are the most important moral challenges.
Expert 4	Know the interests and reasons that lead to the director's position.	Analyze the links with the directive work.	Propose the individual have training in diagnostic research, institutional theories and understanding others.

Table 9. Critical incidents that are related to corporativisim and ethical management

Moral dilemmas	Description	Strategies	Impact on the ethical management
Between political loyalty and pedagogic loyalty	Clash between unions. Arbitrary entry to the facilities.	Hiring ethical individuals, respect for the autonomy,	The director cannot carry out an ethical negotiation with the authorities and s/he is overtaken by the unions.

	Decreased personal relationships. Corporativisim.	compliance with the transparency law, answer official letters.	
Protectionism and corruption.	There is a person in the organization that is protected by a union officer (relative). Nepotism.	The actions are not carried out due to old regulations and to the brother's nepotism. Swaps so to preserve the human resources in the institution.	The director is overcome by people who use their power in an inadequate manner, so the director has to accept the situation. There is not a real solution because the problem was transferred to another institution. Lack of justice and fairness.

Table 10. Critical incidents that are related to corporativisim and ethical management

Moral dilemmas	Description	Strategies	Impact on the ethical management
Authoritarianism from the supervisor.	The supervisor is imposing on the director a project that now is obsolete for the current situation of the educational institution.	In order to obtain solutions, the problem was commented with the decision-making body. The decisions taken were argued.	The director gets verbal sanctions from the supervisor; nevertheless, they could work together when the director based his actions on the organization's diagnosis.
Authoritarianism from the supervisor: lack of flexibility in the regulations.	The director's behavior was exposed in front of other stakeholders in the educational organization.	A document with the obligations of the director was handed to him.	The educational work was undermined, feelings were involved and the communication was broken.

Table 11. Critical incidents that happen during the management of the directors in relation to the conflicts between directors, teachers and students

MORAL DILEMMAS	DESCRIPTION	STRATEGIES	IMPACT ON THE ETHICAL MANAGEMENT

Mistreatment of students	There is a teacher who justifies mistreating her students with her origins.	Talk to the teacher, send her to updating courses, and threaten her with reports in her file.	Inadequate management: the updating courses do not guarantee an ethical performance of the teacher; neither do the reports in her file.
Dealing with students with special needs.	The director tries to organize and train the teachers to obtain better results; however, the teachers feel that such requirement is unnecessary and as a burden.	Establish communication, create team work and sensitize the workers regarding the advantages of writing the reports. This can be done by setting a group that shows the benefits obtained.	The solution used is working just as the director expected.
The challenge of dealing with the position's power and the authority's power.	The director is discredited: his orders are not followed. This situation results counterproductive for the co-workers that do follow the orders.	The problem was discussed with people from the organization.	The director wants to be fair while applying the norms and desires to obtain the support of other workers.
Apply the regulations while taking into consideration the decision-making bodies.	The institution has strong quality demands; as a result, the director puts a lot of pressure on his co-workers. He does it in a very inflexible manner.	The decision-making bodies talked to the director regarding his behavior and asked him to modify it. The director agrees to do so in order to achieve the job's objectives. There were contributions from both parties.	The director wants to use resources for management training and is guided by the institutional mission, which allows the commitment from all the stakeholders.

Table 12. Critical incidents that happen during the management of the directors in relation to other stakeholders in the educational organization

Moral dilemmas	Description	Strategies	Impact on the ethical management
Parents' collaboration: the dilemma between the position power and the authority power.	The parents are prejudiced against the director due to the director's age (he is too young) and inexperience.	The director won the respect of the community thanks to his work skills and by delegating responsibility.	The director had little experience when he obtained the position; however, he leaned on the teachers and was able to create a collaborative environment.
Participation from the parents in the proposals.	The president of the parents association is overbearing and authoritarian.	The parents decided to face up the president and reach democratic solutions.	The communication among the stakeholders improved. The decision making is carried out in according to the institutional mission.

Table 13. Problems found during the ethical management of the directors

Moral dilemmas	Description	Strategies	Impact on the ethical management
Lack of continuity in the management of the educational organization.	The school is a rural, passage one; therefore, the programs and the stakeholders do not stay there.	There is concern about the issue; however, neither the parents nor the students stay there also.	A low-quality education. Lack of commitment, responsibility or dedication to the educational project.
Informality in the position.	Due to urgencies, some substitute teachers are working in the institution, but they don't have any training whatsoever.	Besides the difficulties of the position, there is no support to or recognition of the work done.	The director is losing heart, is having difficulties to carry out his job, and does not know neither the reasons to be a director or the individuals he is leading.

Conclusions

Thanks to the horizontal and transversal analysis and interpretation of the data obtained in the in-depth interviews, it was deemed that the directors arrive to the educational organization with several different lacks in their ethical or management training, which cannot be easily compensated during their continuance in the position. This does not make less important the relevance of including training in management ethics in the educational programs for the managers of educational institutions.

Therefore, one criterion that can guarantee the ethical management is the selection of managers who have a professional and psychological profile that includes high moral values.

Some of the critical incidents narrated by the former directors, tally with the categories laid down by experts.

Although when talking about the educational management, many directors agree, at least in speech, that the honesty, justice, respect, commitment, credibility, accountability and tolerance values are needed; there are several difficulties to practice them in the day to day of the educational management.

On the other hand, it is necessary to keep the link between the values and its hierarchy and the compliance with the institution's mission.

The main conflicts faced by the directors in their management duties are the lack of willingness and commitment from their co-workers and the authorities, the lack of flexibility in the norms, the difficulty for conciliating the interests of the different stakeholders in the organization and, above all, the importance of being coherent with the institutional mission.

So, the challenges of ethical training of directors underline the need of having training programs backed up by cases about the moral dilemmas faced during the performance of his/her management duties, as well as the need of proposing development lines that favor the professional training of reflexive directors who are able to analyze the nature of the moral conflicts faced during their management, as well as to find solutions for the ethical dilemmas in their management work.

The main negative experiences are caused because it is allowed that professionals obtain the directive positions when is noticeable that they lack the specific management training, have a far individualist notion of the academic work or are too worried by administrative, political and labor issues rather than taking care of the quality offered by the educational institution.

The factors that hinder the ethical training of directors are directly related to inadequate hiring criteria, irregularity issues, the interest and reasons for becoming a director, and a limited knowledge of self and other institutional stakeholders in the educational organization, as well as the ignorance of factors that help to increase the efficiency and quality of educational services.

It is likely to say that the possibilities for ensuring an adequate management that is coherent with the mission and values of the educational organizations are related to criteria from the systems of selection and appointment of directors -which, in exchange, ensure the directors' high moral values, and management and organizational skills-, and to the support of programs specifically for training in action, backed up by the systematization of experiences obtained from the case analysis and the management internships. The management internships allow trainee directors to work shoulder to shoulder with an acting director, so to observe first-hand the performance of his duties.

All this actions aim to help the management to face the moral dilemmas with elements such as high-moral values and conviction, accountability and co-accountability , communication and team work skills, leadership in an environment of multiple leaderships and the skill to reach agreements and consensus.

Acknowledgments:

This research was supported by the Instituto Politecnico Nacional, under Research Grants 2027 and 20195762. With thanks to PhD Fernando N. Winfield-Reyes for his comments, enrichement of content and institutional collaborative work.

Finally, please find attached to this email the manuscript modified by us.

References

Álvarez, I. (2008). *La promoción de los valores en la educación básica mexicana. Desafíos y experiencias.* Mexico: International Symposium held in Durango.

Begley, P. (1999) *The values of Educational management: A Book of Readings.* USA. Obtained on the 12th day of November, 2006 from: http://www.site.ebrary.com/lib/uisantafemx/Doc?id=10095171&ppg=1.

Cameron, K. y Whetten, D. (2005). *Desarrollo de habilidades directivas.* Mexico: Pearson Education.

Fierro, C. (2006). *Conflictos morales en el ejercicio de la función directiva del nivel básico.* Mexico: Departamento de Investigaciones Educativas Cinvestav-Sede Sur.

Kohlberg en Papalia (1992) Desarrollo Humano, México: McGrawHill.

Latapí, P. (2003). *El debate sobre los valores en la escuela mexicana.* FCE.

Lickona, T. (1994). Educación del carácter. En I. Barr (Presidencia), *Educación y Valores.* Ponencia magistral. http://www.ifie.edu/IfieWeb/Publicacion1.html

Moore, N. (1997). La société de l'information: Rapport mondial sur l'information 1997/1998. Francia: UNESCO.

Rivero, P. (2004). *Apología de la inmoralidad* en Este País, pp 46 – 50, August 2004.

Yurén, T., Navia, C. y Saenger, C. (2005). *Ethos y autoformación del docente: Análisis de dispositivo de formación de profesores.* Barcelona: Pomarés.

Yurén, T., Navia, C. y Saenger, C. (2005). *Ethos y autoformación del docente: análisis de dispositivo de formación de profesores.* Barcelona: Pomarés.

Yurén, T. (2009) Educar en el presente para la eticidad del futuro. Conferencia magistral del Simposio Nacional de Educación y Eticidad. UAEM.

Professional Orientation for Students of Health Courses Study conducted at a Public University in Northern Brazil

Luiz Carlos Cavalcanti de Albuquerque
PhD in Psychopedagogy from the University of Coruña, Spain. Bachelor in Psychology. Professor of Professional Orientation and General Psychology discipline and Researcher in OBSAT and GEISC of the Federal University of Rondônia, Brazil.
carlos_lula@hotmail.com

Leonardo Severo da Luz Neto (Corresponding author)
Master in Education - Autonomous University of Barcelona, Spain. Master in Psychology - University of São Paulo. Master in Religious Studies - Faculty of Theological Education Logos of São Paulo. Bachelor of Nusring. Professional Physical Education. Bachelor in Theology. Professor at the Federal University of Rondonia, Brazil - Department of Collective Health and Researcher at the Technology Research Group (GEITEC/UNIR/CNPq), Brazil and Interdisciplinary Studies in Collective Health Group (GEISC/UNIR/CNPq), Brazil.
lluz@unir.br
Phone: 55 069 99245-9995

Helio Franklin Rodrigues de Almeida
PhD in Physiology from the University of A Coruña, Spain Revalidation University of Brasília, Brazil, Master of Exercise Physiology - Federal University of Santa Maria, Brazil, Graduated in Physical Education – State University of Pará, Brazil. Professor of the Department of Collective Health, Researcher at the OBSAT and Researcher of GEISC of the Federal University of Rondonia, Brazil.
helio@unir.br

Teresinha Cícera Teodora Viana
Master in Health Sciences by the Institute of Medical Assistance to the State Public Servant of São Paulo. Specialist in Family Health and Didactics of Higher Education. Bachelor of Nursing from the Faculty of Biomedical Sciences of Cacoal. Lecturer in the Nursing and Medicine Undergraduate Courses at the Faculty of Biomedical Sciences of Cacoal / Rondônia. Nurse at the Municipal Health Department of Cacoal (SEMUSA) and member of the Group of Interdisciplinary Studies in Collective Health (GEISC) of the Federal University of Rondônia.
teresinhaenfermeira@hotmail.com

Ariel Alves Gomes
Student of Psychology at the Federal University of Rondônia, Brazil and participants in the Institutional Scholarship Program of Scientific Initiation of the Ministry of Education of Brazil.

carlos_lula@hotmail.com

Paulo Vítor Alves de Freitas
Student of Psychology at the Federal University of Rondônia, Brazil and participants in the Institutional Scholarship Program of Scientific Initiation of the Ministry of Education of Brazil.
carlos_lula@hotmail.com

Thainá Loras Vieira
Student of Psychology at the Federal University of Rondônia, Brazil and participants in the Institutional Scholarship Program of Scientific Initiation of the Ministry of Education of Brazil.
carlos_lula@hotmail.com

Abstract:

This article deals with the results of a research that integrated part of the discipline of Professional Guidance, given in the eighth period of the Psychology course of the Federal University of Rondônia, having as subjects, students of the health courses of a university of western Amazonia. Its objectives include: knowing the type of professional orientation offered in this context, the type of orientation that the students point out as necessary, proposing actions in response to the students' demands. In line with the problem investigated, and in light of the study's main objectives, a descriptive research line was adopted with data collection through interview. Besides being one of the most used in educational research, it presents itself as the most adequate for the proposed objectives. This research has provided a greater theoretical and practical knowledge of the theme orientation and has led to innovative reflections on inciting questions, also opens up new possibilities for research and interest so that further study of this subject can be carried out, not only about the objectives proposed in this work, but also the inferences extracted with a more general character, that can formulate some suggestions of improvement of the analyzed situation.

Keywords: *Professional Orientation. Higher education. University orientation. Theory of the Trace and Factor.*

1. INTRODUCTION

To approach the professional orientation necessarily implies understanding the relation of this field of knowledge with the capitalist mode of production, since it only starts to take on a role of relevance and consolidate in this scenario. There are three aspects of modern social organization that favor the perpetuation of capitalism: first, the means of production are concentrated in the hands of proprietors, leaving workers with no possibility of surviving autonomously; second, the worker is free to sell his ability to work; and third, the objective of the work fails to satisfy human needs to target the market and making a profit. (BRAVERMAN, 1981).

In this way, professional orientation becomes a field of knowledge and practice in this context. According to Bock (2002), the question of the selection and recruitment of "right workers to the right place" gains strength in order to increase productivity, while, inspired by liberal ideology (freedom, fraternity and equality), this mode of production places the responsibility for the social position they occupy in individuals themselves.

According to Sparta (2003), the Brazilian professional orientation was born linked to the Applied Psychology, that was developing in the country in the 1920s next to Medicine, Education and Work Organization. From the 1940s, there was a great leap in the area with the creation of the Getúlio Vargas Foundation in Rio de Janeiro, which studied the Rational Organization of Work and the influence of Psychology and formed professionals in this area.

Since its birth, professional orientation in Brazil has been based on the Trait and Factor Theory, that is, on the conception that the orientation process is directive and the role of the advisor is to make diagnoses, prognostics and indications of the right occupations for the individuals (SPARTA, 2003).

If professional choice previously depended exclusively on personal skills, there is now another process that interferes with this choice and precedes the job market: the choice of a higher level course. With the increase of vacancies in higher education and greater insertion of the population in this level, we have a student population more heterogeneous, causing new demands in higher education. Therefore, the quality of training is increasingly valued for this heterogeneity to remain.

However, there is frequent manifestation of school failure in higher education because students are not satisfied with the course of choice (MONTEIRO; GONÇALVES, 2011), as well as the lack of student assistance for students with regard to career planning and preparation for the job market.

According to Echeverría (1999) and Echeverría, Figuera and Gallego (1996), the current characteristics in higher education demand the insertion of professional orientation in this area, namely: the increase of areas and offers of post-graduation, difficulties of access in the labor market, among others. Romero and Sobrado (2002) understand that professional orientation in higher education is justified by the need to attend to aspects in the life of the individual that includes the professional dimension.

In addition, it can provide students with more appropriate choices regarding courses, preventing them from escaping; assist in their formation so that the student has greater possibility of options of extracurricular activities that increase their curriculum; and help in the transition from high school to higher education, which requires the student to adapt to new institutional routines and regiments.

The objective of this research was to know the type of professional orientation offered in this context and the type of orientation that the students point out as necessary, as well as to propose actions as response to the demands of the students. The focus in the health courses was given by this nucleus concentrating part of the university's integral courses, which demands a more attentive look at the issues raised by these specific students.

This research is the result of the final evaluation activity of the Professional Orientation course, given in the eighth period of the Psychology course at UNIR.

2. METHOD

Characterized by the quantitative approach, the present research has as a tool for collecting the data, the questionnaire, defined by Prodanov and Freitas (2013, p 108) as "an ordered series of questions that must be answered in writing by the informant "in which" the language used ... should be simple and direct, so that the respondent can clearly understand what is being asked. "

Among the advantages presented by the choice of this instrument is that it has an "economic ... character in use and allows a large number of people to be quickly and simultaneously reached". (LaVille, Dionne, 1999, p.184).

The questions that were part of the questionnaire were adequate from the existing script in the thesis entitled "Professional Orientation Needs of Students of the Federal University of Rondônia", which deals with the need for professional orientation of students of the Federal University of Rondônia, a subject that resembles this search. (ALBUQUERQUE, 2012).

The questionnaire was made available on the Google Forms online platform by decision of the researchers because it understood that the scope and diversity of participants would be broadened. Composed of 31 questions, mostly multiple choice, it was divided into two phases: the first with sociodemographic questions about the current course and the experiences with the vestibular; in the second stage were the questions related to the level of information about the university environment that the participants obtained and would like to have had access to.

The research was publicized through the Whats App messaging application, institutional e-mails from selected course departments, and publication to student groups at the university. The questionnaire remained available for public access from October 27 to November 24, 2018.

At first the population to be studied was formed by students of Medicine, Psychology, Nursing and Physical Education, all of the Nucleus of Health Sciences (NUSAU) of the Federal University of Rondônia (UNIR). However, the sample collected from this last course did not appear significant and was discarded.

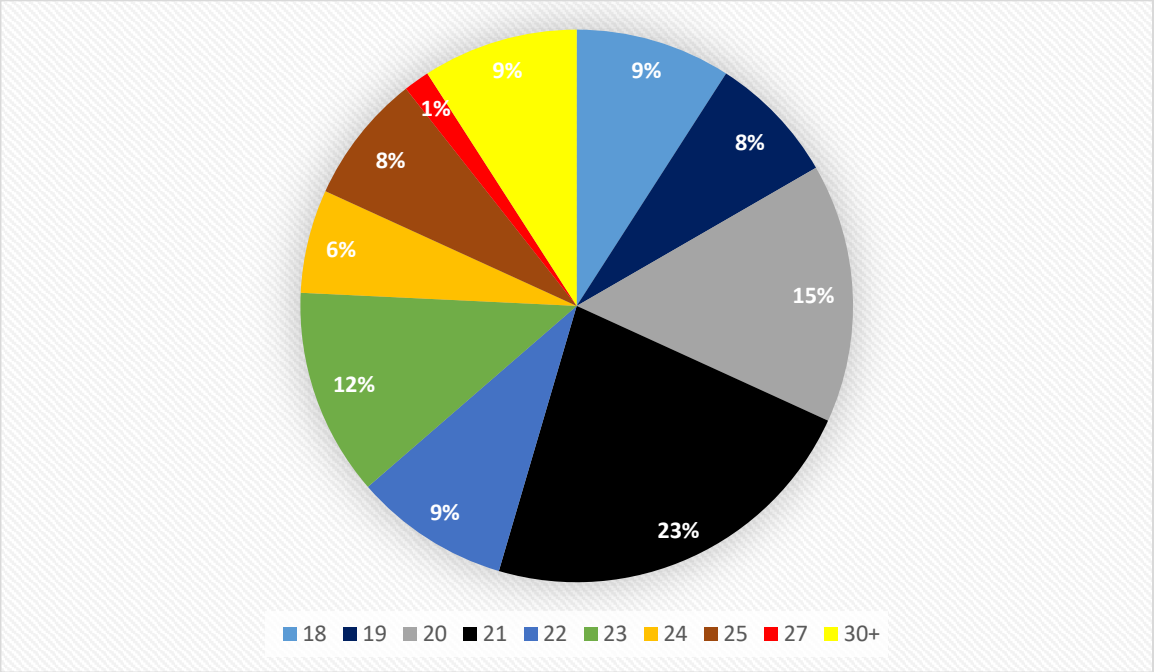
3. RESULTS AND DISCUSSION

3.1 Personal and initial information of the academic context

The data obtained in the first stage of the questionnaire are approached through the questions related to the socio-demographic and initial aspects that marked the academic trajectory of the participants.

A total of 66 responses were obtained and the female participation predominated, counting 51 of the analyzed responses, contrasting with 15 male respondents. Considering that the research focuses on courses in the health area, two of them are characteristic because they have larger contingents of students and professional women, - in Psychology the contingent reaches 89% of the profession (CFP, 2013), the same occurs with the Nursing with 85% of the profession (COFEN, 2013) - this data was already expected. There was diversity in the ages of the people who answered the questionnaire, being the youngest of 18 years and the oldest of 49.

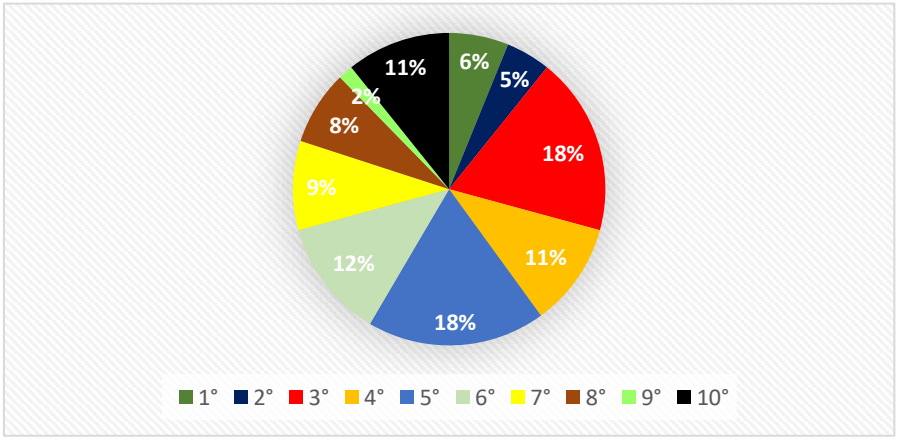
Figure 1 - Age of subjects



Source: the authors.

When viewing Figure 1, we noticed that the subjects with greater adherence to the research are young people of 20 and 21 years of age. This data can corroborate with the next about the marital status, which determined 59 of the subjects as unmarried, 6 married, 1 marked as others and no separated or divorced.

Figure 2 - Periods of the courses in which subjects are enrolled



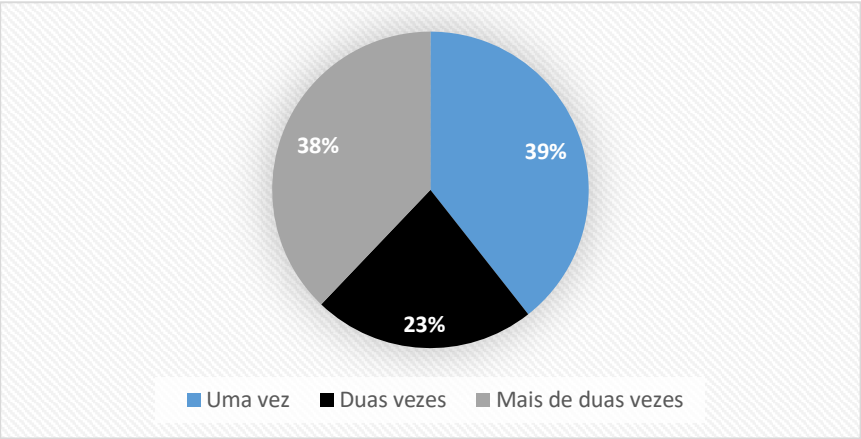
Source: the authors.

As can be seen in Figure 2, the majority of participants are in the initial graduation periods, from 1 to 5, counting 38 of the participants, while the final periods, from 6 to 10, total 27 answers. We emphasize that one of the participants did not answer this question.

The next four questions that also formed this first stage of the questionnaire cover the beginning of the subjects' academic course.

The first question had the following statement "How many times did you have a college entrance examination?" With three options for answer, according to Figure 3:

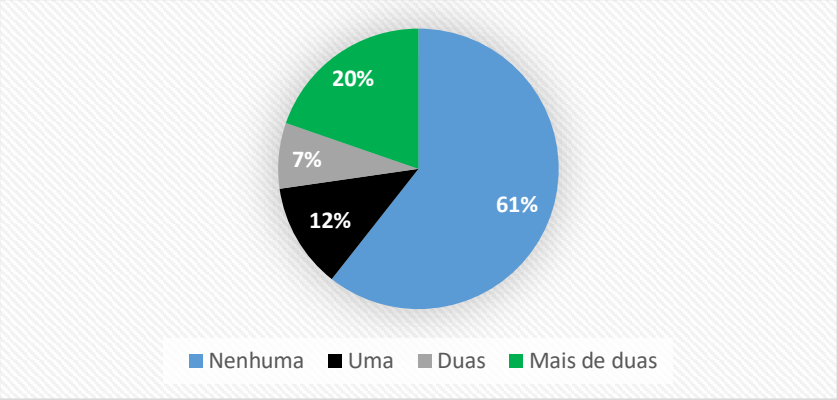
Figure 3 - Number of vestibular provided by the participants



Source the authors.

The second question asked: "Number of subjects that failed in the course they are doing" and 40 subjects answered that none, 8 participants answered that one, 5 participants answered that two and 13 participants answered more than two, according to Figure 4:

Figure 4 - Number of subjects that subjects failed during the course



Source: the authors.

Then he asked himself, "Did you complete another university course?", Six subjects answered yes and most, 60 subjects, answered that they did not. The last question on this block stated: "Have you ever changed course?" And 20 subjects said yes, while 46 reported no.

3.2 Related to initial and continuing training

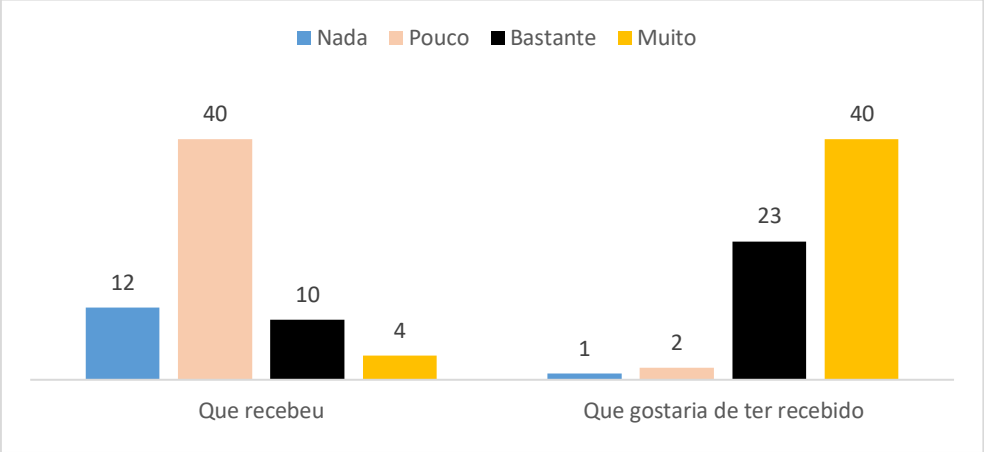
Questionnaire data will now be analyzed that includes in orientation received before and / or after graduation. Professional orientation in Higher Education has a relevance in the formation, being able to

allow integration in the university life, definition of academic decisions and finally the insertion in the job market.

Information is one of the primary components of professional orientation, aiming to broaden the knowledge of academic options. Therefore, having access to educational, professional and labor information contributes to better decision-making.

According to the data obtained about 40% of the subjects would like and need more information that incorporates characteristics of the course, including information on curriculum, electives, specializations and internships.

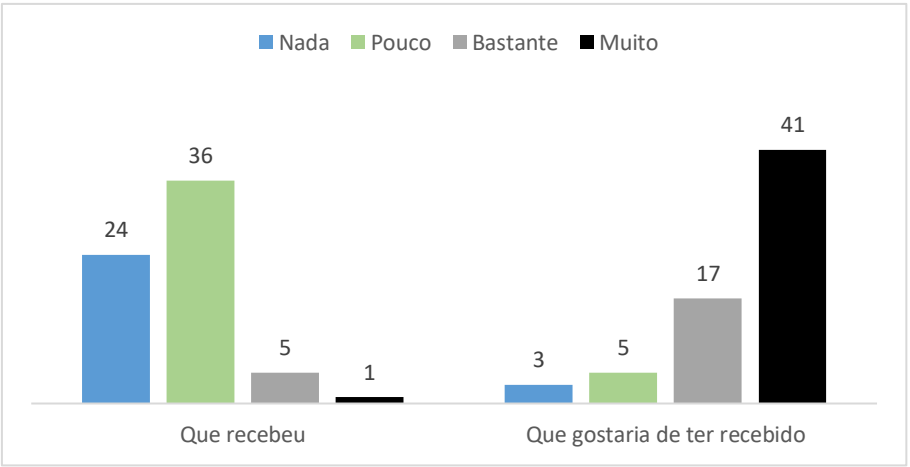
Figure 5 - To know the characteristics of the course



Source: questionnaire applied by the authors.

In Figure 6, it is concluded that the information about postgraduate courses is relatively low, about 24% of the subjects were not aware of the existence of the specializations, being these, masters and doctorates. Even comparing with the percentage of those who received little information about continuing education courses (36%), there is a great need for students to have access to this type of information at a time prior to their entry into Higher Education.

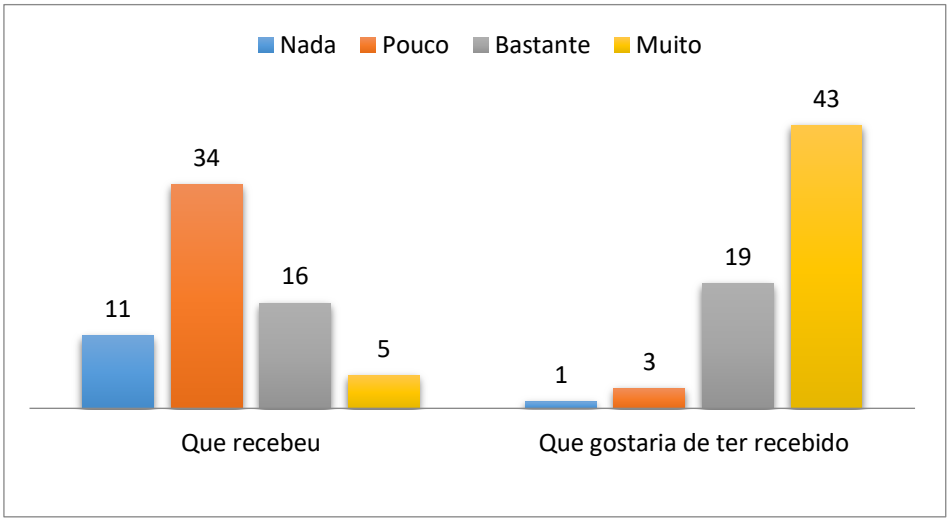
Figure 6 - To know the postgraduate courses



Source: questionnaire applied by the authors.

Here the data resemble the previous ones, in the sense that the access to information by the students is still scarce. A feature of Higher Education is the opportunities that exist in courses related to your study, that is, there is a wide range of internships, congresses, seminars ... Variables that make the difference in your curriculum. As well as being passed in advance to the student can generate a benefit to your resume.

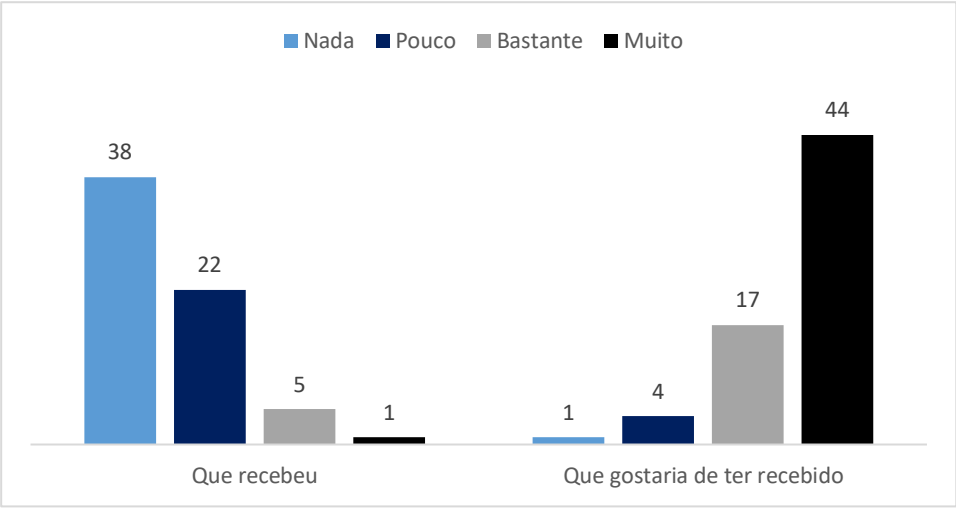
Figure 7 - To know about courses related to your studies



Source: questionnaire applied by the authors.

Relating the data obtained when questioning the amount of information obtained by students linked with knowledge of exchange programs within the university, be they between several campuses and even foreign universities, who received clear information that still has been little. Only a small percentage of the subjects (1%) consider having received much information about exchange programs. Compared with the expectations of the other subjects to receive more information about the program, adding 61% among those who would like to know a lot and a lot about it.

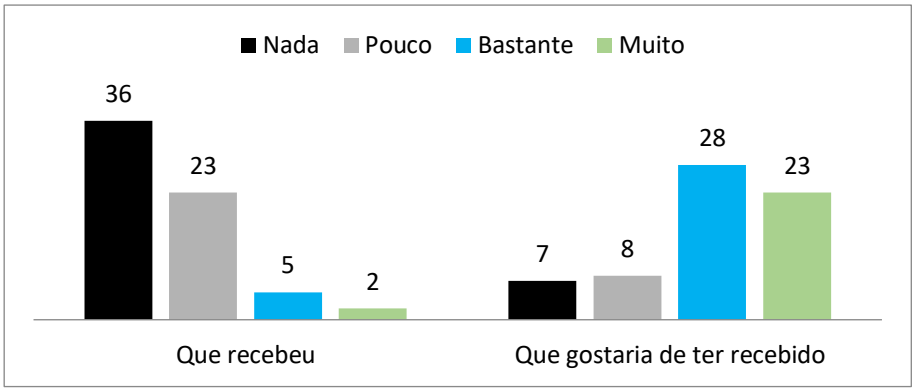
Figure 8 - To know programs of student exchange (relation between several foreign universities and universities)



Source: questionnaire applied by the authors.

Although Figure 8 shows about 60% of students did not have access to information to choose another course, it contrasts with the data of the question of "who would like to have received information about a new university course", since only 23% would like to have access to information. It can be said that they are not in the plans of the students, to change of course of graduation. Although all the figures point out in great majority that the subjects need more information in all the exposed contents.

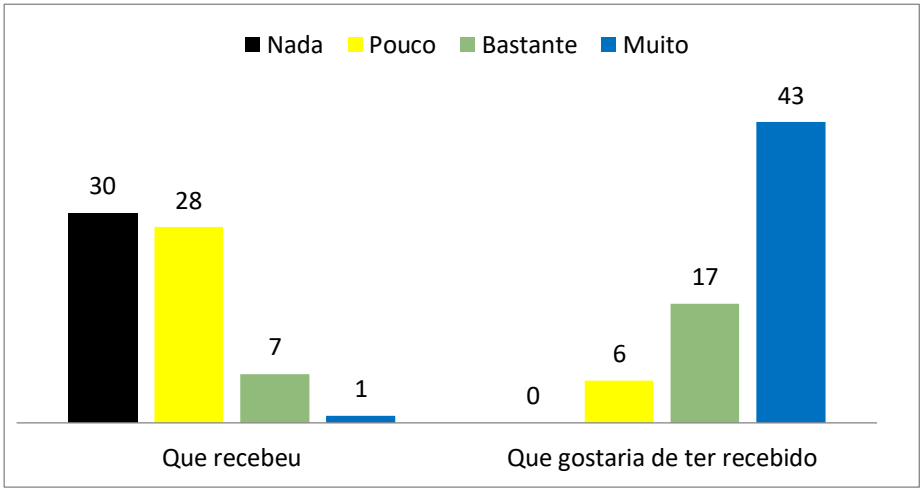
Figure 9 - To choose a new university course (procedure and information about the courses)



Source: questionnaire applied by the authors.

With regard to the complementary training of the student is the issue with less value, in the context that includes guidelines for elective courses, extension courses, internships and postgraduate studies. To contribute to previous analysis of continuing education, students are looking forward to more information and guidance for decision making. That is, the student who received nothing or little information adds up to 58%. As an overview from this dimension of academic information, the student needs more access to information about graduation, and more than that guidelines linked to the choice of course because the training period passed by the university has important consequences on social, personal development and professional.

Figure 10 - Counseling in decision making



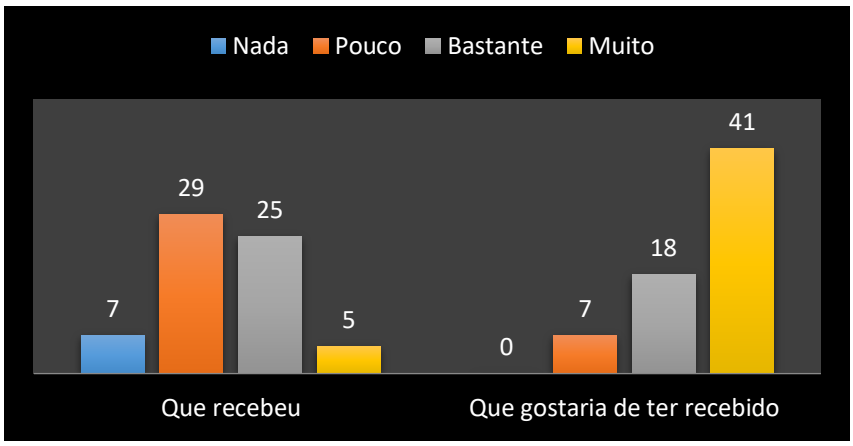
Source: questionnaire applied by the authors.

3.3 Related to the university's bureaucratic and operational issues

Information about the functioning of the institution of higher education is an important item to be worked on in an orientation, as pointed out by Albuquerque (2012). The knowledge about the bureaucratic issues of the university contributes to the decision making more conscious of the educational and professional planning of the academic, besides giving him the recognition of the possibilities of auxiliary resources of students that function as incentive to the permanence in the university environment.

Regarding this last mentioned point, we can see in the graph below the level of knowledge of the subjects of the research.

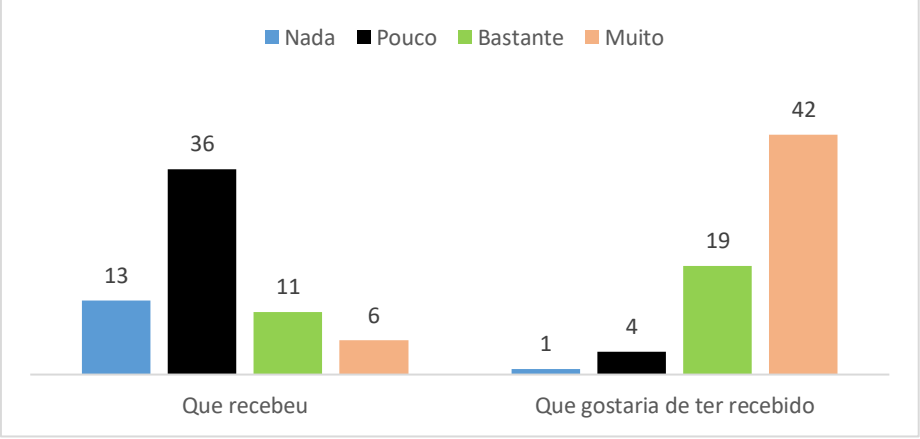
Figure 11 - To know the possibilities of scholarships (student aid, monitoring)



Source: questionnaire applied by the authors.

In analyzing these results, we verified that the access to information about the possibilities of scholarships when starting in the academic environment was divided among the subjects, and 54% (36) answered that they received "Nothing" or "Little" information, while 46% (30) reported that they received "Enough" or "Very". In the following chart, the opinion is based on the opinion that if you would like to receive more subsidies on this topic, representing 89% (59) of the answers, against 11% (7) who perceive as "Nothing" or "Little" the will to have known more before. Next, we analyze the statement that addressed the information directed to administrative procedures that cross the academic path of the students during the course.

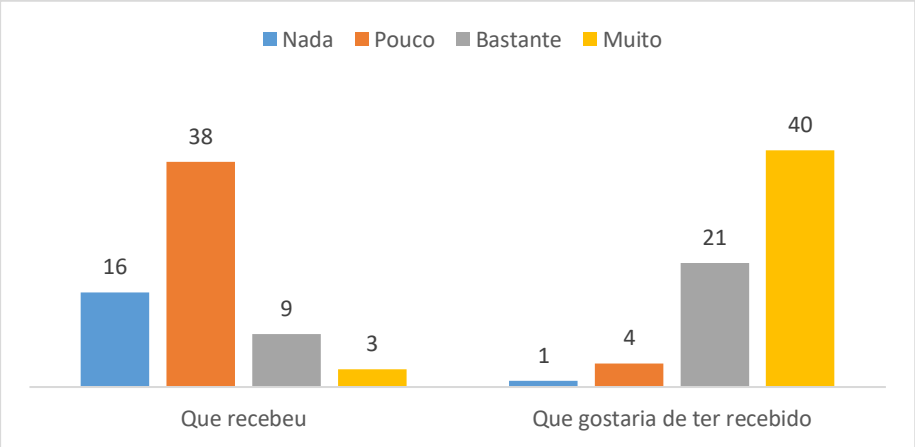
Figure 12 - To know the administrative procedures (enrollment, prerequisites, transfer, locking)



Source: questionnaire applied by the authors.

It was observed that most of the subjects reported having had little or no access to information about this subject, representing 74% (49) of the sample, compared to 26% (17) who analyzed having received "Very" or "Much" access To this. At the other moment of the same question, we see the predominance of opinion of the subjects reporting that they would like to have received more information, marking 92% (61) of the total, while 8% (5) marked the "Nothing" or "Little" .

Figure 13 - To know how the university is organized (general statute and bylaws, departments, coordination, direction of faculty, pro-rectors, extracurricular activities)

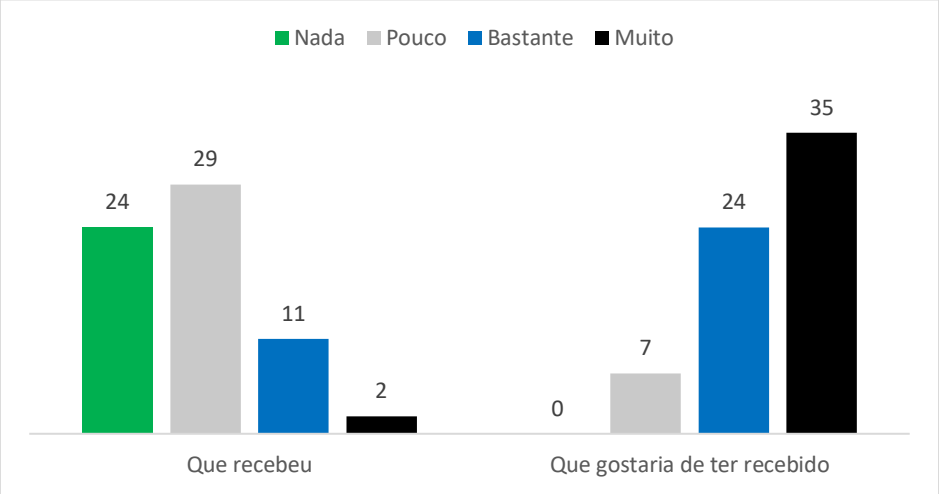


Source: questionnaire applied by the authors.

Again it is possible to observe the high in the options that point to the scarce access to information on the one hand and the high interest in having had this information before. In the "Who received" column, 82% (54) scored the "nothing" or "little" alternatives, while 18% (12) noted "Pretty" or "Very". On the other hand, 92% (61) stated that they would like to have received such information, marking the options "Pretty" or "Very", and only 8% (5) opined as "Nothing" or "Little" .

In Figure 14, the institutional knowledge considered is broader in comparison with the previous one, being now related to the functioning and organization of HEI at a macro level.

Figure 14 - To know the university politics (right and duties of the students, choose of the leaders of the university and superior councils of the institution)



Source: questionnaire applied by the authors.

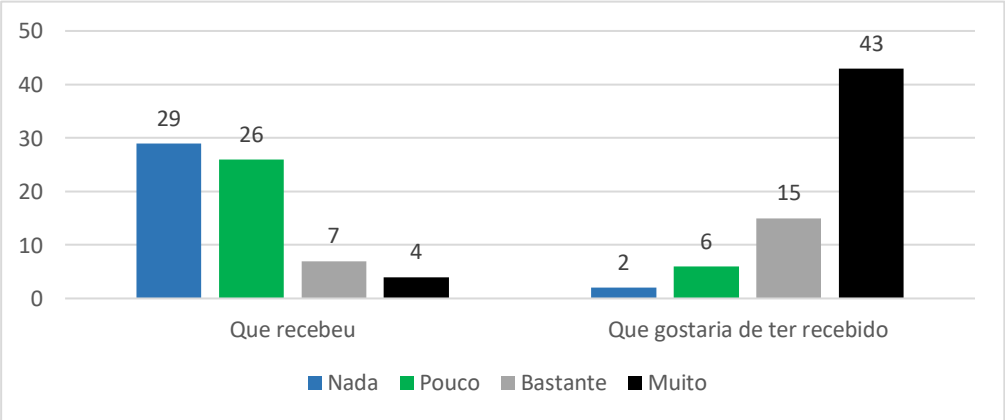
In the case of university politics, a high index has shown to have received little or no access in this regard, representing 80% (53) of the sample, compared with 20% (13) who had "Enough" or "Very" understanding about the subject. And similarly to the results obtained previously, most people estimate that they would like to have had more access to such information, characterizing a massive 89% (59) of the sample, against 11% (7) that marked the "Nothing" or "Little "Of interest in having prior knowledge on the subject.

3.4 Related to self-knowledge

Self-knowledge refers to the individual's knowledge of himself, his attitudes, values, abilities, abilities, potentialities, limitations, etc. In this case, the focus is on professional aspects. With this knowledge in hand there is the possibility to improve your professional skills and build alternatives to overcome limitations. The choices need to be appropriate to the individual's reality and as close as possible to their preferences and abilities.

You can see the results of this question in Figure 15:

Figure 15 - Self-knowledge

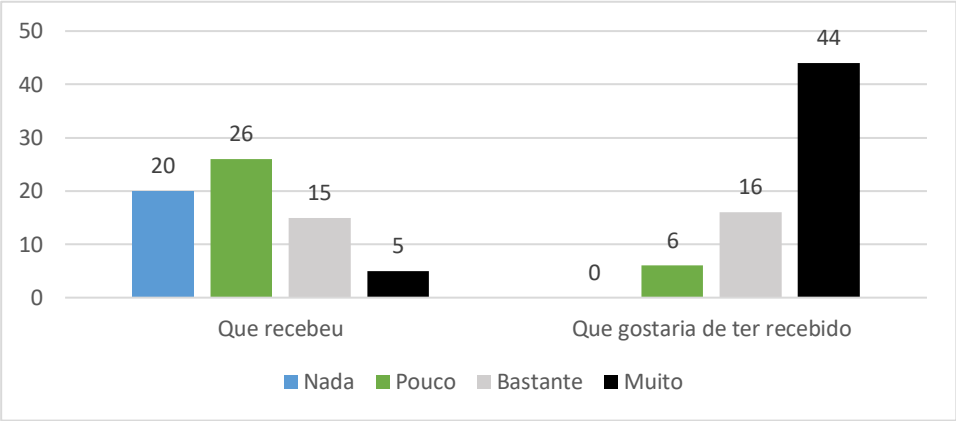


Source: the authors.

According to the results, the vast majority of subjects reported receiving "Nothing" (29) or "Little" (26) guidance on self-knowledge in higher education. Only 11 participants reported receiving "Enough" (7) or "Very" (4) guidance. Concerning the desire for guidance in this regard, the vast majority (43) responded as "A lot", while "Enough" was stated by 15 participants.

With regard to the orientation to know and reflect on the competences that the participants have and those that are demanded by the market, we have the following results:

Figure 16 - Competencies that have and those required by the market



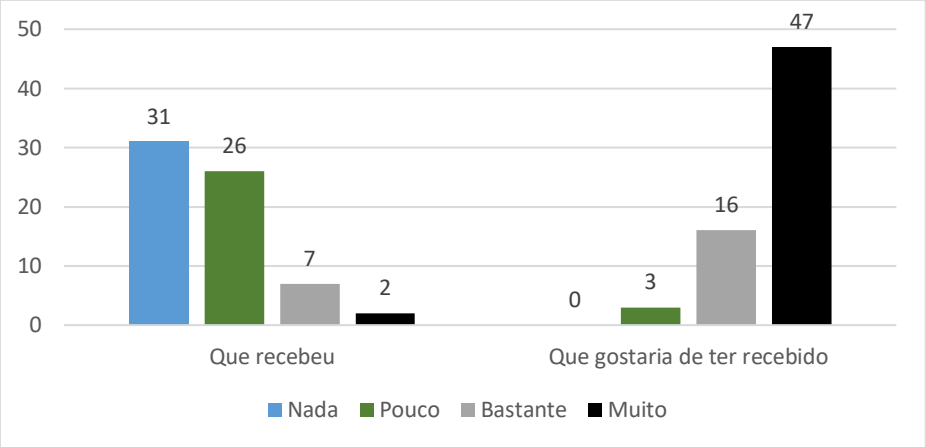
Source: the authors.

For the subjects who received guidance in this regard, only 15 reported as "Enough" and 5 as "Very". What is striking is the number of people who answered "Little" (26), followed by "Nothing" (20), which shows that there is little, if any, guidance. The courses of the health area at the Federal University of Rondônia have roughly addressed the relationships between individual skills and abilities of students and those required in the labor market, perhaps due to the universities' focus on the Tripod Teaching, Research and Extension.

3.5 Related to the labor market

With respect to the elaboration of a professional project (to define objectives that are wanted in relation to the profession and to elaborate a plan of action) the following results were obtained:

Figure 17 - Professional project



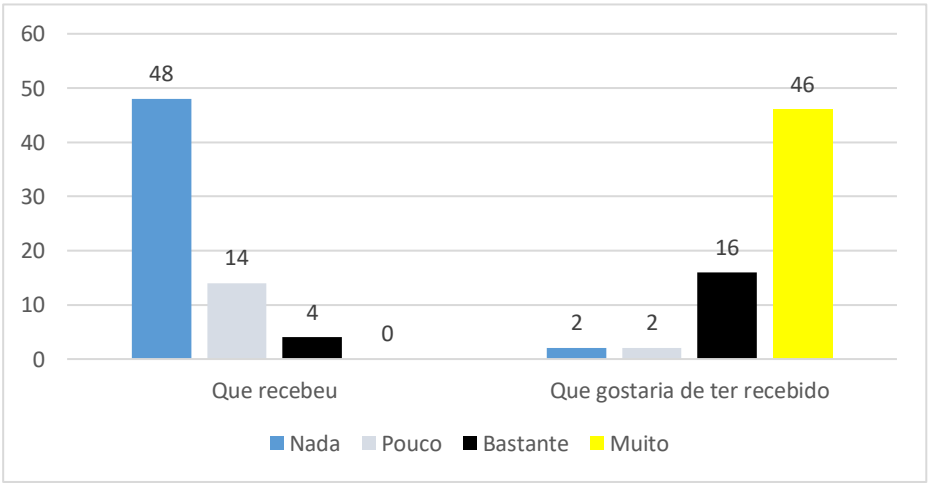
Source: the authors.

For the subjects who received guidance in this regard, only 15 reported as "Enough" and 5 as "Very". What is striking is the number of people who answered "Little" (26), followed by "Nothing" (20), which shows that there is little, if any, guidance. The courses of the health area at the Federal University of Rondônia have roughly addressed the relationships between individual skills and abilities of students and those required in the labor market, perhaps due to the universities' focus on the Tripod Teaching, Research and Extension.

3.6 Related to the labor market

With respect to the elaboration of a professional project (to define objectives that are wanted in relation to the profession and to elaborate a plan of action) the following results were obtained:

Figure 18 - Professional project

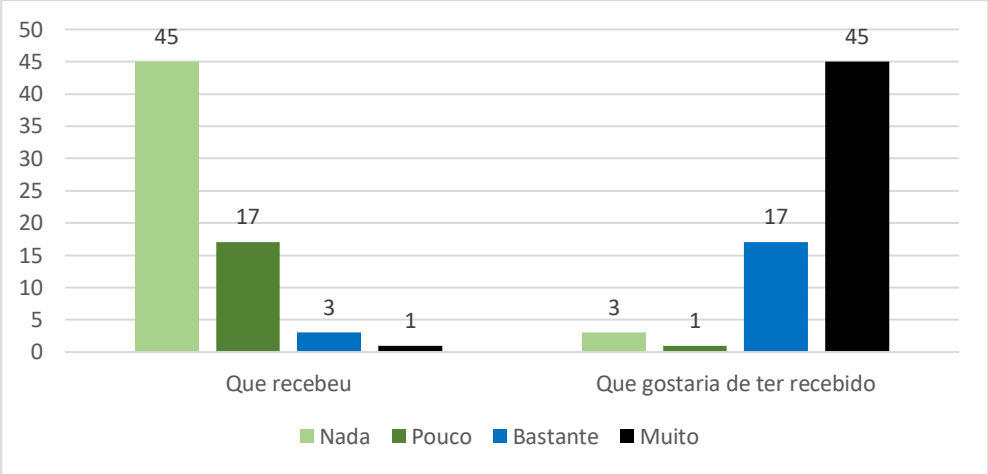


Source: the authors.

Higher education training is often associated with access to the labor market. Vocational guidance offers a complement to this access, by providing knowledge and attitudes that can facilitate the process of professional insertion. The results here are matched for those who have received and would like to have

received: 48 report receiving "No" guidance, while 46 would like to have received it. A similar occurrence is found with regard to the orientation for curriculum vitae:

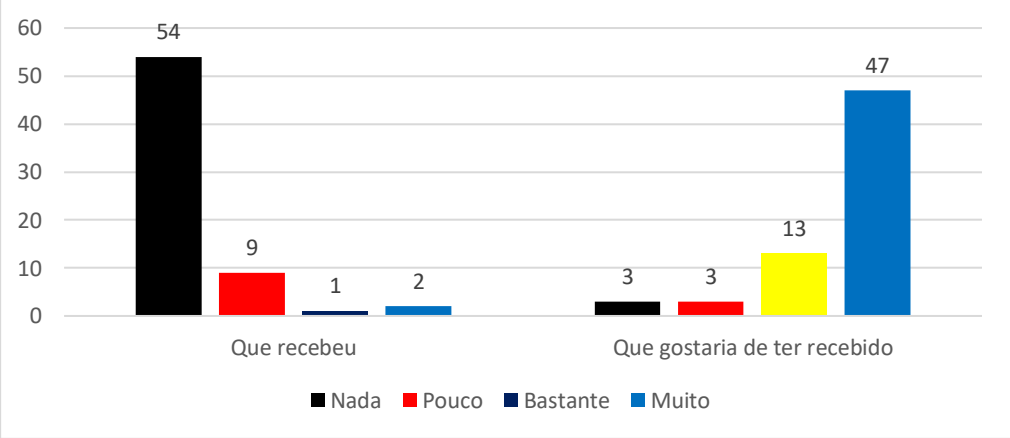
Figure 19 - Curriculum vitae



Source: the authors.

The orientation for acting in a job interview is shown as one of the most absent factors in higher education, as shown in the results in Figure 20:

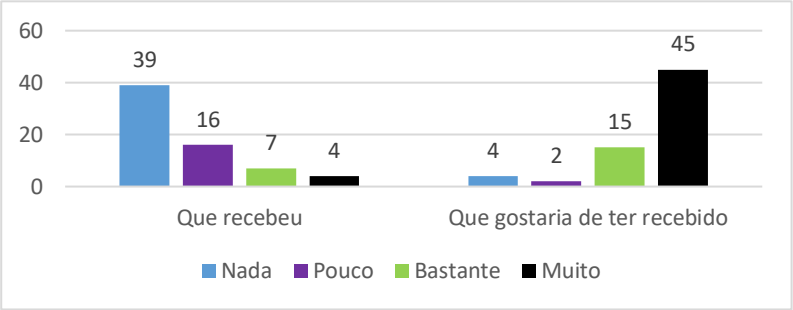
Figure 20 - Job Interview



Source: the authors.

It can be observed that the vast majority of the subjects (54) received no guidance in preparation for a future job interview, while only 3 participants received "Enough" or "Very". Likewise, 60 participants said they would like to receive "Enough" or "Very" this kind of guidance. Information on labor legislation (types of contracts, rights and duties of workers, professional associations, trade unions) and labor market insertion in general are covered in the courses, albeit to a lesser extent:

Figure 21 - Labor Legislation



Source: the authors.

Here the number of people who received this type of guidance is mentioned, 11 in total. On the other hand, 6 people said they would not like to receive this information, ranging from "Nothing" (4) to "Little" (2). In addition, 60 people would like to have received, among those who would like to receive "Much" (45) and "Enough" (15).

4. FINAL CONSIDERATIONS

It is verified that the contents on which the subjects received more orientation are from the area of academic information. Although scarce, it is existing. The most important of these are the following: to know the characteristics of the course (curriculum, optional subjects, specializations, internships), to know how the university is organized (general statute and regulations, departments, coordination, (extracurricular activities, extracurricular activities), to know the postgraduate courses (specializations, masters, doctorates) and to know the administrative procedures (enrollment, prerequisites, transfer, locking).

The university, with fulcrum in the tripod teaching, research and extension prioritizes during the process of academic training the incentive to research and extension through the fomentation and presentation of postgraduate courses, mainly masters and doctorate programs. Because they are involved in this full-time course research, the involvement with the university is greater, which leads to a thorough knowledge of administrative procedures and characteristics of the course itself. Then there are aspects related to self-knowledge (identification and analysis of own attitudes, values, abilities, skills, limitations), skills and abilities required by the labor market, such as information related to project design, career planning and curriculum vitae.

The results of the research confirm the dissatisfaction with the orientation received, both in the stage that precedes the entrance to the university and during the stay in it, as well as the existence of deficiencies that affect all the areas of the professional orientation and the pupil of all the courses.

REFERENCES

[1] ALBUQUERQUE, L. C. C. (2012). **Necessidades de orientação profissional de estudantes da Universidade Federal de Rondônia**. 471 f. Tese – Universidade da Coruña, A Coruña.

[2] ARZOLA de la Rosa, L., GALLARDO Vigil, M. (2009). Los perfiles profesionales desde un enfoque científico tecnológico en el Trabajo Social dentro del contexto avileño. In XIV Congreso Nacional de Modelos de Investigación Educativa. Huelva. AIDIPE. 517-522.

[3] AUBREY, C. An overview of consultation, en Aubrey, C. (Ed.) (1993). Consultancy in the United Kingdom. Its role and contribution to educational change. Londres: Falmer Press.

[4] AZPILLAGA Larrea, B., y BEREZIARTUA Zendoia, J. (2005). Análisis de trabajo. Identificación de componentes de competencias para el desempeño de la orientación. En: Actas del XII congreso Nacional de Modelos de Investigación Educativa: Investigación en Innovación Educativa (pp.795-802). Tenerife, Universidad de La Laguna.

[5] BOCK, S. D. (2002). **Orientação profissional**: a abordagem sócio-histórica. São Paulo: Cortez.

[6] BRAVERMAN, H. (1981). **Trabalho e capital monopolista: a degradação do trabalho no século XX.** São Paulo: Zahar.

[7] CARVALHO, M. S. (2007). Perspectivas sobre a influência parental na execução de planos de carreira no Ensino Secundário (Dissertação de mestrado, Escola de Psicologia, Universidade do Minho, Braga, Portugal). Available in http://repositorium.sdum.uminho.pt/handle/1822/9766

[8] CFP - CONSELHO FEDERAL DE PSICOLOGIA. (2013). **Quem é a psicóloga brasileira?** Mulher, psicologia e trabalho. Brasília: CFP. 157 p.

[9] CHIAVENATO, IDALBERTO. (2010). Gestão de Pessoas, terceira edição. Totalmente Revista e Atualizada, v. 3.

[10] COFEN - CONSELHO FEDERAL DE ENFERMAGEM. (2013). **Enfermagem em Números,** Available in http://www.cofen.gov.br/perfilenfermagem/blocoBr/Blocos/Bloco1/bl_ident-socio-economica-equipe.pdf

[11] ECHEVERRÍA, B. (1999). **Profesión, Formación y Orientación**. In SOBRADO, L. (Ed.). Orientación y intervención sociolaboral (pp.9-40). Barcelona: Estel.

[12] ECHEVERRÍA, B.; FIGUERA, P.; GALEGO, S. (1996). La orientación universitaria: del sueño a la realidad**. Revista de Orientación y Psicopedagogía**, v. 12, n. 1, p. 207-220.

[13] FARIA, L. (2008). A eficácia da consulta psicológica vocacional de jovens - Estudo do impacto de uma intervenção (Tese de doutorado, Instituto de Educação e Psicologia, Universidade do Minho, Braga, Portugal). Available in http://repositorium.sdum.uminho.pt/handle/1822/8502

[14] LASSANCE, M., SILVA, L., BARGAGI, M., PARADISO, A.(2005). **Competências do orientador profissional**: uma proposta brasileira com vistas a formação e certificação. Revista brasileira de orientação profissional. São Paulo: Vetor.

[15] LAVILLE, C.; DIONNE, J. (1999). **A construção do saber**: manual de metodologia da pesquisa em ciências humanas. Porto Alegre: Artmed; Belo Horizonte: Editora UFMG.

[16] LEVENFUS, R. S. (1997). **Orientação vocacional ocupacional**: À luz da psicanálise. In LEVENFUS, R. S. (Org.). Psicodinâmica da escolha profissional. Porto Alegre: Artes Médicas, pp. 227-243.

[17] LISBOA, M. D.(2002). **Orientação profissional e o mundo do trabalho:** reflexões sobre uma nova proposta frente a um novo cenário. In LEVENFUS, R.S y SOARES, D.H Orientação vocacional -

Ocupacional: novos achados teóricos, técnicas e instrumentais para a clínica, a escola e a empresa. Porto Alegre: ARTMED.

[18] MONTEIRO, A. M.; GONÇALVES, C. M. (2011). Desenvolvimento vocacional no ensino superior: satisfação com a formação e desempenho académico. **Revista Brasileira de Orientação Profissional**, v. 12, n. 1, p. 15-27.

[19] PEREIRA, Anderson Siqueira; DUTRA-THOMÉ, Luciana; KOLLER, Silvia Helena. (2016). Habilidades sociais e fatores de risco e proteção na adultez emergente. Psico, v. 47, n. 4, p. 268-278.

[20] PÉREZ BOULLOSA, A. (2009). **Orientación para la inserción profesional**: estrategias y recursos, In SOBRADO, L. y PASCUAL, A (coords.), (2009). Orientación profesional: nuevos escenarios y perspectivas. Madrid: Biblioteca Nueva.

[21] PRODANOV, C. C.; FREITAS, E. C. (2013). **Metodologia do trabalho científico [recurso eletrônico]**: métodos e técnicas da pesquisa e do trabalho acadêmico. 2. ed. Novo Hamburgo: Feevale.

[22] RODRIGUEZ MORENO, M. L. (2009). **Técnicas e recursos de orientación profesional**, in SOBRADO, L. E. y PASCUAL, A. (Coords.) (2009). Orientación profesional: nuevos escenarios y perspectivas. Madrid: Biblioteca Nueva.

[23] RODRÍGUEZ MORENO, M. L. (2010). **Desarrollo de competencias: teoría y práctica**: balance, proyecto profesional y aprendizaje basad. Barcelona: Laertes.

[24] ROMERO, R. S.; SOBRADO, L. (s/d). **Orientación para el desarrollo de la carrera profesional del universitario**. In: ALVAREZ, R.; LAZARO, A. (Orgs.). Calidad de las universidades y orientación universitaria. Málaga: Aljibe, p. 305-324.

[25] SPARTA, M. (2003). O desenvolvimento da orientação profissional no Brasil. Revista Brasileira de Orientação Profissional, v. 4, n. 1, p. 1-11.

[26] WHITMORE, John. (2006). **Coaching para performance**: aprimorando pessoas, desempenhos e resultados. Qualitymark Editora Ltda.

Monitoring sustainable development in Brazil through a composite index

Bruna A. Branchi, Letícia Lixandrão
Pontifícia Universidade Católica de Campinas (PUC-Campinas)
Brazil

Abstract

Sustainable development indicators gained visibility with the United Nations 2030 Agenda and its 17 Sustainable Development Goals. At the same time, two basic problems became relevant: data availability and results communication. The present study aims to deal with both of them by proposing a Sustainable Development (SD) Index for Brazil. Collecting data for such composite index gave the opportunity for facing the data problems: availability and frequency mainly. On the other side, by comparing the Brazilian SD Index in 2001 and 2015, it is possible to show its efficacy in monitoring and easiness in communicating the progress, as well as problems, a country faces in meeting the UN Sustainable Development Goals.

Keywords: Multidimensional index; Social indicators; Economic indicators; Environmental indicators; Sustainable Development Goals

1. Introduction

Assessing Sustainable Development (SD) by an index is undoubtedly a challenge since neither sustainable development nor its indicators are uniquely defined. Dissension can arise from different views of sustainability (weak or strong, for example) as well as from statistical methodology chosen while constructing a composite index. But such kind of index can provide useful information, by synthetizing multidimensional problems and presenting them in a simplified way, for policy makers and the public in general. It is important to remember that SD Index, as any form of quantification, is the result of a series of "interpretative decisions about what to quantify, how to categorize, and how to label it" (Rottenburg & Merry, 2015, p.11). Therefore, data quality and accessibility are basic characteristics able to affect the quality of the measurement. As Porter states "A quantitative index or indicator typically cannot measure the very thing of interest, but in its place something whose movements show a consistent relationship to that thing" (Porter, 2015, p. 34). And consistency is deeply rooted in the quality of raw data.

In this paper a SD Index is proposed and used to measure the Brazilian experience comparing two years, 2001 and 2015. After a review of the evolution of SD concept and its measurement, the composite index methodology will be presented. In the third sections, the analysis of the results of such index applied to Brazil is the opportunity for discussing the quality of such tool for monitoring sustainable development and communicating the result to a large audience. Detailed information on variables selection, data sources and availability can be found in the appendix.

2. The need for assessing Sustainable Development

Measuring a country performance has been at the core of economic inquiries since its beginning (Quesnay and his 1785 Tableau Économique for example (Blasé et al., 1993)).

For a long time, economic growth was viewed as the essential premise for development. Starting from economic growth, development includes changes in the quality of life, institutions and productive structure (Myrdal, 1960; Lewis, 1969; Hirschmann,1983).

In the XX century, the Keynesian revolution in Economics revealed the urge to find a common indicator to measure the production value of the capitalistic activities of a nation. The UN Statistical Commission, headed by Richard Stone, defined a set of rules for national accounting, the System of National Accounts, and the Gross Domestic Product (GDP) became a well-known and widely used. The GDP concept gained relevance and visibility, being used (and misused) for assessing economic growth as well as quality of life. Its flexible usage for measuring phenomena other than the economic performance of a nation is responsible for a plethora of criticisms that surrounds the GDP. Undoubtedly some relevant methodological drawbacks are also responsible for the search of alternative to GDP, even when used to value the economic performance, such as externalities, non-market activities, among many others. But resuming the result of productive activity of a nation by a single number is undeniably the strength of GDP and one of the reasons for its popularity. An interesting synthesis of its limits and suggestions for a better measure of well-being can be found in the Report by the Commission on the Measurement of Economic Performance and Social Progress written by Stiglitz, Sen and Fitoussi (2009).

The idea of development evolved from its unique economic dimension to a multidimensional structure focused on people and society. According to Sachs (2000), this debate is fundamental for the creation of the United Nations after World War II.

The growing concern with the environmental limits to growth, as the Brundtland Report (WCED, 1987) shows, led to a more comprehensive definition of development, including environment along with social and economic aspects, that is Sustainable Development (SD).

Following the Rio Earth Summit in 1992, an increasing number of sustainable indicators centered on economic, social and environmental aspects of SD appeared. In 1997 a group of leading experts on sustainable measurement elaborated the Bellagio Principles (Hardi & Zdan, 1997), that were later revised by the Bellagio Sustainability Assessment and Measurement Principles (STAMP) (IISD, 2009). The 2009 version resumed the previous one and it removed duplications present in the older version while delineating the "basic values and systemic, let alone holistic, approach to sustainable development" (Pintér et al., 2018). Among the eight principles, two are of special interest for our study, and they are listed in table 1.

Table 1. Two of the Bellagio Sustainability Assessment and Measurement Principles

Principle 4: framework and indicators
Assessment of progress toward sustainable development will be based on: • a conceptual framework that identifies the domain within which core indicators to assess progress are to be identified

• standardized measurement methods wherever possible, in the interest of comparability • comparison of indicator values with targets, as possible
Principle 6: effective communications
In the interest of effective communication, to attract the broadest possible audience and minimize the risk of misuse, assessment of progress toward sustainable development will: • use clear and plain language • present information in a fair and objective way that helps to build trust • use innovative visual tools and graphics to aid interpretation and tell a story • make data available in as much detail as is reliable and practicable

Source : Pintér et al., 2018.

By stating the need for using standardized measurement method, the Bellagio STAMP remind us one of the basic aims of an index: its use for comparability, among places and over time. More, it implies the importance of a sound statistical ground, especially for composite indexes. When emphasizing the importance of using a clear and plain language, they look at the potential users: government, researcher, higher education institution as well as anybody interested in knowing more on sustainability. To improve communication, information must be accurate and appealing in order to capture attention.

In 2000, the United Nations promoted the Millennium Development Goals, a set of 8 goals and 22 targets that member states committed to achieve by 2015. They were: 1) to eradicate extreme poverty and hunger; 2) to achieve universal primary education;3) to promote gender equality and empower women, 4) to reduce child mortality; 5) to improve maternal health; 6) to combat HIV/AIDS, malaria and other diseases; 7) to ensure environmental sustainability; and 8) to develop a global partnership for development.

These objectives and targets came along with indicators aimed to enable comparisons, within a country and between countries, and to evaluate the result of each country commitment to reach the goals.

By the year of 2015, United Nations member states adopted the 2030 Agenda and its 17 Sustainable Development Goals (SDG), and 169 targets. The SDG can be seen as a further step in the global commitment to SD, started with the Millennium Development Goals experience. For example, SDG aimed not only to eliminate poverty but also reducing inequality within and between countries. This wide range of goals and targets inspired the search for common indicators at international and local level.

In this research the SDG indicators where used during for the variable selection phase as commented in the next section.

3. Method

Given that the SD concept is intrinsically multidimensional, it requires a large set of indicators for monitoring progress in economic, social and environmental targets.

3.1 Data selection

During the 47th Session of the UN Statistical Commission the Inter-agency Expert Group (IAEG) on SDG Indicators presented a set of criteria that SDG indicators should share (UN, 2016). In this research we followed the official list of proposed Sustainable Development Goal indicators published in December 2017 (UNSTATS, 2017)[4]. Classifying the indicators according to frequency, methodology and diffusion, the IAEG classified indicators in three groups (or Tiers). For our study indicators Tiers 1 type were selected because

> Indicator (Tiers 1) is conceptually clear, has an internationally established methodology and standards are available, and data are regularly produced by countries for at least 50 per cent of countries and of the population in every region where the indicator is relevant (UNSTATS, 2017).

Among the 17 SDG, it was possible to collect data only for 13 of them, which represent the partial indexes used to build de SD Index.

The complete list of 50 indicators selected can be found in the appendix, along with a detailed definition of the selected variables and the list of all sources of data. After selecting the indicators, Brazilian official statistical databases were used looking for data covering the years 2001 and 2015. When data were not available for the selected here, the closest year with data was chosen.

3.2 Rescaling

In order to compare different indicators, each variable was rescaled from 0 to 1, with 0 denoting the worst contribution to sustainable development and 1 being the best. Rescaling is a delicate operation since it depends on the extreme values of a distribution. Fortunately, no outliers were found. The minimum and maximum values of each variable in the two years of analysis were chosen as lower and upper bounds. This option allows to compare data for the years/over time under study.

After defining the lower and upper bounds, all variables were transformed according to the following formulas:

$$x^* = \frac{x - \min(x)}{\max(x) - \min(x)} \quad (1)$$

$$x^* = \frac{\max(x) - x}{\max(x) - \min(x)} \quad (2)$$

Where x* is the normalized values after rescaling; x is the raw data, min and max represent the lower and upper bounds.

Formula (1) was applied to those variables which positively contribute to sustainable development. An example is the proportion of households with access to sewage or clean water.

Formula (2) was applied when the indicator selected negatively contributes to sustainability. For example, the poverty rate.

4 The data selections was realized before the publication of the 2018 updates: https://unstats.un.org/sdgs/files/Tier%20Classification%20of%20SDG%20Indicators_11%20May%202018_web.pdf

3.3 Weighting and aggregation

After rescaling all variables, the next step is to weight and aggregate them in order to calculate the composite index. According to Sachs et al. (2017) there isn´t a universal agreed answer to the weighting problem. "As a normative assumption, we therefore opted for fixed weights and decided to give equal weight to every SDG to reflect policymakers' commitment to treat all SDGs equally and as an "integrated and indivisible" set of goals" (Sachs et al., 2017, p. 44).

In this study, the arithmetic mean was chosen to aggregate indicators within each SDG, reflecting the weak sustainability concept. The same decision was taken to aggregate different indices in order to calculate de SD index. As Sachs et al. (2017) wrote, the use of arithmetic mean is easy to understand (and to communicate) and, reflecting the weak sustainability idea, it allows to treat each SDG equally.

4. Results

Brazil is a federation of 26 States and a Federal District. For each selected indicator, data were collected on a local unit base (States and the Federal District).

As stated before, it was possible to collect data only for 13 SDG, which represent the partial indexes used to build de SD Index.

For communication purposes, each partial index was named after the SDG it aimed to measure. The results for Brazil are summarized in table 2. Since the SD Index ranges from 0 to 1, a value of 0,51, as for 2001, can be interpreted as Brazil in 2001 is on average 51% on the way to fulfill SDG. Or, in a plain language, is halfway to reach a full economic, social and environmental development. During the next 14 years progress was made in Brazil and the SD Index reached 0,61 in 2015.Observing the partial indexes values it is possible to see those that are limiting the move toward sustainable development and those that score well above the average.

Table 2. The Sustainable Development Index and its components, Brazil, 2001 and 2015

	2001	2015
SDG1	0,587	0,862
SDG3	0,553	0,619
SDG4	0,544	0,569
SDG5	0,216	0,330
SDG6	0,415	0,656
SDG7	0,746	0,947
SDG8	0,467	0,551
SDG10	0,372	0,506
SDG11	0,602	0,769
SDG12	0,684	0,316
SDG13	0,465	0,500
SDG16	0,782	0,888

SDG17	0,157	0,661
SDI	**0,510**	**0,610**

Source: The authors.

Figure 1 is a different way of showing the results of table 2. Visually it is easier to notice the general improvement, comparing 2001 blue line with the 2015 red one. At the same time, it becomes clearer where progress was more relevant (SDG 17, 1 and 7) and a regress was registered (SGD 12), as well as where more effort is needed (SDG 5 and 13).

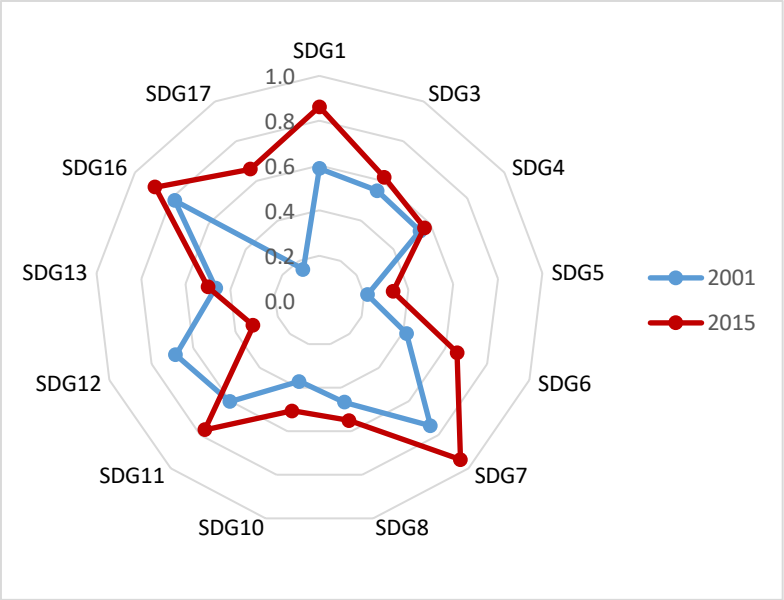


Figure 1. The Sustainable Development Index for Brazil, 2001 e 2015

Source: The authors.

The SD Index indicates relevant progress in three partial indexes, those related to SDG 1, 7 and 17. SDG17, the best performing component of this index, is measured by access to fixed internet broadband and by the number of internet users. Following the IAEG directions for selecting SD indicators, those available on a national bases are related to technology and its contribution to implement SD. In this sense, having more people accessing internet is a way of improving access to information and, therefore, making citizens aware of the importance, among other thing, of SDG. SDG1 aims to end poverty and during the 15 years under study the Brazilian government did engage in policies aiming to reduce poverty directly, via income transfer programs, and indirectly, via economic growth. SDG7 is related to the access to reliable and sustainable energy. The indicators used here measure access to electricity. In this area Brazil has nowadays reached almost all households. Unfortunately, no information is available on the type of energy source and therefore such variable does not allow to discriminate between sustainable and unsustainable energy sources. The only component in which Brazil moved away from the SD targets is on the use of pesticides in agriculture, as shown by de indicators related to SDG12. This is an alarming result given the importance of agriculture in the Brazilian economic structure. More efforts are needed for implementing a gender equality agenda (SDG5) and fighting climate change by reducing greenhouse gases (SDG13).

In synthesis, the SD Index allows to state that while Brazil is on the right track to reach sustainable development, more work is needed, especially on the environmental part (as indicators related to SDG 12 and 13) and social terms (by actively reducing inequality).

5. Conclusion.

A range of social, economic and environmental concerns delimits the sustainable development. With the UN 2030 Agenda, a global commitment was taken by a large number of countries and engaged institutions at different levels, as well as individuals. In order to monitor actions and their result toward SDG, indicators and indexes gained a relevant position.

The SD Index proposed in this research is a first attempt to show how a quantitative tool based on publicly available data can be elaborated to assess development over a span of time. By using a composite index by aggregating a group of partial indices, it was possible to show a global improvement, as the SD Index rose from 0,51 to 0,61 in 15 years. At the same time, by analyzing its components, some additional information was easily available, making the analysis much more enlightening. It was possible, for example, to identify the need for more action against greenhouse gases and pesticide and the need to foster gender equality.

Clearly this index can be improved by including more variables. In Brazil, the Official Statistical Office is undertaken a large effort, along with other research centers, in order to organize a complete set of indicators related to the 2030 Agenda (IPEA, 2018). The expected result of such effort is undoubtedly attending the Bellagio STAMP, making regular and reliable data available to public.

A composite index, as the one proposed, can synthetize complex, multidimensional, problems to a limited set of relevant features. It is a simplified, but reliable, tool to effectively inform policy makers and citizens. Clearly it does not cover all the SD components, but it is movements, as Porter´s citation in the introduction states, are consistent to it.

7. References

M. Blasé, F. Beanhamou, B. Chavance, A. Gélédan, J. Léobal, and A. Lipietz, Histoire des pensées économiques: les fondateurs, Dalloz, Sirey, Paris, 1993.

P. Hardi, T. Zdan (eds), Assessing sustainable development: Principles in practice, IISD, Winnipeg, 1997. Available at: http://www.iisd.org/pdf/bellagio.pdf

Hirschman. “Confissões de um dissidente: a estratégia do desenvolvimento reconsiderada”, Pesquisa e Planejamento Econômico, vol. 13, n. 1, 1983, p.

IISD – International Institute for Sustainable Development, Compendium of sustainable development indicator initiatives, 2009. Available at: http://www.iisd.org/measure/compendium/searchinitiatives.aspx

IPEA, Agenda 2030 - ODS – Metas nacionais dos objetivos de desenvolvimento sustentável, Ipea, Brasilia,

2018. Available at: www.ipea.gov.br/portal/publicaçoes

W.A. Lewis, O desenvolvimento econômico com oferta ilimitada de mão-de-obra. In A.N. AGARWALE, S. SINGH (Coord.), A economia do subdesenvolvimento, Forense, Rio de Janeiro, 1969.

G. Myrdal, "Teoria Econômica e Regiões subdesenvolvidas", Textos de Economia Contemporânea, Ministério da Educação e Cultura/Instituto Superior de Estudos Brasileiros, Rio de Janeiro, 1960.

R. Rottenburg, S.E. Merry, "A world of indicators: The Making of Governmental Knowledge through Quantification". In R. Rottenburg, S.E. Merry, S.-J. Park, and J. Mugler (eds), The World of Indicators, Cambridge University Press, Cambridge, 2015, pp.1-33.

L. Pintér, P. Hardi, A. Martinuzzi, and J. Hall, "Bellagio STAMP: Principles for sustainability assessment and measurement". In S. Bell, and P. Morse (orgs.), Routledge Handbook of Sustainability Indicators, Routledge, New York, 2018.

T.M. Porter, "The flight of the indicator". In R. Rottenburg, S.E. Merry, S.-J. Park, and J. Mugler (eds), The World of Indicators, Cambridge University Press, Cambridge, 2015, pp. 34-55.

I. Sachs, Caminhos para o desenvolvimento sustentável, Garamond, Rio de Janeiro, 2002.

J. Sachs, G. Schmidt-Traub, C. Kroll, D. Durand-Delacre, and K. Teksoz, SDG Index and Dashboards Report 2017. New York: Bertelsmann Stiftung e Sustainable Development Solutions Network (SDSN), 2017.

J.E. Stiglitz, A. Sen, A., and J.-P. Fitoussi, Report by the commission on the measurement of economic performance and social progress, 2009. Available at: http://www.stiglitz-sen-fitoussi.fr

UN - United Nations, Report of the Inter-Agency and Expert Group on Sustainable Development Goal Indicators, 2016. Available at: http://unstats.un.org/unsd/statcom/47th-session/documents/2016-2-iaeg-sdgs-e.pdf

UNSTATS, Global indicator framework adopted by the General Assembly, 2017. Available at: http://unstats.un.org/sdgs/indicators/indicators-list/

WCED – World Commission on Environment and Development, Our Common Future, Oxford University Press, 1987.

Appendix

Appendix 1. SDG indicators for Brazil

SDG	Indicators	Years	Sources
Goal 1. End poverty in all its forms everywhere	Proportion of population living below the national poverty line (1/4 of the minimum wage)	2001 2015	[6]
	Proportion of population living below the national poverty line (1/2 of the minimum wage)	2001 2015	[6]
Goal 3. Ensure healthy lives and promote well-being for all at all ages	Maternal mortality ratio	2001 2011	[4]
	Under-five mortality rate	2001 2011	[4]
	Neonatal mortality rate	2000 2010	[4]
	Proportion of HIV infections per 1,000 population	2001 2015	[4]
	Tuberculosis incidence per 1,000 population	2001 2012	[4]
	Mortality rate attributed to cancer	2001 2011	[4]
	Suicide mortality rate	2001 2011	[4]
	Death rate due to road traffic injuries	2001 2011	[4]
	Adolescent birth rate (aged 10-14 year)	2001 2011	[4]
	Adolescent birth rate (aged 15-19 years)	2001 2011	[4]
	Health worker (doctors) density (per 1000 inhabitants)	2001 2010	[4]
Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	Proportion of children under 5 years of age who are in kindergarten	2000 2010	[1]
	Proportion of children and young people (6 to 14 years) who are not attending school	2000 2010	[1]
	Proportion of 19 to 21 years old with high school diploma	2000 2010	[1]
	Proportion of those with 25 years or more who have not ended high school	2000 2010	[1]
	Proportion of those with more than 25 years with undergraduate degree	2000 2010	[1]
Goal 5. Achieve gender equality and empower all women and girls	Proportion of seats held by women in national parliaments and local governments	2001 2015	[2]
	Proportion of male time spent on household activities compared to female time	2004 2014	[5]
Goal 6. Ensure availability and sustainable management of water and sanitation for all	Proportion of household using safely managed drinking water services	2001 2015	[6]
	Proportion of household with wastewater safely treated	2001 2015	[6]

	Proportion of local administrative units with established procedures for participation of local communities in environment management (with Conselho de Meio Ambiente)	2001 2013	[6]
	Proportion of local administrative units with established and operational policies on environmental care (with Fundo Municipal de Meio Ambiente)	2001 2013	[6]
Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all	Proportion of population with access to electricity	2000 2010	[6]
Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Annual growth rate of real GDP	2003 2015	[6]
	Youth (15-24 years) unemployment rate, by sex	2001 2015	[6]
	Proportion of informal employment in non-agriculture employment, by sex	2002 2015	[6]
	Average hourly earnings of female and male employees (proportion)	2001 2015	[6]
	Proportion of youth (aged 15-24 years) not in education, employment or training	2004 2014	[6]
	Proportion of children engaged in child labor, by sex	2001 2011	[6]
	Frequency rates of fatal and non-fatal occupational injuries, by sex	2001 2011	[3]
Goal 10. Reduce inequality within and among countries	Working poor (proportion of those earning half minimum wage)	2001 2015	[6]
	Gini Index, by sex	2000 2010	[1]
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable	Proportion of household with urban solid waste regularly collected	2001 2015	[6]
	Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated	2000 2008	[6]
	Proportion of local administrative units with environmental law	2002 2013	[6]
	Proportion of urban population living in slums, informal settlements or inadequate housing	2001 2015	[6]
Goal 12. Ensure sustainable consumption and production patterns	Pesticides commercialized by planted area (kilogram per hectare)	2005 2014	[6]

Goal 13. Take urgent action to combat climate change and its impacts	Greenhouse gas emission (carbon dioxide CO_2)	2001 2015	[7]
	Greenhouse gas reduction (carbon dioxide CO_2)	2001 2015	[7]
Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	Proportion of victims of violence	2001 2015	[4]
	Proportion of children whose births have been registered with a civil authority	2001 2015	[4]
Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development (Technology)	Fixed Internet broadband subscriptions per 100 inhabitants	2003 2015	[6]
	Proportion of 10 years old and more using internet, per 1000 inhabitants	2005 2015	[6]

Sources

[1] PNUD, Fundação João Pinheiro, IPEA, Atlas de Desenvolvimento Humano. Available at: http://atlasbrasil.org.br/2013/

[2] Brasil, Câmara dos Deputados. Available at: https://www2.camara.leg.br/transparencia/recursos-humanos

[3] Ministério da Economia, Secretária da Previdência, Anuário Estatístico de Acidentes de Trabalho. Available at: http://www.previdencia.gov.br/dados-abertos/dados-abertos-sst/

[4] Ministério da Saúde, Departamento de Informática do SUS. Estatísticas Vitais. Available at: http://www2.datasus.gov.br

[5] IBGE, Pesquisa Nacional de Amostra de Domicílios (PNAD). Microdata. Available at: https://ww2.ibge.gov.br/home/estatistica/pesquisas/pesquisa_resultados.php?id_pesquisa=40

[6] IBGE, Sistema IBGE de Recuperação Automática (SIDRA). Available at: http://sidra.ibge.gov.br

[7] SEEG - Sistema de Estimativas de Emissões de Gases de Efeito Estufa - Observatório do Clima (OC), 2017/V5.0

GENDER, DECOLONISATION, EDUCATION AND TRANSFORMATION OF GENDER RELATIONS

LUCY WAIRIMU KIBERA[5]

Abstract

An examination of literature on gender inequality has revealed that most women are disadvantaged in education as they constitute two thirds of the 750 million illiterates in the world. In addition, only one third of women have studied Science, Technology, Engineering and Mathematics subjects that lead to financially rewarding careers compared to social-science related subjects that are studied by most women. Women are also underrepresented in research and development and professional ranks at university with 28.8 and 25 percent respectively. Women are further marginalized in terms of land ownership at 20% and in labour market at 48.5 percent compared to males with 75 percent. In addition, women earn less by 23 percent for a similar job performed by men. Women's work mainly involves domestic work which is unpaid for. On the whole, women work nearly one hour longer than men since those who work for paid employment have to combine it with domestic work. In addition, only 11 and 12 women are heads of states and governments respectively out of 190 nations globally while only 22.8 percent of all national parliamentarians are women. Finally, health of women is endangered because they are not in charge of their reproductive health. Generally, girls and women are prone to sexual harassment and physical violence at 38 percent. In decolonising and degendering the gender divide and inequalities, social institutions such as the family, school and government must embrace new belief systems that give equal opportunities to women and men to develop their potentials to the fullest for self-development, fulfilment and determination and the benefit of the whole society.

Introduction

This paper broadly defines the key concepts associated with gender issues such as gender and sex. It also elucidates how cultural meanings attached to concepts of gender, sex, sexism, sex ideology and gender stereotypes may have contributed to gender inequality in terms of educational outcomes of females and males, job opportunities, feminization of poverty, ownership of land, sexual harassment, poor health and power relations between the two genders. The term decolonisation means developing new belief system that will rid off education of ideas that tend to disadvantage females in education and other areas of human interaction and engagement in society.

5 Professor Lucy Wairimu Kibera is a Professor of Education of University of Nairobi

The Concept of Gender and Sex

The term gender is normally and widely used to differentiate between women and men on socially designed constructs rather than biological differences. Gender differences represent expectations which people have been socialized to hold of someone on basis of external female or male genitalia. Gender, is also a construct that is associated with cultural, psychological and intellectual characteristics deemed appropriate for males and females in a particular society. Money (1955) distinguished biological sex and gender role. He defined a gender role as the actions that may reveal one's status as a girl and woman or boy and man respectively. Thus, gender is a socio-cultural declaration of particular characteristics and roles that are associated with individuals on account of their biological sex and corresponding manifestations of sexuality.

Gender differention is often associated with oppressive and restrictive tendencies and especially on the girl and woman. These negative tendencies that could predate birth though their forcefulness and visible influence often start immediately at birth and last during the entire life cycle of an individual and beyond on account that they are passed on to successive generations through socialization. The attributes associated with the male gender by the society include and not limited to: physical prowess, freedom, expansiveness, depth, trust, loyalty, wisdom, stability, high intelligence, bravery and rationality. On the other hand the female gender is characterized by society with caring, emotionalism, compassion, sweetness, romance, peace and femininity (https://www.bourncreative.com).

Some African traditional cultures had special ways of announcing the sex of the newly born baby. For example, the Gikuyu people of Central Kenya had a special way of announcing to people the sex of the newly born baby. For instance, if a baby boy was born, his birth was announced by the birth attendants by **five** ululations while that of a girl was accompanied by **four** ululations. These ululations were loaded with meanings that had a life time effect on both girls/women and boys/men. The first **four** ululations meant or symbolized the same for the two sexes; however, the 5th ululation which was and still is only for boys is different. The first ululation or "Ngemi" in Kikuyu means kingship/queenship or "Uthamaki", the second ululation means wealth or "Utonga"; third ululation means priesthood or "Ugo"; and fourth ululation means prophecy or "Urathi" in Gikuyu. The fifth ululation which is a preserve for boys/men only is bravery or "Ucamba". Bravery is the characteristic that distinguishes between men and women with finality and therefore a man is expected to be a protector of his family, clan, tribe, society, nation as well as culture appertaining to material, resources, spirituality, morality, beliefs, customs and traditions. Failure to demonstrate bravery by men attracts humiliating comments from women such as: *"You take my dress and give me your trousers. You men are cowards. What are you waiting for? Our leader is in there; let us set him free"* (http://link.springer.com). These words attributed to a freedom fighter, Mary Muthoni Wanjiru, who challenged men because they had failed to secure release of Hurry Thuku from the British colonists in 1922.

After this declaration, the crowd surged and an estimated number of people between 21 and 250 were killed, four (4) of them women including Wanjiru by the colonialists. Consequently, Harry Thuku was released and exiled to Northern Kenya from 1922-1930 (http://www.jstory.org>stable).

The term sex on the other hand, signifies the physical, biological and genetic variations between females and males. It refers to whether individuals are born with female or male genitalia which are followed later

on by emergence of secondary characteristics such as well developed breasts, menstruation and pitched voice for women and beards and deep voices for men respectively.

It is noted that girls and boys who try to deviate from the prescribed behaviour deemed appropriate to their gender are given negative labels as a way of terminating and sanctioning such behaviours. For instance, the term "tomboy" or "Wanja Kahii" (young boy) in Gikuyu culture is given to a girl who acts as a boy and likes activities outside the domestic sphere, while the term "Sissy" or "*Huni Wangechi"* is associated with a boy who behaves like a girl. At this juncture, a question is posed "Do similar labellings exist in your community for girls and boys who do not conform to communities' prescriptions of behaviour and thought processes? On basis of these few examples, it can be assumed that most cultures reinforce what boys and girls should do and behaviours they should display in all aspects of life.

The Ideology of Sexism and Gender Stereo-types

Ideology of sexism refers to sets of beliefs and visions about women and men that cannot be backed with facts. The term sexism refers to any form of discrimination shown to individuals because of their biological sex. The ideology of sexism argues that the female sex is weaker compared to male sex. In reality though, some females are physically and intellectually superior stronger than males.

Gender stereotyping is closely linked to sexist ideology. Its views or perspectives about masculine and feminine characteristics are anchored on the biological sex. In other words, these are capabilities which women and men are assumed to have and therefore are expected to manifest them throughout their lives.

Gender Equity

Gender equity is the process of exercising fairness to women and men. To achieve fairness between the two genders, measures must be put in place to compensate for socio-economic and political disadvantages that have blocked women and men from operating on the same plane and especially in education. It is widely recognized that education is a powerful weapon in the elimination of inequalities in various facets of society such as political power, representation in governments and in most decision making institutions of the society, labour market, ownership of property and education among others. To this end, Sustainable Development Goal for Education (SDG 4) has called for provision of inclusive and equitable quality education for all, females and males as well as people with disabilities, indigenous peoples and other at risk of exclusion from education (UNESCO, June, 2018).

Decolonisation of Education

Having defined some of the prominent gender concepts and how they are used to allocate females and males different characteristics of perceived to be feminine and masculine respectively, attention is focused on how colonisation or domination of education by the male gender has impacted on education of both genders. The term colonisation, though, it is normally used in relation to forceful occupation, domination and subjugation of people and/or nations by more dominant nations it can be used in education. Indeed

effective colonisation occurs when knowledge and belief systems of the colonizer are forced on the colonized people. Colonisation of education in respect to gender relations can mean that one gender and in our case males have dominated access to education as well as the content of education and inter lia values attached to education of females versus that of males. According to human capital theory by Becker (1964) education is the most important ingredient of socio-economic development and therefore those without it are marginalized.

Etymologically, the term education is derived from two Latin words "educare" and "educatum". The term "educare" means to train or mould. It also means to bring up or to lead out or to draw out from inward to outward. The word "educatum" thus denotes a process of bringing out and facilitating the development of an individual's physical, intellectual, psychological and spiritual potentials to the fullest.

Plato (428–c. 348 BCE) stated that "education is the creation of sound mind in a sound body". Its role is to develop a person's faculty specially the mind so that she/he may be able to enjoy the contemplation of supreme truth, goodness and beauty. Plato regarded education as a means by which individual justice and social justice are achieved for all. Achievement of individual and social justice is possible when each individual develops her/his ability to the fullest. Plato is one of the earliest scholars to advocate for the education for both females and males. However, Jean Rousseau (1762) in his pedagogical treatise **Emile** recommended that women should receive education that would equip them with skills to nurture children properly. This situation has persisted to the present society. This type of education located women in the domestic sphere while those men prepared them for work outside domestic sphere. This state of affairs has persisted to a large extent to the 21st century in that fewer females than men access education and in addition fewer women specialize in Science, Technology, Engineering and Mathematics field which eventually lead to lucrative careers. This is in spite of the fact of various international conventions such as Universal Declaration of Human Rights (1948), International Convention on Elimination of All Forms of Racial Discrimination (1965), International Covenant on Civil and Political Rights (1966), and Convention on Elimination of All Forms of Discrimination against Women (1979) have outlawed exclusion of individuals (female and men) from access to justice in all domains human endeavour and interaction.

The United Nations, Millennium Development Goals (2000) also committed world leaders to combat poverty, hunger, disease, environmental degradation, and discrimination against women. Further, the Sustainable Development Goals that succeeded Millennium Development Goals in 2015 have committed states and governments of the world to achieve gender equality. In particular goals 2 and 3 of millennium Goals task nations to achieve universal primary education and gender equality and empower women. Similarly, Sustainable Development Goals 4 and 5 commit states to provide quality education for all and to attain gender equality respectively. Provision of quality education to all regardless of gender and elimination of gender inequality is expected to contribute to development of society in all aspects.

Benefits of educating women to society in the World

UNESCO (2013) EFA Global Monitoring Report enumerates number of reasons in favour of educating the girl child. These benefits intimate inter lia that: educated women are less likely to die in childbirth because they will not marry young and will eat well and attend pre-natal and post-natal clinics; if all women attain

primary level of education, there would be 15 percent fewer child death; educating girls to secondary level would reduce maternal deaths by half; educated mothers would improve child nutrition thus shielding children from malnutrition and related diseases; high levels of education would help to forestall marriage at an early age, thus result in postponing marriage and effectively bringing down population growth rates; education would narrow pay gaps between men and women; and educated women would more likely to get productive work and thus add to financial power of the family.

Status of Literacy of among females in the world

In spite of these beliefs UNESCO (2018) reported that 750 million of adult population were illiterate and two-thirds of them were women. This is not in keeping with Dr. Aggrey's advice who in 1920's when he said that when you "educate a woman you educate a nation". There is evidence that nations with educated women and men are well head in socio-economic development compared to nations whose populations of females are illiterate. This is particularly true of nations where education for both women and men is at par and/or near parity. Examples of such countries with high literacy rate for both genders include Central Asia at (100 percent), Europe and Northern America (100%) and Eastern and Southern Eastern (99 percent) for women and men respectively (UNESCO, Institute of Statistics, July, 2017).

The regions of the world that have not yet attained gender parity are Eastern and South-Eastern Asia at (97) percent literacy level for males and (94) percent (females), Latin America and the Caribbean (94) percent males and (93) percent females, Northern Africa and Western Asia (86) percent males and (74) percent females, Southern Asia (83) percent males and (63) percent females and Sub-Saharan Africa (72) percent males and (57) percent females (UNESCO, Institute for Statistics, July, 2017). However, though only few regions of the world have attained gender parity in literacy it is important to note that that more girls and women are now accessing education. This has been attributed to attention that has been given to education of girls by feminists, international communities since Declaration of Human rights in 1948. Further, research now suggests that girls are more hardworking compared to boys and can concentrate 3-4 times than boys. They are also better organized and enjoy protection from parents. Most parents monitor movements of girls more closely than that of boys. Recent research findings have shown that women have overtaken men in attainment of post-graduate qualifications in most development nation (Margriet van Hek, Gerbert Kraaykamp & Maarten H. J. Wolbers (2016).

Causes of marginalization of women in Education

The gender gap in education can be attributed to a number of factors which do not have any scientific base. Historically, it has been assumed that boys and men are innately and intellectually superior and especially in mathematics and scientific needs. Most researchers though have in the late twentieth and twenty first centuries have shown very little difference in educational achievement of boys and girls. Girls tend to do better in almost all subjects particularly in early grades (Trawler, 1995 & Goldstein, 1987). However, as they move up the educational ladder their academic performance declines. Some of factors that are associated with low educational performance of girls include socialization, culture, school learning environment and hidden curriculum.

Early socialization and academic performance of males and females

Norman et al (1988) pointed out that before children start school, conditioning and sex stereo-typing have been ushered in by the types of play that girls and boys are encouraged to engage in and the types of toys they are provided to play with. Girls may have their educational aspirations affected through playing with dolls and other toys which reinforce the stereotype of women as "caregivers". Boys on the other hand, are encouraged to be more active compared to girls in their play and this may be reflected in the kinds of toys they are exposed to such as constructional toys which can help them to develop scientific and mathematical concepts. The stereotyping of boys and girls is further reinforced through media, books, comics, television, and various types of advertising. These often portray girls as homemakers and service oriented workers such as nurses, teachers caregivers, and sexual entertainers. On the other hand, boys are painted as innovators, scientists, pilots, mathematicians, laboratory technicians, engineers, and leaders among others.

Culture and gender differences in education

In poor and developing countries, there is cultural preference to educate boys versus girls (Kibera, et.al 2007 & Douglas, 1964). Most societies in the past have been preferring to educate boys rather than girls and also have been bequeathing their property to males because they believed and some still subscribe to the fact that girls are "visitors" and/or "flowers" in their biological home because on marriage they will acquire another home and family; thus investment in a girl's education is perceived to be essentially beneficial to her "new" home and family by marriage and not the biological family.

Further, a woman is said to have no tribe, state or nation since her identity or belongingness is known after her marriage and therefore she cannot be trusted as a custodian of cultural heritage of the biological family or tribe or society or nation at large. However, in the recent past, though the belief system about the cultural identity of women is gradually changing; women now like men have an opportunity to have dual citizenship. Dual citizenship is now enshrined in some nation states worldwide, including the Constitution of Kenya, 2010. Nevertheless, education of a man is still being given a higher premium because men are still regarded as providers to their family's basic needs of shelter, food, and clothing among others while women are basically perceived to be homemakers and nurturers of children. It is also assumed that a woman does not require education to be a mother and nurturer. Since it is "innately" wired in them many men also shy away from marrying women with high levels of education for they fear of being dominated by such women. The society seems to forget that education should humanize a person by fostering traits such as, humility, leadership, co-operation, complementation and self-determination among others. If education makes a female or a man proud or domineering or rude, that is not education, but miseducation. Education a process of humanising a person from egocentrism.

School Learning Environment and Gender gap in Education

Learning environment for girls has not been most of time conducive. Most schools, for example, in Kenya and many other countries are co-educational and therefore girls are exposed to sexual harassment by their male counterparts and male teachers. For instance, in 1991 nineteen (19) girls were killed and 71 others raped by their male colleagues at St. Kizito Mixed Secondary School in Meru in Kenya (Mackenzie, 1993). The Guardian, 11/12/2017 reported that one in three girls or (37 percent) in mixed or co-educational secondary schools were sexually assaulted in school.

In addition to threatening school environment, mixed secondary schools are not well endowed with teaching learning materials compared to single sexed schools which by and large are national, with best teachers and learning resources. Undoubtedly, differential allocation of teaching and learning resources leads to differential learning outcomes and lower educational aspirations and especially for girls (Kibera, 1995).

Further, most girls and especially those from poor resource families often miss school due to lack of sanitary towels to management menstrual flow about 5 days per month. According to World Bank (2016) 20 percent of school days each year are missed by girls due to lack of hygienic and effective sanitary wear to manage menses (https://blogs.worldbank.org.2016). In Kenya a large number of girls miss an average of 4 days of school each month during their menstrual flow period (Business Daily, June 1st, 2017).

Hidden curriculum and gender gap in education

The Hidden Curriculum refers to the unwritten rules, values and normative patterns of behaviour which both girls and boys students are expected to conform to and learn while in school. For example, respecting authority, respect for other pupils' opinions, punctuality, aspiring to achieve and having a work ethic among others. Textbooks which are available for the classroom teaching process are mostly dominated by male illustrations that portray them as strong and being doctors, dentists, policemen, pilots, head of states and government while females are depicted as pretty and doing cooking and plaiting hair (Global Monitoring Report, 2016; Kibera & Kimokoti, 2007; Kibera, 2001 & Obura, 1991). Use of male specific images marginalizes and silences girls and women not only in educational institutions but also other sectors of the society.

Effects of Illiteracy and Gender Relations

Given the importance of education in developing human capacity, it can be argued that women are disadvantaged in almost all areas of human endeavour such as in the labour market, ownership of business, land, socio-political power because they lack education to articulate their issues and also perform tasks requiring relevant skills and knowledge. An examination of the representation of females and males attests to marginalization of the female gender in various facets of human operation. Lack of education or inadequate education for girls has marginalized the female gender in many facets of society. These include:

Gender Participation in Labour Force and Domestic Labour

Currently, participation of women in global labour market stands at 48.5 percent compared to that of males at 75 percent (ILO, 2017). In addition, women earn the same pay even when they perform a similar job to that of man. Woman is also paid less by 23 percent (United Nations Report, 2017). For instance, women and especially in rural areas in Kenya are paid Kenya shillings 55 for every 100 Kenya shillings earned by a man for a similar job done (Economic Forum Report, 2017). Moreover, it is not easy for a woman to enter into labour market during her reproductive life in industries and government institutions because they suffer from baby "penalty" since they are likely to go to maternity leave from time to time and also to attend to the baby issues of sickness, immunisations and other related care. Most women though work longer by about one hour daily (8 hours and 39 minutes) because they combine working for paid employment and also unpaid domestic work at home (http://www.weforum.org>2017).

Poverty, Land Rights and Gender Inequality

It is estimated that 7 percent of the extreme poor people in the world are women (World Bank, 2018). The majority of women work in the agricultural sector (Food Agricultural Organization, 2011). This is in spite of the fact that women own less than 20 percent of land (World Bank, 2017). This is notwithstanding that if women are given access to land, their farms would increase yield by between 20 and 30 percent at family level and 2.5 to 4 percent at global level. Land in most case is bequeathed to sons as inheritance though in many countries the succession law entitles both females and males to inherit land from parents. Cultural beliefs that deny women from inheriting their parents' property is so deep rooted to the extent that most women do not contest for it due to fear of curse and violence that would be meted on them by the male siblings.

Sexual Harassment, Health Status and Gender Inequality

Sexual harassment is defined as unwelcome sexual advances, requests for sexual favours and other verbal or physical conduct of sexual nature (United Nations, 2017). Sexual harassment is also associated with any sexual act or coercion including acts to traffic a person or acts directed against a person's sexuality regardless of the relationship to victim in times of peace or armed conflict situation. According to World Health Organization (2017) one third of all women who have been in relationship have experienced physical or sexual violence by their partner while an estimated 38 percent of murders of women are committed by their partner. The brutal murder of Sharon Otieno and her unborn baby, a student from Rongo University, is a case in point (Daily Nation, September, 22nd, 2018).

Partly due to sexual harassment, nearly four hundred thousand (378,397) adolescent girls become pregnant between 2016 and 2017 (United Nations Fund for Population, 2017). In addition, some societies and especially in Africa encourage child marriages. This often happens when girls in some cultures are forced to undergo circumcision, a rite that that "forces" maturity and involvement young girls into sexual involvement, teenage pregnancies and child marriage that affects approximately 38 percent of girls in Sub-Saharan Africa (http://www.girlsrotbirds.org-2017).

Girls and women also suffer more compared to boys and men from sexually transmitted diseases and HIV/AIDS. Girls and women are often used as sexual objects by men. Recently, Kiwanda (2019) Minister of Tourist "unveils" new tourist product "curvy women" bodies of Uganda as tourist attraction. In times of war conflict sexual violence has also been used on women as a weapon of humiliation and power throughout history.

Gender and Power Relations

Gender inequality and power relations are as old as creation of human kind on account that man preceded women in creation story (Genesis 2: 21-22). It was natural, therefore to assume that woman was destined to be ruled by man regardless of her talents and abilities. Currently, therefore 11 women are heads of states and another 12 are head of governments out of 190 states in the world (UN Women, 2017). Further, 22.8 percent of all national parliamentarians are women (UN Women, 2017). The percentage of women in political leadership is below 30 percent threshold recommended by Beijing Platform of Action of 1995 which committed states to ensure that women had a least representation in all institutions of society at 30 percent.

Gender gap in creativity and academia

Women are also lagging behind in area of innovation and creativity. According to UNESCO Institute for Statistics (June, 2018) representation of women in research and development stood at 28.8 percent. These fields are perceived to be non-feminine. As a result society and schools have not encouraged girls to pursue them. Socialization of girls against these subjects is so thorough that most girls believe that they are "innately" weak and are unable to do them. Further, given that development of creative and innovative works costs money, may explain why women are still lagging behind due to the fact that they are financially handicapped. As a result of these encumbrances against development of women's creativity and innovativeness, it is not surprising that in 2010 only 8 percent of primary inventors were women (fortune.com>.....> most powerful women, 21st July, 2016). In addition, underrepresentation of women in Science, Technology, Engineering and Mathematics (STEM) at 33 percent meaning women's opportunity to be innovative is limited (https://en.m.wikipedia.org, 2016).

Further, literacy gap between the two genders continues to be manifested in senior leadership positions held by women in academic fields. According to Women in Academia (2017) women representation at professional rank stood at 25 percent. It is noted that underrepresentation of women in academia is more acute in Africa. Forum for African Women Educationists, FAWE, (2018) observed that only six (6) percent of African Women participate at university level education as lecturers, faculty members and administrators. Furthermore, women are prone to sexual harassment, gender stereo-typing and insensitive evaluation. Most women occupy lower ranks in academia and when they rise up to the highest academia rank; diminutive terms are used to bring them down such as being referred to as "flowers" and "mamas" a Kiswahili word that means mothers. For instance, women Professors are times addressed as "mama Professors in academic meetings when they gave contrary views to an issue". While the term "mama" is a respective title for a woman, it is diminutive in academic circles because it seems to squarely to locate a woman in domestic sphere of operation as mothers and nurturers.

Strategies Towards Elimination of Colonisation of Education and Gender Inequalities

Achievement of gender parity requires deliberate conscious effort and commitment by socio-political institutions in degendering society. The process should aggressively address all areas in which gender disparities have been anchored falsely on biological superiority of the male sex. Towards this end states and governments in the first instance, should resocialize society about myths that perpetuate disparities between girls and women and boys and men. To this end, all Declarations, Conventions and Protocols by various bodies of United Nations outlawing gender inequality must be enforced. The implementation of these Declarations, Conventions and Protocols to the letter and spirit, is likely to lead to female and males to enjoyment of similar opportunities, rights, entitlements and responsibilities in various facets of human interaction for both females and males respectively. Equitable distribution of material related resources and socio-cultural capital between women and males will entail:

- granting equal distribution of political power between women and men;
- providing similar opportunities to women and men in attainment of economic independence including land ownership;

- allocating same conditions and opportunities in respects to jobs, terms of employment, tenure, and job advancement;
- sharing of responsibility between females and males in rearing and nurturing children;
- outlawing sexual gender related violence in peace and in war times;
- making education accessible to girls by making more resources as well as sanitary towels for girls from poor families and especially in Sub-Saharan Africa where literacy levels of girls and women are low to enable them access education;
- sensitizing parents, teachers and society on the importance of educating girls through media such as the radio, public lectures and songs that are easily accessible to them;
- doing more research should be carried out in schools and in the communities to establish the relative importance of the factors that impinge on the education of girls;
- building educational institutions are close to children's homes to avoid children getting fatigued fro working long distances and also being exposed to sexual harassment especially girls. Thus boarding schools and especially for girls should set among sparsely populated areas in order to give them equal access to education;
- funding education as a humanitarian activity in conflict should be given high priority to accommodate the displaced children;
- compiling comprehensive data on the situation of girls and women with particular reference to poor urban, poor rural, nomadic regions, school dropouts, girls and boys with special needs education and adolescent mothers should be compiled to facilitate giving such a second chance after delivery and appropriate planning and budget allocation;
- counselling women to study science related subjects that lead to financially rewarding careers;
- educating girls about their sexuality through a formalized curriculum and how they can deal with teenage relationships between girls and boys from the upper primary classes onwards in order to avoid a large proportion of unwanted pregnancies and outlawing sexual harassment;
- offering adult education and relevant education should be made accessible to illiterate women who constitute to thirds of illiterates globally;
- providing educational materials and textbooks that do not only portray girls and women only in their traditional roles; and
- finally, embracing a new way of thinking that values capabilities of both women and men equally though resocialization of society into accepting equality as beneficial to both genders, otherwise realization of gender parity will take a long time to detriment socio-economical development.

Conclusion

Given that equality does not mean identical or sameness but similar traits and or/objects, agents of socialization and resocialisation should create a conducive environment for all members of the society to become receptive to new ways of thinking. This idea aptly buttressed by goal 4.7 of United Nations Sustainable Development Goals, in its proclamation that all learners should "acquire the knowledge and skills needed to promote sustainable development, including among others through education for

sustainable lifestyles human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and culture's contribution to sustainable development".

This goal seems to suggest that education holds the key to resocializing, degendering, and empowering society with knowledge, skills, value systems that are accommodative in terms of equality in gender relations. Such education should ensure that every individual irrespective of gender and other dissimilar condition is given an opportunity to enjoy similar chances of possibility. Therefore a spirit of complementality and self-determination and not competition, superiority and aggressiveness should guide the new gender relations.

In conclusion, no person knows everything and unity between females and males is bound to bring synergies, abundance and positive transformation society. It is important to note that oppression of any gender brings conflicts, violence and underdevelopment. It is therefore in the interest of society to give both females and males similar opportunities to develop their potentials. It is difficult to foresee a peaceful co-existence of females and males where men lag behind women in education and other areas of human endeavour. The clarion call in this century and beyond should be "total" balancing of development of the two genders because "unity is strength".

References

Alam S.M.S. (2007) Women and Mau Mau: Rethinking Mau Mau in colonial Kenya. Palgrave Macmillan, New York

Becker G. (1964). Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education. New York, Columbia University Press.

Douglas, J. (1964) *The Home and the School* London: MacGibbon and Kee.

EFA Global Monitoring Report (2013): Teaching and Learning: Achieving quality for all- Gender Summary. UNESCO, Paris

FAO (2018). Women in Agriculture: Closing the gender gap for development.

Genesis 2: 21-22. Retrieved from http://www.biblestudytools.com/genesis/passage/genesis+2:21-22

Goldstein, H. (1987) Multilevel Models in Social and Educational Research. London: Arnold. (1995) Multilevel Statistical Models, 2nd edn. London: Arnold.

ILO (2017a). World Employment and Social Outlook: Trends for women 2017. PRODOC, Geneva

ILO (2018). World Employment and Social Outlook: Trends 2018. PRODOC, Geneva

Kibera, L.W. & Kimokoti A., (2007) Fundamentals of Sociology of Education by University of Nairobi Press, Nairobi.

Kibera, L.W (1995). The Effects of School Stratification on the career and Educational Aspirations of Girls in Kenya's Secondary Schools, *Journal of Third World Studies,* Vol. XII, No.1, pp 59-77.

Kiwanda (2019). Curvy, Sexy Ugandan Women Named New Tourist Attraction. Retrieved From https://www.nation.co.ke/news/africa/Curvy-Ugandan-women-named-new-tourist-attraction on Wednesday, February 6 2019

https://www.bourncreative.com/meaning-of-the-color-blue (December, 2018). Meaning of the Color Blue - Bourn Creative. Retrieved

Margriet van Hek, Gerbert Kraaykamp & Maarten H. J. Wolbers (2016). Comparing the gender gap in educational attainment: the impact of emancipatory contexts in 33 cohorts across 33 countries, Educational Research and Evaluation.

Money, J. & Hampson, J. (1955). Hermaphroditism: recommendations concerning assignment of sex, change of sex, and psychologic management. Bulletin of the Johns. Hopkins Hospital 97: 284 - 300.

Nation Media Group (September 22, 2018). How murder has shattered Sharon Otieno's young family. Retrieved from Daily Nation, January 22, 20189

Norman, R. Z., Smith, R., & Berger, J. (1988). The processing of inconsistent status information. In M. Webster Jr., & M. Foschi (Eds.), *Status Generalization.* CA: Stanford University Press.

Obura, A. (1991). Changing Images: Portrayal of Girls and Women in Kenyan Textbooks, Nairobi, ACTS.

Plato (1961). *Collected Dialogues*. Edited by Edith Hamilton and Huntington Cairns. Princeton, NJ: Princeton University Press.

Rousseau, Jean-Jacques (1979). *Emile.* Trans. Allan Bloom. New York: Basic Books

The Guardian (11th December, 2017). Sexual harassment 'rife' in schools but largely unreported, study says. Retrieved from https://www.theguardian.com/world/2017/dec/12/sexual-harassment-rife-in-schools-but-largely-unreported-study-says

UN Women (2017). Women in Leadership. New York: UN

UNESCO (2018). Sustainable Development Goal 4 and Its Targets. Retrieved from Https://En.UNESCO.Org/Education2030-Sdg4/Targets

UNESCO Institute for Statistics (2016). Women in Science: Fact Sheet No. 43. Paris: UNESCO

UNESCO Institute for Statistics (2018). Literacy Rates Continue to Rise from One Generation to the Next. UNESCO, Paris

UNFPA (2017). State of the World Population: Reproductive Health and Rights in an age of Inequality. New York: UNFPA

United Nations (1948). Universal Declaration of Human Rights. New York: UN

United Nations (1952). Convention on The Political of Women. New York: UN

United Nations (1966). International Covenant on Civil and Political Rights. New York: UN

United Nations (1967). Declaration on the Elimination of All Forms of Discrimination against Women. New York: UN

United Nations (1974). Declaration on the Protection of Women and Children in Emergency and Armed Conflict. New York: UN

United Nations (1979). Convention of All Forms of Discrimination Against Women. New York: UN

United Nations (1993). Declaration on the elimination of violence against women. New York: UN

United Nations (1997). Universal Declaration on Democracy. New York: UN

United Nations (1999). Optimal Protocols to the Convention of All Forms of Discrimination Against Women. New York: UN

Women in Academia (2017). Retrieved https://www.catalyst.org/research/women-in-academia

Women in STEM fields, 2016. Retrieved from https://en.wikipedia.org/wiki/women-in-STEM-fields

World Health Organization (2017). Violence against Women. Geneva, Switzerland

Accessibility for high-skilled/gifted people in higher education: challenges and commitments

Vaneza Cauduro Peranzoni
Postgraduate Program in Sociocultural Practices and Social Development, University of Cruz Alta
Cruz Alta – RS, Brazil

Sirlei de Lourdes Lauxen
Postgraduate Program in Sociocultural Practices and Social Development, University of Cruz Alta
Cruz Alta – RS, Brazil

Tiago Anderson Brutti
Postgraduate Program in Sociocultural Practices and Social Development, University of Cruz Alta
Cruz Alta – RS, Brazil

Fábio César Junges
PNPD/CAPES Scholar of the Postgraduate Program in Sociocultural Practices and Social Development, University of Cruz Alta
Cruz Alta – RS, Brazil

Abstract

The present article seeks, through literature review, to discuss the accessibility in higher education of high-skilled/gifted people. The education of high-skilled/gifted people presupposes an interaction between those involved in the educational process, aiming at totality, in a global perspective that regards all students in their individual needs; this requires a curricular proposal articulated to reality resulting in significant learning, for the formation of an aware citizen able to exercise citizenship. Thus, working with high-skilled/gifted people implies accepting heterogeneity of groups and individuals; it also implies knowing particularities, as well as the contact and the dialogic among subjects. There is also the suggestion of knowing existing jobs and building, in a collective process, forms of work based on new methodologies, which meet all their individual differences, providing them with growth.

Keywords: Giftedness. Higher Education. Accessibility.

1. Introduction

Although the inclusion in Higher Education of people with special needs is quite discussed today, the great difficulties these individuals find in their own integration are well known, not only by an incidence of "pre-concepts", but also because society, although evolving, always takes in "these different people" doubting

their capacity, or frightened by a unwanted responsibility.

The inclusion of people with special needs in universities raises the responsibility and awareness about every aspect that must, necessarily, be interconnected between university and community, because coexistence and cooperation provide the high-skilled/gifted person the development of a healthy social life. Mittler (2003, p. 140) complements this provision saying that "inclusion and exclusion begin in the classroom. No matter how committed a government can be in relation to inclusion".

Therefore, this article firstly presents challenges of including high-skilled/gifted people in Higher Education. Most universities are still not prepared for inclusion, requiring adaptation to receive better the high-skilled/gifted student. Reflections on issues relating to high-skilled/gifted people are still not very common in the university environment. Therefore, in a second moment, the article proposes the creation of educational spaces that stimulate learning and the development of these people, as well as the implementation of research spaces in this area, while a commitment with the emancipatory and inclusive education.

2. Challenges of the inclusion of high-skilled/gifted people in higher education

The inclusion of high-skilled/gifted people involves changing the curriculum, evaluations, teaching and the grouping types within our universities. It is also based on the diversity based on race, gender, nationality and social level of each one. According to Mantoan (1998, p. 2):

> The inclusion resulting from a quality education for all students causes and demands, from school and teachers, new positions and is a reason for modernizing education and for teachers to improve their practices. It is an innovation that implies an effort of upgrading and restructuring the current conditions of most of our schools.

We believe rethinking beliefs, ideas and values assigned to high-skilled/gifted students is significant in teachers/professors' training. In the same way, the training and constant improvement of these professionals are necessary, providing conditions to take up the challenge to assist high-skilled/gifted students in relation to learning and the achievement of citizenship and their space in the community.

According to Carvalho (2004, p. 53), "in the case high-skilled/gifted people, the hegemony of normality also 'acts' generating questions about the 'superiority' they present, whether intellectual, artistic or of another nature".

Ainscow (1999, p. 218) understands the challenge of inclusion as an overcoming of barriers, in which

> The trend is still thinking in "inclusion policies" or inclusive education as stating about students with disabilities and other characterized as having "special educational needs". Furthermore, the inclusion is often seen only as involving the movement of students of special schools for the contexts of regular schools, with the implication that they are "included", since they are part of that context.

Therefore, as expressed in the Federal Constitution (BRAZIL, 1988), education is a guarantee for every person, which means it is for everyone, without exception, experienced in an egalitarian environment, aiming at achieving full human development and citizenship. For high-skilled/gifted people to exercise this right, the university needs to adapt to the inclusion process as a whole.

Therefore, the aim is an inclusive university and society, which provide access to every person and respect

the limits and differences of each one, providing space to all people so that they can grow and transform their lives, breaking with many of the barriers imposed on them.

When higher education institutions receive a person with special needs, they face a great challenge that starts with the classroom and goes through the support structures and resources necessary for this demand. A point to be discussed in the universities, for the inclusive process, is diversification and flexibility of the teaching and learning methodology, including, in this context, organization and functioning of the university as a whole.

Universities must have the proposition of open curricula and varied curricular proposals in the Pedagogical Political Projects of undergraduate and post-graduate courses. We must also review the flexibilization of pedagogical criteria and procedures, thus favoring the differentiation in teaching methodology, didactic procedures, in temporality to achieve certain goals and in the evaluation of high-skilled/gifted students. The adopted methodology must be consistent with curricular objectives and contents.

Structuring an appropriate educational intervention for a favorable performance for these people at all levels, from personal to social, will only be possible when universities have inclusive molds, adapted to the needs of people with special needs, respecting differences and observing students' diversity,.

People with special needs are increasingly reaching higher education, once, according to the School Census/MEC/INEP (BRAZIL, 2008), the enrolment of students with special needs in higher education records that the number of pupils increased from 5,078 to 11,999 students. In relation to the high-skilled/gifted students, the census reveals a number of 3,257 enrollments in the year 2008. This indicator, despite the increased enrolment, reflects the educational and social exclusion, especially of high-skilled/gifted people, stressing the need to promote the inclusion and the strengthening of policies of accessibility in higher education institutions.

Some definitions of percentage of high-skilled people include between 1 and 2% and others, above 15-20%, have high skills/giftedness. The World Health Organization (WHO), which calculates its estimate based on scores obtained in IQ tests, defines that from 3.5 to 5% of any population would be high-skilled/gifted people, according to Freitas and Perez (2010), being around approximately 8 million people in total.

Concretizing this concept of inclusive university, which provides education for all, becomes a great challenge for those responsible for the construction of school environments. The models found in Brazilian education institutions, in their majority, disregard, in many respects, the real needs of students and attendees of these establishments, as well as professionals in the area.

It is possible and feasible to adopt some special/space solutions for environments of educational institutions to meet the needs of people with special needs. However, only this is not enough to determine a change in the attitude of those who operate this process (educators, staff and the students themselves).

3. Educational alternatives in higher education for high-skilled/gifted students

There are some educational alternatives in higher education high-skilled/gifted students and we propose to discuss some of them in this moment, which are: acceleration, curricular enrichment, skill groups, teaching internship, tutorships, tutorial education program.

The acceleration is one of the most widely used educational alternatives for high-skilled/gifted students. It consists of finishing studies faster, in early joining university and in advancing a semester to another when the student already has all the necessary knowledge in that semester.

According to Sabatella (2008), acceleration can understand the flexibilization of the curriculum, complete steps faster, do activities during the vacation and in other times.

Some authors are against and others, in favor of acceleration, but Clark, according to Alencar and Fleith (2001, p. 130) describes the following advantages:

1. This method can be used in any school.
2. Intellectually gifted students tend to choose older partners, and acceleration favors this contact.
3. Acceleration allows gifted students to begin their professional life earlier, which results in greater productivity.
4. Since their time at school is smaller, the costs also decrease.
5. Students feel less bored and dissatisfied when they are able to accelerate their studies, experiencing a less tedious and more stimulating program.
6. Students who participate in acceleration programs have been showing higher social and emotional adjustment.
7. Acceleration allows demanding more productivity from students according to their abilities.
8. If an unusually bright student stays with colleagues of the same age, he/she will likely find the tasks proposed by professor very easy and will develop inappropriate study habits.
9. The opportunity to interact and participate in academic activities tends to favor a more responsible attitude from the student and the establishment of new purposes and objectives.

With this, we observe that acceleration has much to offer to our students, if pedagogical political projects of universities and courses contemplate this feature. If acceleration is not described in the pedagogical political project, it will hardly be effected with success.

Our legislation provides for the acceleration, as laid down in Art. 24 of LDB/1996 “V - verification of academic performance shall observe the following criteria: (...) c) possibility of advancement in courses and in grades by assessing the learning and also in Art. 59 “Educational systems shall provide for learners with special needs: (...) II [...] and acceleration to finish faster the school program for gifted students.”

Universities can make the acceleration of academics by verifying their abilities in disciplines in advance and not making them attend unnecessary credits, in which they already have the basic knowledge. Thus, the academic feel more motivated, goes beyond his/her knowledge, further researches, and shows more interest.

Teaching internship is another educational alternative for high-skilled/gifted students and can be used in the university to encourage them with specific knowledge to deepen their knowledge with a professor and, thus, help their colleagues. This alternative has also been employed for a long in the educational institutions across and outside the country, and has increasingly allowed students to exchange ideas, knowledge and deepen their interests by specific themes.

Tutorship is an educational alternative for high-skilled/gifted students, in which a professor who dominates a content or theme of the area of interest of the high-skilled/gifted student offers to guide and work with

this academic according to their interests, in combined shifts and schedules. Since universities have a large field of knowledge and information areas, this space would provide the existence and permanence of tutorships according to individual research interests, or also from groups with high skills/giftedness.

According to Freitas and Pérez (2010, p. 67), teaching internships "very similar to tutorships, usually performed by specialists in a particular area (usually outside the school) who work with the student in researches or specific projects which require knowledge that, sometimes, the classroom professor had no time to build".

Thus, in universities, there are many specialists, masters and doctors in specific areas, so that we could have several students assisted by teaching internship programs according to the specialty of the academic.

Another form of education for high-skilled/gifted students are skill groups, which, according to Sabatella (2008), consist of separating academics by intellectual level, or also by performance in any specific area within the university to work the skill groups with specific areas of interest. According to Sabatella (2008, p. 186), this educational alternative requires:

- recognizing the broad individual differences and the heterogeneity of the group, always including some individualized instruction;
- avoiding complete segregation, giving students the opportunity to live together with others with different abilities;
- selecting well-qualified professors who must be constantly updated regarding research, evaluation forms and specific curricular proposals for these students;
- encouraging the development in various areas, in addition to the intellectual;
- the constant contact and communication between professors and professor and parents.

This alternative is also known in the literature as segregation and its goal is to separate students with a greater potential from other students, during certain time, and, after these students develop their activities in another room, these students return to the classroom.

Some authors are favorable to skill groups and others, against them. Favorable because they increasingly develop specific potentials and talents of each student and contrary because they can also leave this same student with snobbish and proud attitudes, according to Alencar and Fleith (2001).

The curricular enrichment for high-skilled/gifted students provides a theoretical deepening in the student's subjects of interest. It must include issues that motivate, encourage, instigate and challenge this student. According to Sabatella (2008, p. 182),

> enrichment is basically done in three aspects: within the curricular contents, with adaptations or extensions of their subjects, according to the student's interests; within certain learning context, with flexibility or diversification of the curriculum; and independent projects (individual or small group) such as workshops, competitions, guidance with experts and mentors, extracurricular activities, programs or courses for personal development in specific areas.

Renzulli (2004) propõe um modelo de enriquecimento curricular, abrangendo: enriquecimento do tipo I, II e III. O enriquecimento tipo I propõe expor ao estudante uma diversidade de atividades extracurriculares através de oficinas, excursões, filmes, programas de televisão, minicursos e palestras. Assim, estas atividades irão despertar o interesse por diversas áreas nos alunos com altas habilidades/superdotação e

também em sua área específica. No enriquecimento do tipo II, de acordo com Alencar e Fleith (2001, p. 135)

Renzulli (2004) proposes a curricular enrichment model, covering: type I, II and III enrichment. Type I enrichment proposes exposing students to various extracurricular activities through workshops, excursions, films, TV programs, mini-courses and lectures. Thus, these activities will awaken the interest in several areas in high-skilled/gifted students and in their specific area. Type II enrichment II, according to Alencar and Fleith (2001, p. 135)

> use methods, materials and instrumental techniques that contribute to the development of higher levels of thought processes (analyze, synthesize and evaluate), and creative and critical abilities, in the research skills [...] in the search for bibliographic references and processes related to personal and social development.

In type III enrichment, students try to solve problems raised in the activities of the type II. Here, they deepen their interest in certain area and develop authentic, original products.

According to Alencar and Fleith (2001, p. 136), the type III enrichment enables the student to develop metacognitive skills, such as planning, resource management, decision making and evaluation, as well as characteristics of affective nature as independence of thought and action, motivation, self-confidence and interpersonal skills.

Another educational alternative in higher education for high-skilled/gifted academics are tutorial education programs. The Tutorial Education Program (PET - *Programa de Educação Tutorial* in Portuguese) was established by Federal Law 11.180/2005 and regulated by Decrees 3.385/2005, 1.632/2006 and 1.046/2007. In 2010 was published Decree 976, which brought news to the structure of the Tutorial Education Program. The objectives of PET, according to Decree 976/2010, in its art. 2:

> I - to develop academic activities in quality standards of excellence, through tutorial learning groups of a collective and interdisciplinary nature;
>
> II - to contribute to the improvement of the quality of undergraduate students' academic training;
>
> III - to stimulate the formation of professionals and professors of high technical, scientific, technological and academic qualification;
>
> IV - to formulate new strategies for the development and modernization of higher education in the country; and
>
> V - to stimulate the critical spirit, as well as the professional activity guided by citizenship and the social function of higher education.

With this, our universities can contribute to continued training of academics, and seek new paths for higher education in our country. The Tutorial Education Program must be organized from formations of graduations, with the formation of groups of students under the guidance of a tutoring professor, thus enabling the academic training of students involving them in teaching, research and extension.

The selected students will receive scholarships, as well as tutoring professors. The PET should contribute to the implementation of public and development policies in their work area, considering this contribution in periodic evaluations.

According to the decree 976/2010, Art. 17, the undergraduate student that wants to receive PET

group scholarship must meet the following requirements:

> I - regularly enrolled as an undergraduate student;
>
> II - not receiving a scholarship of any other program;
>
> III - present a good academic performance according to parameters set by the HEI's highest collegiate; and
>
> IV - be willing to dedicate twenty hours a week to the program activities.
>
> Single paragraph. The announcement of the student selection process to compound PET groups shall be officially disclosed, within the scope of undergraduate and extension pro-deanships, or equivalent, at least eight days in advance, including information on date, place, schedule, selection criteria and procedures.

We observed, in public universities that many students participate in tutorial education programs. Currently, the tutorial education program has 779 groups distributed among 114 Higher Education Institutions in different areas of knowledge and in various geographical regions of the country, according to the site of the Ministry of Education (MEC, 2013).

Also according to Decree 976/2010, Art. 18, the student who receives the the program scholarship shall have the following duties:

> I - ensure the academic quality of PET;
>
> II - participate in all activities programmed by the tutoring professor;
>
> III - participate during his/her stay in PET in teaching, research and extension activities;
>
> IV - maintain good performance in the undergraduate course;
>
> V - contribute to the training process of his/her HEI colleagues, not necessarily in the same area of training, especially in the year of admission to the institution;
>
> VI - publish or present in scientific event an annual academic work, individually or in groups;
>
> VII - mention his/her PET scholar status in publications and papers presented.

Therefore, we realize that high-skilled/gifted higher education students have several educational alternatives, such as: acceleration, curricular enrichment, skill groups, teaching internships, tutorships and tutorial education program, but the professional who works with this student is responsible for referring him/her to the appropriate service and providing him/her all the help necessary for his/her good performance in university.

4. Conclusion

Universities have been concerned about people with disabilities and pervasive developmental disorders. Nevertheless, actions and policies for high-skilled/gifted people have been often put aside this concern, and appropriate specific programs have not been performed. Furthermore, most actions also focus on the level of education for children and adolescents, excluding adults, who also require specific actions.

The university intends to be this space of formation, with different and relevant themes. In this perspective, this article proposes to discuss the high skills/giftedness in adults, committed to an inclusive and changing education, in order to promote and encourage the search for the development of quality education, as developed countries.

When considering a developing country, we must ensure that our actions and policies include all populations, so that we can really have quality education. This involves since professors' training up to qualification at all education levels and modalities.

5. References

Ainscow, M. 1999. *Understandind the development of inclusive schools*. London: Falmer Press.

Alencar, E. M. L. S.; Fleith, D. S. 2001. *Superdotados*: determinantes, educação e ajustamento. São Paulo: EPU.

Brasil. Ministério da Educação. *Lei de Diretrizes e Bases da Educação Nacional*. LDB 9.394, de 20 de dezembro de 1996.

Brasil. IBGE. *Censo Demográfico, 2000*. Disponível em: <http://www.ibge.gov.br/home/estatística/populacao/censo2000/default.shtm>. Acesso em: 18 maio 2008.

Brasil. INEP. *Censo Escolar 2006.* Disponível em: <http://http://www.inep.gov.br/basica/censo/default.asp>. Acesso em: 20 maio 2008.

Brasil. *Portaria MEC nº 976, de 27 de julho de 2010.* Programa de Educação Tutorial. Publicada no D.O.U em 28/07/2010.

Freitas, Soraia, Napoleão; Pérez, Susana. *Altas habilidades/superdotação:* atendimento especializado. Marília: ABPEE, 2010.

Mantoan, Maria Tereza Égler. 1998. *A integração de pessoas com deficiência:* contribuições para uma reflexão sobre o tema. São Paulo: Mennon.

Mittler, Peter. 2003. *Educação inclusiva*: contextos sociais. Porto Alegre: Artmed.

Renzulli, Joseph S. O que é esta coisa chamada superdotação, e como desenvolvemos¿ Uma retrospectiva de vinte e cinco anos. Trad. Susana Gracielea Pérez Barrera Perez. *Educação*, Porto Alegre, v. 27, n. 1, p 75 – 121, jan./abr. 2004.

Sabatella, Maria Lucia Prado. 2008. *Talento e superdotação*: problema ou solução? 2. ed. Curitiba: IPBEX.

Agricultural dynamics and food security in Senegal

Malick TOURE

Doctoral Student, Doctoral school Sustainable Development and Society (ED 2DS, University of Thies, Senegal

Address : toure.elmalick@gmail.com

Abstract

The objective of this paper is to analyze the dynamics of the Senegalese agricultural economy and the food security. Analysis of secondary data shows that agricultural growth is low over the period 1961-2014. The average annual growth rate is 6.3% and conceals large disparities between periods. This evolution leads to low production and agricultural productivity. Hence the contribution of agriculture in value creation at the national level to a downward trend. From more than 24% in 1987, it rose to 18% in 2016, when other sectors are becoming more productive.

The food security is analyzed largely through the environment of the agricultural sector from the point of view of the production of its various parameters. According to the prevalence of undernourishment measured from the minimum dietary energy requirements and the global hunger index, food security is improving more and more from 1992 to 2016. The IFM increases from 19.7 points in 1996 to 13.8 in 2016, but does not yet allow Senegal to leave the zone of insecurity "serious". There is also a linear decline in the prevalence of undernourishment over the period 1992-2016.

Key words: Agricultural economics, Food security, agricultural growth

I. Introduction

The agricultural sector is an important lever of the national economy. The strategic dimension of the sector in terms of food security and the promotion of macroeconomic balances, in addition to the large share of the population directly dependent on it, make agriculture a key sector for the economic and social development of a country.

Senegal has 755,532 farming households living mainly in rural areas (ANSD, 2013). However, Senegalese agriculture remains unproductive in view of the poor performances it has recorded for decades. The sector employs about 73.8% of the rural population, concentrates 28% of the labor force and paradoxically provides only 7.8% of production (DPEE, 2013).

This poor productivity performance has negative effects on food security due to the close link between agriculture and food security (Berthé and Keita (2009), Faye et al (2007), Diallo et al (2013)). This concept of food security was the subject of a long discussion at the World Food Summit in Rome in 1995. This definition of food security was adopted: "Food security is ensured when all people at all times have economic, social and physical access to sufficient, safe and nutritious food that meets their nutritional and dietary preferences to enable them to lead active and healthy lives".

There are four components to food security: food availability, accessibility, stability and use.

- The availability of food products remains difficult to control because of low production, which depends on factors such as rainfall, access to land and inputs, soil richness, and so on. In addition, in Senegal, most producers are smallholders. In fact, 82.1% of farming households cultivated less than 5 parcels during the 2012-2013 season (ANSD, 2013). Thus, at the individual level the availability in kilocalorie per person on average and that in kilogram per person becomes low. This largely justifies the lack of matching between supply and demand for food products.
- The issue of access to food is highly dependent on availability but also on market structure and consumer income. In his famous analysis of famine, Sen (1981) argues that every individual must enjoy the "right to food" and this depends, among other things, on his income and the property he owns. Sen's (1981) analysis shows that in addition to the food supply, demand factors are important for ensuring food security at the individual level (Harrigan et al, 2012). The higher the income increases in the consumer, the more he tends to demand more value in the food product requested.
- Regarding the third component, namely stability, we find that arable land for irrigation is very low in Senegal and represents less than 5% of total arable land in the period 2000-2016; which raises the food dependency rate and makes the country sensitive to exogenous food shocks as was the 2008 food crisis. The variability of food supplies by $ I and Kcal is low over the period 2000-2016.
- For use, there is progress on access to improved sanitation services (78.5% in 2015 according to FAO, 2018) and the level of access to improved water services (47, 6% in 2015 according to FAO, 2018).

Thus, the problem of food insecurity is of a certain acuity and would be difficult to control without efficient agriculture. The typology of cultures is thus problematic. In fact, practiced crops remain mainly food (91%). The main industrial crop remains groundnuts (75%) (RGPHAE, 2013). These crops are grown mainly in winter (58.1%). The farmer relies on winter logging revenue from 3 to 4 months to deal with 12 months of expenses. This situation makes vulnerable actors in the sector who also face the hazards of climate change.

Thus, the objective of this research is to analyze the dynamics of agriculture and the record of food security in Senegal.

II. Literature review:

Many authors consider that agriculture is responsible for feeding the population and providing income to the whole value chain. Thus, theoreticians of the agricultural economy have focused on the importance of studying upstream factors of agricultural production. The first theories attributed the increase in agricultural production to changes in factors such as land, labor and capital. Other factors are also important for increasing production and especially productivity. According to Douillet and Girard (2013), this is the climatic context (which is a non-controllable factor), available technologies, agricultural practices and public policies that can directly or indirectly affect the agricultural sector.

In poor countries, the agricultural sector is the main activity of rural households. The latter practice agriculture to satisfy the subsistence needs first and foremost. Badouin (1971) finds three main channels to

demonstrate that the growth of agricultural production is a prerequisite for the economic development of a country:

- First, it allows the economy to cross the "hunger threshold". This channel eliminates the risk of famine and raises the level of the food ration. Food availability, accessibility and nutritional quality have a positive impact on human resources;
- It then allows the "isolation threshold" to be exceeded. The part of the production not consumed represents a marketable surplus. With such a surplus, the agricultural sector enters into relations with urban and external markets and actively participates in the "monetization of the economy";
- The growth of agricultural production finally allows the "threshold of stagnation" to be exceeded. The surplus income generated in agricultural production constitutes savings that, invested productively, will bring about further progress for both agriculture and the rest of the economy.

According to Diallo et al. (2013), increasing productivity and agricultural production are a sure way of ensuring food security and improving living conditions in rural areas. Similarly, "the improvement of agricultural performance helps to reduce the food expenditure of urban households through the fall in prices of basic necessities". The gain from a surplus income is, however, allocated to non-agricultural product expenditures. As a result, the performance of the agricultural sector leads to the economic transformation of goods and consequently to the basket of urban and rural households. This abundance and this fall in prices benefit the criterion of access to food products for both urban and rural households.

Rostow's (1960) work on the stages of economic growth highlights this interdependence between agriculture and the secondary sector. According to Rostow, economic development cannot be successful without a successful transition from the agricultural economy to the industrial economy. Indeed, the agricultural economy guarantees the satisfaction of the livelihood needs of rural households and consequently reduces poverty and food insecurity.

In the same way the cost of materials falls for the manufacturer in addition to the regularity of stocks. Thus, the price of the food product drops for the household. This increases his income and even that of the worker who benefits from an increase in hours of work.

Based on Engel's law that "the income elasticity of demand for food products is less than 1, productivity improvement in agriculture benefits the industry," Berthelier et al. (2005) state that the decline in agricultural prices is not fully absorbed by an equivalent increase in demand for agricultural products; it thus refers to industrial products.

Mellor (1976) analyzes the importance and vitality of agricultural productivity growth. As the non-farm population steadily increases with increasing demand for food, agriculture, through productivity, is expected to grow at a near-pro rata pace to meet demand. This might answer Malthus' (1798) concern that the population would increase in geometric progression if it is not controlled, while the subsistence would only increase in arithmetic progression. For Malthus, for example, "the happiness of a country depends on the extent to which the annual increase in population is close to the annual increase in agricultural production."

From the agriculture-poverty relationship, Valdès (2007) defines three transmission channels "namely the labor market, farm income and food prices". Developed agriculture provides a considerable increase in the

level of employment both directly in the agricultural sector and indirectly in the industrial sector. This increases the level of incomes not only of farmers but also of industrial and therefore the wealth of rural and urban households. The third channel of Valdès is central in the fight against food insecurity.

In a document of the Department of International Development (DFID[6], 2004), the authors, looking for the linkages between agriculture and poverty reduction, find four "transmission mechanisms" namely: (i) the direct impacts of poverty; improvement of agricultural performance on rural incomes; (ii) the consequences of lowering the price of food for the rural and urban poor; (iii) the contribution of agriculture to growth and the creation of economic opportunities outside the sector; (iv) the fundamental role of agriculture in stimulating and sustaining economic transition, when the sector ceases to occupy first place in a country (and in the livelihoods of the poor) and gives way to more variety of processing and services (Cervantes-Godoy, D. and J. Dewbre (2010).

Thus, according to the literature, agricultural growth has a significant positive impact on a country's economic development and food security.

III. Dynamics of the Senegalese agricultural economy

III.1. Agricultural growth

The agricultural sector must feed the population, provide income to farmers, create jobs and self-employment, provide foreign exchange to the economy and supply the industrial sector with raw materials. From 1961 to 2014, agricultural production generally grew in a linear fashion. From 1,887,159 tons in 1961, it rose to more than 5,397,755 tons in 2008, maximum production. Production then drops to 4,268,097 tons in 2014[7]. During the period 1961-2014 the annual average production is 2 921 502 tons.

Cereals represent on average 35% of the production over the period 1961-2014. Legumes and sugar follow with respectively 29% and 16% on average. The groundnut sector with unshelled groundnuts dominates the legume group with an annual average of 94% of the production of this group of products.

In the early 1960s, production was driven by the groundnut industry, which averaged 38.6% of the total over the period 1961-1984 and 27.6% over the period 1961-2014. The period 1961-1984 was marked by the first agricultural policy which focused mainly on the groundnut sector. Several policies and strategies followed one another after the first agricultural policy, namely: the New Agricultural Policy for the period 1984-1994, the Agricultural Sector Adjustment Program (PASA) and the sectorial policy letters for the period 1994-2000, the agricultural policies of the post-occupation period of 2000 such as the LOASP, the REVA plan and the GOANA. PRACAS is the agricultural policy of the second political alternation of 2012.

Despite the agricultural policies implemented, the annual growth rate of production has been fluctuating and averaged 6.3% between 1961 and 2014.

6 Department for International Development is an executive department of the UK government responsible for humanitarian aid and international development assistance

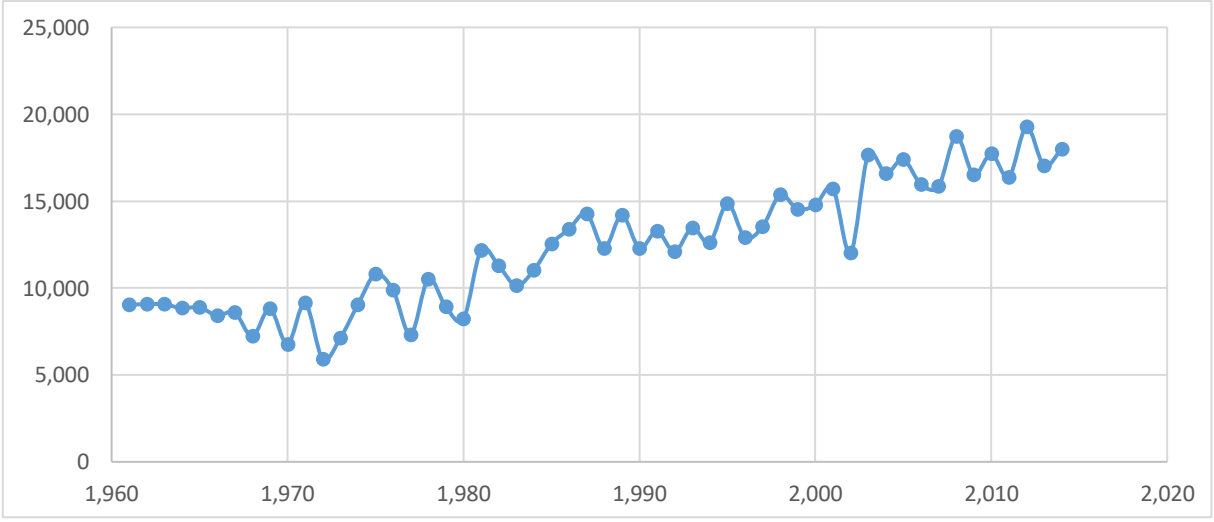
7 FAOSTAT, 2018 and author's calculations

The annual growth rate of agricultural production hides large disparities from one year to the next. There are glorious moments of increase (39.4% in 1971, 27.5% in 1974, 37.7% in 1999, 36% in 2003 and exceed the threshold of 401% in 1978, 1981 and 2008) and periods down to below zero percent (down from 20 to 40 percent in 1970, 1972, 1977, 1979, 1983, 2002 and 2011). This makes it difficult to maintain stable growth in agricultural production.

There is more stability in the other sectors than agriculture, which concentrates a larger share of the population. From 1961 to 2016, on average, the growth in agricultural value added was 2.58% at a time when the industry grew on average by 3.81% and services by 3.09%. This is in line with Malassis (1973)'s analysis that "the growth of non-agricultural production is higher than that of agricultural production in general". The intensification of factors for better agricultural productivity is becoming a priority.

Agricultural productivity refers to the ability of farmers to better combine inputs to maximize outputs. The average agricultural yield over the 1961-2014 period is 12,298 hg / ha. The average annual growth rate of returns is 1.3%. Agricultural yield, in this graph, gives us the production of one hectare of land in hectogram. The maximum yield was recorded in 1972 at 5914 hg / ha and the highest yield in 2012 at 19273 hg / ha.

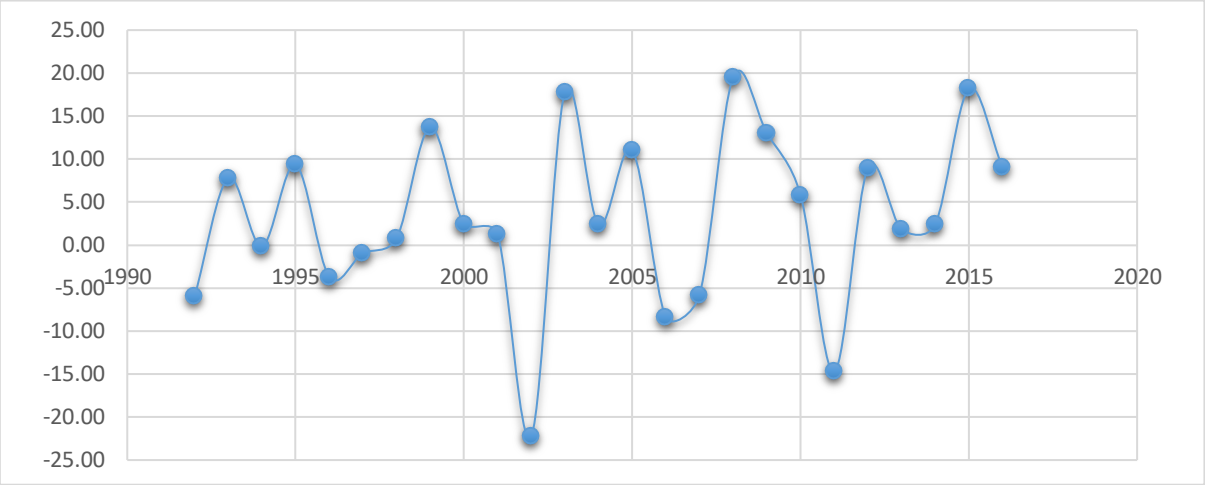
Fig. 1: Agricultural yield (hg / ha)



Source: FAOSTAT, 2018 and author's calculations

Agricultural value added is another measure of agricultural performance. It makes it possible to analyze the efficiency of the output and the efficiency in the use of the factors. The following graph shows a saw-tooth pattern of annual growth in agricultural value added. An increase in value added translates into increased production and farmers' incomes. A decline, especially a negative trend, reflects a very expensive remuneration of the factors and / or a low production linked to endogenous and exogenous factors.

Fig. 2: Agricultural value added (annual growth %)



Source: FAOSTAT, 2018 and author's calculations

This difficulty in maintaining stable growth in agricultural value-added leads to a decline in the share of agricultural value added in GDP. From 1980 to 2016, agriculture represents on average 18.83% of the national production.

The state can act in favor of the peasants by granting subsidies in agricultural equipment or inputs. The problem in this case lies in the implementation of these subsidy policies. Depending on the area harvested, the annual average is 2 368 836 ha from 1961 to 2014. The harvested area was 2,091,235 ha in 2016. This rate multiplied only 1,137 times to reach a modest 2,378,273 ha. 2014, in 54 years. This largely justifies the foreign dependence on food products to fill the gap that is widening further with the level of increase in demographics. In this context, Malthus's thesis that the population would increase in geometric progression, if it is not controlled, while the subsistence in arithmetic progression.

After the adoption of the LOASP in 2004, subsequent policies such as REVA and GOANA led to harvests of up to 3 123 469 ha. However, there is still a fall to 2,262,807 ha in 2012.

The availability of arable land is not fully cultivated. On average, from 1961 to 2014, harvested areas represent 75% of arable land. As a result, 25% of the average arable land in this period is not harvested and therefore not well exploited.

On average, arable land represents 16% of the country's land area. Their average annual growth rate is almost zero (0.003) over the period. This is largely due to the fact that the available arable land exceeds the demand for land for crops or pastures. In fact, agricultural land represents on average 46% of arable land over the period 1961-2015, with an average annual growth rate of almost zero (0.001). The use of arable land for permanent crops and pastures is low. For example, 54% of arable land is for temporary harvests or is not grown or used for grazing.

From the 1980s, the quantity of seeds decreased, partly because of the droughts experienced during these periods, combined with massive rural exoduses. In 1997, this amount was 102,871 tonnes, which is approximately the same amount of seed used in 1961. This decline follows the same trend to reach a lower level in 2014 with 873 38 tonnes of seed being grown.

In summary, the dynamics of rising agricultural growth are timid. Despite the sector's stakes in the fight against poverty, on the part of the population that depends directly or indirectly on it and food insecurity, its share in GDP does not allow to respond proportionally to the demand of the actors. The food balance sheet is analyzed largely through the environment of the agricultural sector from the point of view of agricultural production but also of the agricultural population.

III.2. Food balance sheet

One of the priority objectives of the agricultural sector is to ensure sufficient and regular production. But it is not enough to guarantee food security, which has four components: food availability, accessibility, stability and use. As a result, food security becomes multidimensional and difficult to identify through an aggregate indicator. However, there are proxy indicators that provide information on the overall food security situation in a country.

Food availability is not simply a matter of self-sufficiency but rather a market supply of food products in line with demand. From independence to the present day, production and imports are increasing while exports are falling. Between 1960 and 2013, agricultural production grew by 113%, imports by 648%, and exports by 38%. The weakness of the exports can be explained by the low level of the cultivations of exploitation which represent 9% against 91% for the food crops (ANSD, 2013).

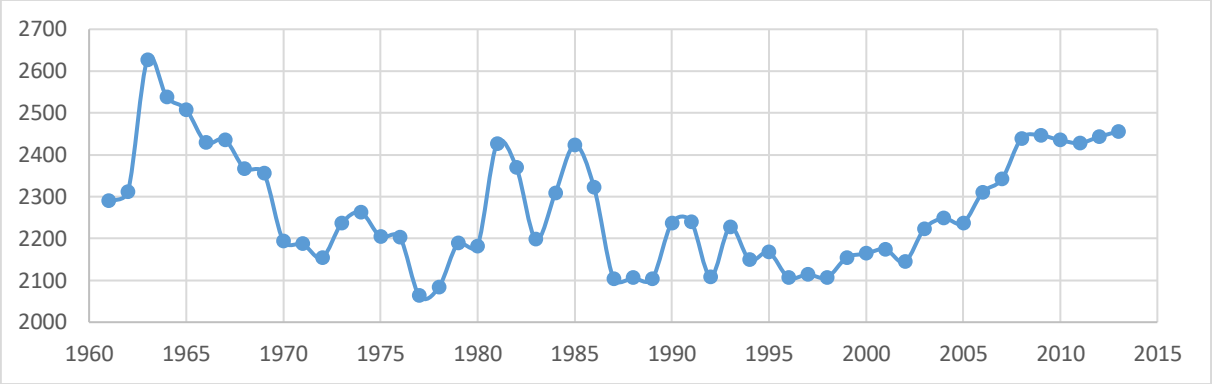
After the independence, this availability, which is 415 kg / person in 1961, increases to 466 in 1965. Very quickly we reached a decrease of 385 in 1970 because of the droughts of the 70's. The latter continue to exert their after-effects alongside structural adjustment policies and trade liberalization for the next three decades. In 2000, with the new political alternation and the priority given to agriculture, there is a linear upward trend in individual availability.

Senegal records a slight change in food availability in kg / person, compared to Brazil. The latter has a strong linear trend upwards regarding its food availability in kg / person. From 498 kg/person in 1961, it is 669 in 2011.

Another parameter for measuring food security via its "availability" facet is the minimal food energy requirement. It is estimated in kilocalories per person per day. Food energy requirements differ by gender and age, and for different levels of physical activity. As a consequence, the minimum food energy requirements, the amount of energy required for light activity and the minimum acceptable weight for the size reached, vary by country and year according to the distribution of the population by gender and age (FAO, 2008). The WAEMU countries are in the range 1700 - 1780 from 1990 to 2008, the last year of updating these indicators. Senegal's minimum energy requirements are 1740 Kcal / person / day in the years 1990-92, then 1750 in 1995-02 and finally 1760 in the period 2006-08.

Food availability in Kcal / person / day is above average for all periods and follows trend of availability in kg / person / day. This comes down to the crucial importance of good agricultural production.

Fig. 3: Food availability in kilocalories (Kcal / person / day)



Source: FAOSTAT, 2018 and author's calculations

Cereals represent on average 62% of total supplies and 68% of plant products. Rice alone occupies on average 27% of the total food supply and 29% of the availability of plant products. Millet occupies a significant place in Senegalese consumption. It is on average 16% of global availability and 18% of those related to plant products. However, it should be noted that the contribution of this product decreased by 65% from 1961 to 2013.

At the level of animal products, meats bring in Kcal / person / day on average annual 35% and dairy products 28% on total animal products. However, the caloric intake of dairy products has a downward trend of 41% over the period 1961-2013 while meat increases by 19% over the same period.

In Senegal, the food self-sufficiency rate (CAS) averaged 82.8% over the period 1961-2013. Its evolution has a downward trend over the period. From 1961 to 2013 the CAS decreased by 33%. The analysis shows that the country has higher self-sufficiency rates in animal products than in plant products. On average, the CAS of animal products is 90.7%. This rate knows a relative increase of 16% over the period 1961-2013. However, the plant-based TAS has a rate of change of -39%. For these plant products, the CAS average is 81.6%.

The State may decide to increase availability through agricultural production (supply-side policy) or to improve the distribution or accessibility of resources (demand policy). Analyzing the level of accessibility involves questioning the markets, trade policies, the level of inflation, household income, the level of infrastructure, etc. The level of GDP / hbt can be an indicator that influences overall accessibility. It allows, among other things, to track the purchasing power of the household.

GDP per capita (2011 constant international PPP $) is evolving positively in a linear fashion (Figure 26). From $ 1907.6 in 2000, Senegal rose to $ 2,380.4 in 2016, a relative increase of 24.8%. This jump is due to a relative average annual growth of 1.4% per year from 2000 to 2016.

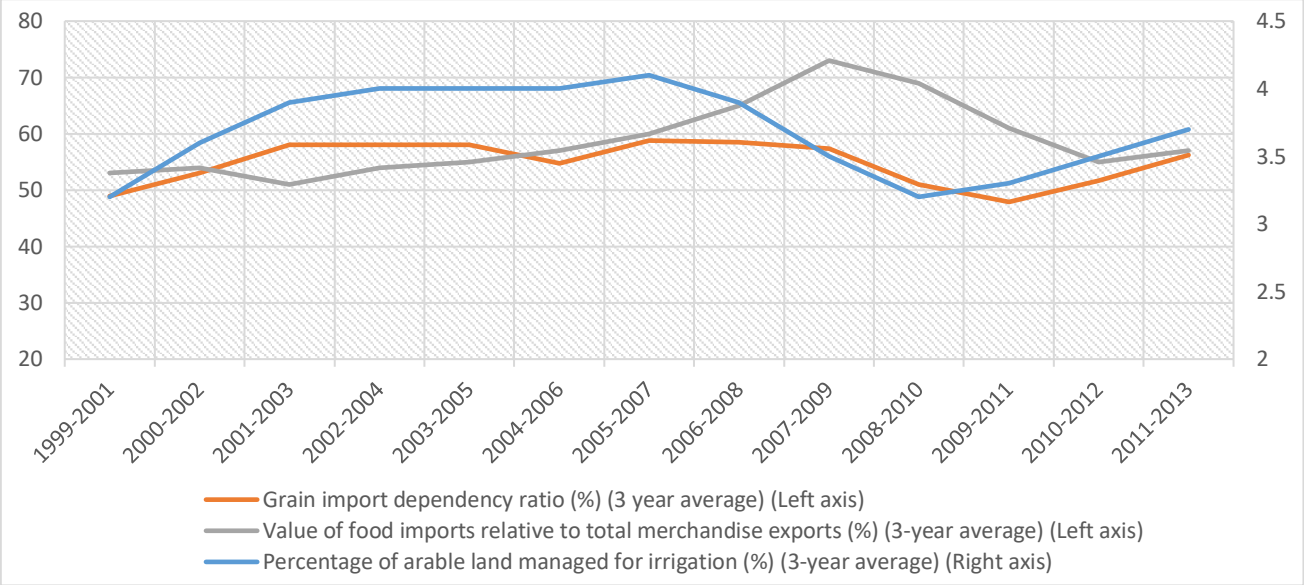
From the point of view of stability, the measurement indicators may relate to dependence on cereal imports, on the value of imports over total merchandise exports, on the percentage of arable land managed for irrigation and / or on the variability of food availability.

Apart from the years 2008 - 2010, there is an evolution, albeit a weak one, of the first three indicators. Arable land for irrigation is very low in Senegal and represents less than 5% of total arable land in the period 2000 - 2016. The period 2008 - 2010 corresponds to the world food crisis which did not spare

Senegal. From 2007 to 2010, the percentage of arable land managed for irrigation decreased by 22%, from 4.1% to 3.2%.

The rate of food dependency is growing. This makes the country vulnerable to exogenous food shocks as was the 2008 food crisis. This compromises food stability.

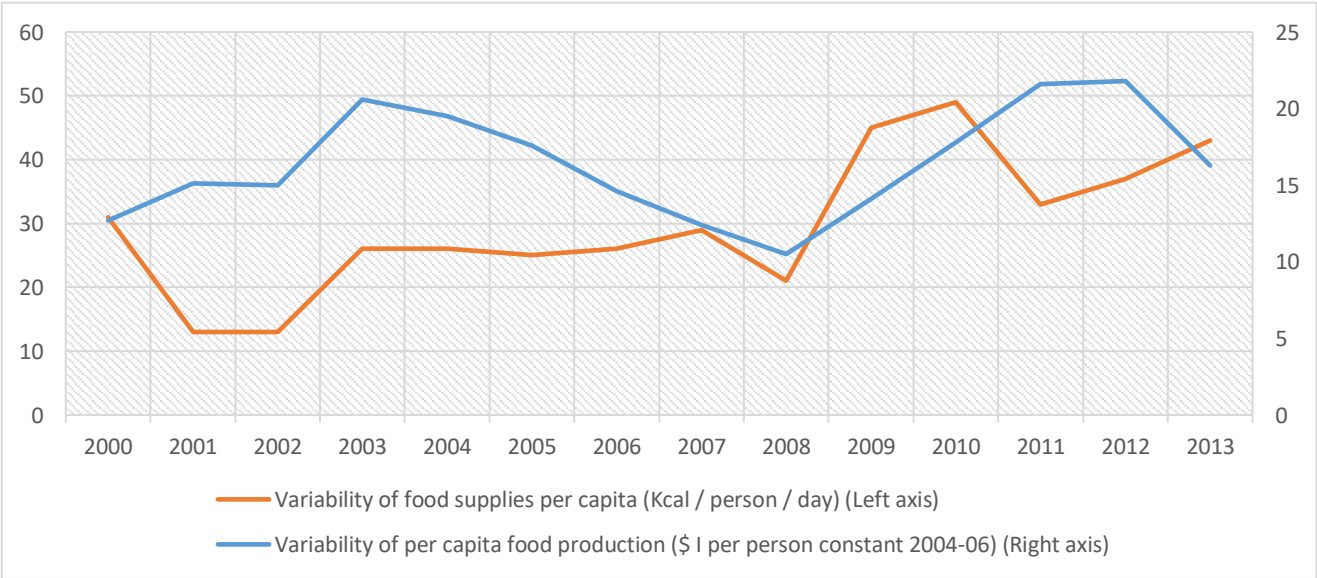
Fig. 5: Stability of food products



Source : FAO (2018) et calculs de l'auteur

Food availability does not change steadily. The variability of food supplies by $ I and Kcal is low in 2008, the year of the food crisis with soaring prices at the international level. The following graph shows the resumption of variability in food availability from 2009 but with a decrease in variability in Kcal / person / day in 2011.

Fig. 6: Evolution of the stability of food products



Source : FAO, 2018 et calculs de l'auteur

Use, the ultimate source of food security, can be understood through household access to improved sanitation services, improved water sources, the percentage of children under 5 years of age being behind of growth, the percentage of children under 5 years wasted.

Access to improved sanitation services increased from 67.4% in 2000 to 74.1% in 2009 and 78.5% in 2015. The level of access to improved water services is 40, 3% in 2000 to 44.6% in 2009 and 47.6% in 2015.

Senegalese households' access to improved sanitation and water services has an upward trend from 2000 to 2015. The former is growing by 18% in this 15-year period and the latter by 16%. Both have an average annual change of 1.12% and 1.02% for the same period 2000 - 2015. For the use there is an improvement, although slow, but almost stable in this period.

Several variables are used to assess in a comprehensive manner the state of food security in a given country. These variables aggregate several parameters related to food availability, accessibility, stability and use. The prevalence of undernourishment is one of the most commonly used variables in determining the proportion of the undernourished population.

In Senegal, the prevalence of undernourishment follows a downward trend from 1990 to 2016. From 24.5% in 90-92, this prevalence is 31.5% in 97 - 99 (highest rate in the period 1990 -2016). Then the prevalence rate declined gradually to a level of 10% in 2014-2016. This decline is on average 6% between 1998 and 2016.

This represents a clear step forward in the fight against food insecurity. Thus, improving food availability in Kcal / person / day and kg / person / day, leaps forward in utilization and stability, has implications for the prevalence of undernourishment at the national level.

The variable defined by IFPRI, the World Hunger Index (IFM), also remains one of the most used in economic analysis. A country whose index is greater than or equal to 30, with a level of hunger extremely alarming, seeks to improve its situation by aiming first at the level simply of alarming MFIs (between 20 and 29.9) then a level of Serious MFI (between 10 and 19.9) then a moderate MFI situation (between 5 and 9.9) and finally an almost zero hungry MFI situation with a low index (MFI <4.9).

From 1996 to 2001, Senegal was in a situation of "severe" hunger with an index of 19.7, 19.2 and 19.3 respectively in 1996, 2000 and 2001. It was close to an alarming level of hunger according to the scale above. From 2005, the index is 13.7, maintained almost until 2013. Thus, we approach the "moderate" situation.

This is a breakthrough in the march towards a control of food security in all these aspects: availability of food, accessibility, stability and use.

According to the prevalence of undernourishment measured from minimum energy requirements and the global hunger index, although not available for all years, Senegal's food balance sheet remains improved and tends towards a progressive situation allowing to eradicate little by little hunger. This improvement may be due to several factors endogenous to food security, such as the evolution of these different components or factors exogenous to these components, such as agricultural financing.

IV. Conclusion

In the underdeveloped countries, agriculture has as main mission to assure the subsistence of the peasants constituting the frankness of the most vulnerable population. This form of agriculture is highly family-based and easily exposed to uncontrollable factors such as climatic variations and inadequate agricultural policies. What is first sought is to cross "the threshold of hunger" (Badouin, 1971). After having crossed the threshold of hunger, agriculture makes it possible to increase the income of the producers and generally actors of the agricultural value chain, in favor of nonagricultural expenditures. Thus, at this level the stage of subsistence farming is reinforced by that of exploitation. The evolution of the process leads to crossing the "threshold of isolation" with the integration of foreign markets. Thus, one of the functions of the agricultural sector is to provide foreign exchange to the economy (Faye et al., 2007) through exports.

Finally, developed agriculture can actively contribute to economic and social development by crossing the "threshold of stagnation" (Badouin, 1971). This level consists in positively and strongly impacting the economic growth of a country. This growth is a corollary to social development through the access of households to quality food products, competitiveness, the adequate and regular supply of the industrial sector, the reduction of unemployment.

Overall, agricultural growth has a weak upward trend over the period 1961-2014 (annual average production of 2 921 502 tonnes). The average annual growth rate is 6.3%. The weak evolution of agricultural growth has a negative impact on agricultural output and consequently on the level of food security. Thus, agriculture contributes to the national GDP. From more than 24% in 1987, its contribution rose to 18% in 2016, when other sectors are becoming more productive.

The food balance sheet, according to the prevalence of undernourishment measured from the minimum dietary energy requirements and the global hunger index, is improving more and more from 1992 to 2016. The IFM has gone from 19, 7 points in 1996 to 13.8 in 2016, but does not yet allow Senegal to leave the zone of insecurity "serious". There is also a linear decline in the prevalence of undernourishment over the period 1992-2016.

Références

[1] Badouin R. (1971), L'économie rivale, Collection DUNOD.

[2] Berthé et Keita (2009), « Investissements agricoles et croissance économique en vue de la réduction de la pauvreté », Programme de Développement de l'Agriculture en Afrique (PDDAA).

[3] Diallo A., Mbaye B. B., Thiaw K. (2013) « Productivité agricole, croissance économique et pauvreté au Sénégal : analyse par un MEGC dynamique récursif en micro simulation », Direction de la Planification et des Etudes Economiques, Sénégal.

[4] Diagne A. (2013), « Efficience des dépenses publiques productivité et croissance dans l'agriculture sénégalaise », Consortium pour la Recherche Economique et Sociale, 2013/49.

[5] Douillet M., Girard P. (2013), « Productivité agricole : des motifs d'inquiétude ? », FARM, note n°7.

[6] Faye et al. (2007), « Implications structurelles de la libéralisation sur l'agriculture et le développement rural au Sénégal (1950-2006) », première phase, rapport final, I-PAR, BM/cf/ASPRODEB, Dakar.

[7] Girard P. et al. (2013), « Renforcement des capacités des agriculteurs en Afrique de l'Ouest: viabilité d'un service de conseil agricole mis en place par une organisation de producteurs », Champs d'acteurs n° 2, Fondation FARM.

[8] Harrigan, J. (2012 à venir). « The Costs of Food Security and Food Sovereignty Policies in the Middle East: A Case Study of Lebanon and Jordan ». Chapitre 3 in Eds. Kamrava, M. et Babar, Z., Food Security and Food Sovereignty in the Middle East.

[9] IFPRI (2015), Indice de la faim dans le monde : relever le défi de la faim : atteindre l'objectif faim zéro, Washington

[10] Mazoyer M, Roudart L. (2009), « Des agricultures manuelles à la motorisation lourde : des écarts de productivité considérables », Grain de sel n° 48.

[11] Mellor (1999), « Pro-poor growth, the relation between growth in agriculture and poverty reduction », Préparé pour l'USAID/G/EGAD

[12] Mounier (1992), « Les théories économiques de la croissance agricole », Coédition INRA-Economica.

[13] Rostow W.W. (1960), « The Stages of Economic Growth: A Non-Communist Manifesto », Cambridge University Press.

[14] Sen, A. (1981), « Poverty and Famines: An Essay on Entitlement and Deprivation ». Oxford, Clarendon Press.

Reinforcing academic outcomes and satisfaction in Higher Education through the incorporation of Positive Leadership

Dr. Agueda Benito, Dr. Veena Dutta, Dr. Alka Dwivedi, Khanka S, Dr. Vipul Sharma
Laureate International Universities, Spain

Abstract

The engagement of students and faculty in the teaching and learning process of Higher Education is key to ensure the career readiness of graduates, and their future ability to make a positive impact in their communities and the world. It is in this context that Positive Leadership has been piloted in a young, comprehensive Indian university, where the two professors that led this innovative approach were trained so that the delivery of their subjects enhanced the principles of positive meaning, positive climate, positive communication and positive relationships. The research carried out during this pilot study incorporated a mixed-methods approach, which allowed to scientifically assess the very positive impact of the initiative. Both students and faculty appreciated a more human methodology and reported highly satisfactory results, including boosted engagement and improved grades.

Keywords: Positive Leadership, Higher Education, academic outcomes, learning effectiveness, educational improvements.

1. The opportunities of Positive Leadership

Leadership has emerged as a very significant concept researched over the years. The impact of a leader on organizational wellbeing, bottom line, and employee performance have been investigated and recognized by many researchers (Kahai et al., 2000; Balthazard et al., 2002; Peterson et al., 2003; Arslan & Staub, 2013). Thousands of books, articles and multiple other resources address the topic and provide analyses, theories and valuable recommendations, some of them general, some them only addressing some particular aspects of leadership or concrete classifications. This is the case of positive leadership, which is related to the concept of positive psychology, and where a recent article by Lino (2017) defends that the essence of being a positive leader implies focusing on the best of the others around you, and simultaneously making every effort to become the best of oneself.

Among the numerous theories and conceptualizations of leadership, there is one particular approach that excels because of the outstanding results it is able to generate, that is Positive Leadership, a concept created and communicated by Dr. Kim Cameron, from the University of Michigan, US. Positive Leadership is developed along the lines of four strategies: generating a positive climate, that enables positive relationships, where positive communication is fostered, and where the positive meaning of what we do is always present (Cameron, 2012).

Two of the key concepts beyond the principles of Positive Leadership are gratitude and recognition. Numerous studies like the one carried out by Roberts (2005) prove that showing gratitude and recognition improves the working climate and increases productivity. When employees observe appreciation of their work, their satisfaction increases and they are moved to keep up with much better levels of work performance. Even health is positively affected by feeling valued, as reported in the online survey that the American Psychological Association conducted (APA, 2012). And it is also true that in a university environment, these findings would apply too. According to Benito and Scott-Milligan (2018), faculty recognition should be a key component of the institutional strategy, the authors believe it needs to be multidimensional and transparent, that it should be provided formal and informally, and originate from the institutions themselves, academic leaders, peers and students.

The principles of Positive Leadership make a lot of sense, but one of the most valuable aspects of this approach is the simplicity of its application. Cameron (2013) provides clear recommendations and an interesting set of tools and techniques that organizations can apply in order to generate extraordinary results. And this seems to have been the case of multiple companies belonging to a great variety of sectors, that range from nuclear energy management, to health services or financial services, where a climate of positivity brought along incredibly virtuous outcomes at all levels. Cameron (2012) provides empirical evidence to demonstrate that positive leadership strategies produce extraordinarily positive results in all these types of organizations.

2. Piloting Positive Leadership in Higher Education

The success of Positive Leadership in many different contexts makes it an interesting approach that could perhaps be expanded to other fields like Education. The members of the present research initiative agreed that it might be a good idea to transfer this very promising research-based approach, which produces extraordinary success, focuses on strengths and enhances virtuous behaviors to some of the courses that are taught in their university. It seems to make sense that the teaching and learning process could benefit from the enhancement of positive communication, positive relationships, positive climate and positive meaning.

Even though no previous initiatives or research have been found regarding the implementation of Positive Leadership in Higher Education, there are some interesting experiences that involve a recent concept, Positive Education, that Professor Martin Seligman from the University of Pennsylvania developed. White (2016) defines Positive Education as “a blend of evidence-based learning from the science of positive psychology and best practices in learning and teaching”.

Positive Education is related to the principles of positive psychology, and on numerous occasions it has proved that its key outcomes are not only well-being and happiness but also academic success. There are multiple local initiatives, most of them taking place in the primary and secondary levels of Education, many of which are compiled in the report on the State of Positive Education that resulted from the World Education Summit of 2016, published by Seligman and a team of authors (Bott et al, 2016)

There is not a great number of initiatives where Positive Education is present in Higher Education, but if there is one that can be easily recognized as a best practice, that is the case of Universidad Tecmilenio. who claims to have been recognized as the first positive university in the world, and whose academic model seems to be in good synchrony with Positive Education: "The most disruptive feature of this model is the importance it gives to the students' long-term well-being, which is based on Positive Psychology and supported by the Institute of Happiness Sciences, created by the Universidad Tecmilenio in 2013" (Tecmilenio, 2019)?

The present research project is part of a broader international initiative, inspired by Benito et al (2018), and it constitutes one more example of how positivity, in our case through the incorporation of Positive Leadership, can be introduced in Higher Education. In parallel to our institution, another three from our network of universities have initiated similar pilot studies, with the same approach and similar structure and research methodology. Only very recently, published after the present pilot study started, the projects carried out at Universidad Europea de Madrid, in Spain, and the one carried out at Pearl Academy, in India, constitute successful illustrations of how Positive Leadership can be incorporated into Higher Education (Benito et al, 2019[1] and Benito et al, 2019[2]).

The institution where this study took place is a UGC-recognized and NAAC-accredited Indian university, which offers undergraduate and postgraduate courses and was established in 2003. The research was developed in two different subjects, one of them an online undergraduate general elective titled Leading in a Dynamic Era, the other one a face to face graduate course in International Finance, corresponding to the MBA in Energy Trading program.

The subjects, and their corresponding instructors were selected quasi-randomly, ensuring calendar compatibility, as well as including two different modalities and educational levels.

Once the faculty members were identified, the following steps took place:

- Faculty were informed about the initiative and asked to participate, both of them expressed their interest and willingness to join.
- Faculty were then trained. The professional development program in which they participated consisted of reading about Positive Leadership (Cameron, 2012); doing an online training module that was developed specifically for this purpose; participating in a first workshop regarding the application of the Faculty Guidelines that were created; participating in a second workshop regarding the actual lesson plans in their respective subjects; and participating in several joint sessions and support meetings with the rest of the research team.
- Faculty implemented Positive Leadership in their subjects. They planned every lesson and identified the Positive leadership ingredients they would incorporate every day.
- Faculty delivered their 'enhanced subjects´ and helped to measure the impact on students.

It was the assumption of the research team that the expectations identified by Benito et al (2018) would be our work hypothesis. Therefore, this study tries to prove that by introducing Positive Leadership in the teaching and learning process, we will contribute to: Humanize the teaching and learning process, increase

faculty and student engagement, increase student satisfaction and improve learning effectiveness and academic outcomes

3. Research methodology

The research study presented in this paper followed a mixed-methods approach, where quantitative and qualitative information was sequentially collected. Then the data analysis and the integration of information processes were carried out, followed by the determination of conclusions.
The quantitative information came from surveys and from the extraction of objective academic information available in the university LMS and SMS. Data were processed and the corresponding descriptive statistics were determined, mainly means and percentages that were then compared with the results of previous years.
A survey was utilized to collect some key quantitative information regarding the impressions of the students that participated in the pilot. Only two demographic questions, regarding age and gender, were included. The survey contained some Likert questions (1-5 scale) regarding student satisfaction, engagement, learning and the contribution of the instructor to the students´ development. Students were also asked if, in comparison with an average subject, the experience was better or not and if they would recommend the subject. And finally, students were asked to express what they had enjoyed the most and were given the opportunity to add any comments they had.

Additionally, the study incorporated some more quantitative information, specifically attendance and grade distribution, which were available in the university information systems.

The qualitative information was obtained from two focus groups with students, as well as an interview with the two faculty members. The focus groups were conducted, recorded and analyzed to be able to extract the main ideas, which are shown in the corresponding part of this paper. They were organized close to the subject end, and were carried out by two of the researchers that had not had direct contact with the students. Both were conducted according to the same guidelines and addressed the following topics: The starting point was the students´ description of their experience and how positive it was. They were then requested to refer to their interaction with the professor and with other students, and describe the learning environment. Students were asked about the connections with their future career, and if thy personally valued the human component in their learning experience. Finally, students were asked if they would recommend this pedagogical approach.
In order to ensure higher accuracy, the case of the interviews with faculty, the two instructors were asked to summarize their appreciations in writing, which are presented as direct quotes in the corresponding section of the present article.

4. Quantitative results: students´ survey and academic outcomes

As it was mentioned before, the participating students were asked to complete a survey about their experience, whose results are summarized in the table below. As it can be appreciated, the results are quite

positive, particularly when evaluating their learning (the majority of the students affirms to have learnt much of very much in the two subjects), when recognizing the contribution of faculty to the students´ development (100% and 95% respectively) and when recommending the subjects (100% and 80% respectively).

It is interesting to appreciate that the results of the online subject were not as good as those of the face to face subject, which is a generalized finding in the university where this pilot took place, where for the moment the online offerings are still very limited.

Table 1: Results of the student survey

	Face to Face module	*Online module*
What is your age range?	100% 20-30	80% below 20; 10% 20-30
What is your gender?	56% female	30% female
How satisfied are you with your experience in this subject?	4.1 (btw very and highly satisfied)	3.6 (btw quiet and very satisfied)
How engaging did you find the classes?	78% very/highly engaging	45% very/highly engaging
How much did you learn in this subject?	89% much/very much	85% much/very much
Did the instructor contribute positively to your development?	100% yes	95% yes
Was the experience better than an average subject?	89% better	63% better
Would you recommend this subject to other students?	100% Yes	80% Yes

Beyond the students´ appreciation of their experience, some more quantitative information was gathered. The two graphs below show the grade distribution and attendance rates of the face to face subject. The Positive Leadership approach presents a much greater number of A+ and A grades (30% and 35% respectively) than those of the same subject when it was taught during the previous semester (2% and 30% respectively). Additionally, attendance rates are much higher when the Positive Leadership approach is incorporated. As it can be appreciated, most of the students attended between 90% and 100% of the sessions, which is a much better result than that of the previous semester, when the maximum attendance rate was 80%.

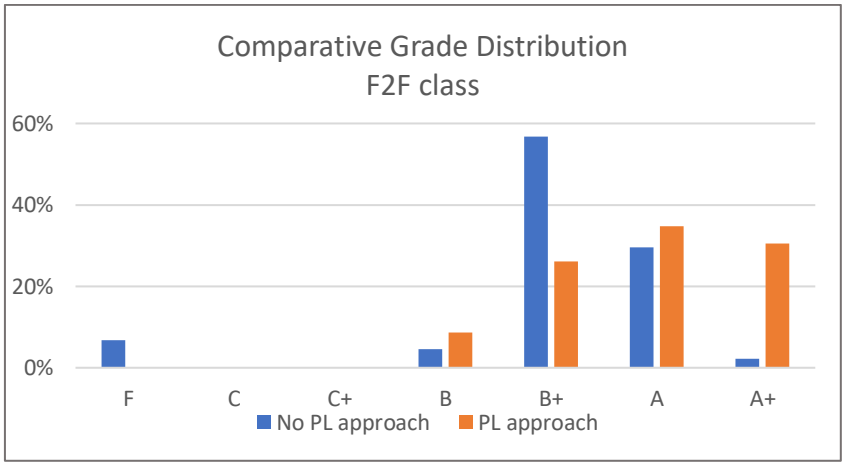


Figure 1

Grade distribution of the face to face subject with and without the incorporation of Positive Leadership

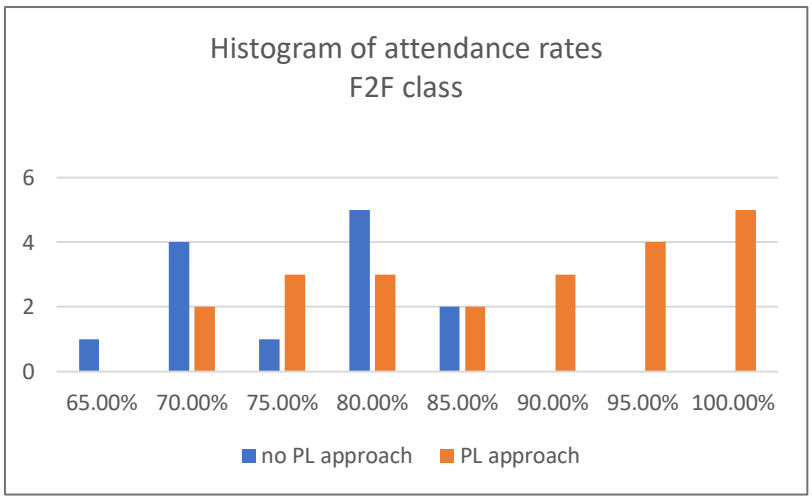


Figure 2

Attendance rates of the face to face subject with and without the incorporation of Positive Leadership

With regards to the online module, the grades of the students were also better than those of the semester before, when positive leadership had not been incorporated. The figure below shows the results.

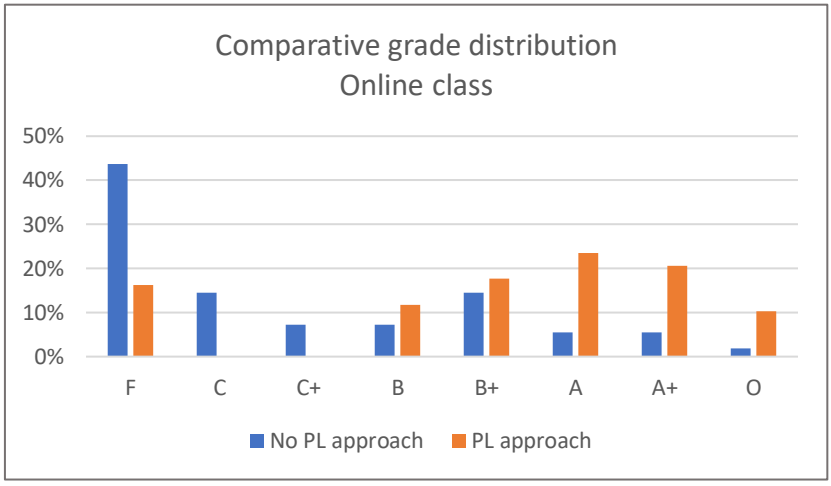


Figure 3
Grade distribution of the online subject with and without
the incorporation of Positive Leadership

In the case of the online subject, the analysis of attendance rates was replaced by the analysis of connection time. Results show that average connection time during the total duration of the subject doubled, and the student that connected the most, did it approximately six times as much as in the student that engaged the most in the previous semester. The table below presents these results.

Table 2
Student connection time in the online subject with (2018) and without (2017)
the incorporation of Positive Leadership

	2017	**2018**
Average connection time	1,091 min	2,078 min
Maximum connection time	5,654 min	35,279 min
Number of students connecting > 1,000 min	46%	35%

5. Students´ qualitative impressions

A key component of this study is constituted by the qualitative information that was extracted from the two focus groups with students, which were organized immediately after the finalization of their subjects in December 2018.

Focus group 1: Face to face subject

The outcome of the first focus group was very positive. Some direct quotes from the participants include the following statements: “The environment of the class was comfortable”, “We could ask any questions

easily", "The faculty welcomed questions asked in class and the interaction was two ways", "We received personalized attention".
The students unanimously agreed that the International Finance lectures were positive. In describing the interaction with the professor, the students stated that faculty was calm, interested in solving the problems, welcoming in solving their doubts, and always ready to provide real, practical examples that would clarify doubts.
The students described the class environment as positive and enthusiastic. Faculty would call everyone by name and that improved the interaction. There were group assignments and discussions in the class. Students emphasized that they were allowed to interact among themselves, contributing to the understanding of any student in the class. They also stated that the interaction was better than in other classes.

The students also said that they were able to identify each other's strengths and it created a strong bond between each other. Participants agreed that the faculty used simple language and engaged all students, so they wanted to attend the lectures. The students also reported that the students received personal time from faculty, and that the faculty was happy to give individualized attention to the students in case some topic needed more time by the student.
The students stated that faculty maintained a good class environment with strict discipline around the use of mobile phones in class. Once the ground rules were set, there was no distraction. One of the participants said that "for an hour and a half, not a single minute was wasted. We were never bored in the class – the time flew in the class". Even more, another participant mentioned that "all of us who had no interest in the finance started having interest in class"

About the question asked regarding the applicability of the lectures to the students´ future, the students stated that the course was of great value and would help them become better professionals.
The student highlighted how the personal touch, like calling them by names, the individual attention and personalized problem solving, helped them to understand the subject better. They stated that "the faculty was high energy and passionate" and that "we remember all the concepts so much better because of the examples in a very engaging class". All students unanimously agreed that they will strongly recommend the pedagogy.

Focus group 2: Online subject

The students complimented the online course and mentioned that the course helped them realize their creative potential. The modules were interesting and they learned a lot about leadership. The students mentioned that the professor was interactive and called the student by first names. The faculty would encourage student participation in every topic, and sent timely messages and feedbacks to the students. The feedback was given in a positive way and students cherished that even the negative feedback was also given in a constructive manner.

The students appreciated the human touch by the faculty – like personalized e-mails to students complimenting their work, and particularly enjoyed the videos that the faculty herself recorded and shared during the module, which brought them much closer to their instructor than in other online courses.

Given the limitations of the course contents and learning activities, students got no opportunity to work in groups. However, there was much more interaction in the online discussions, where students were encouraged to share comments with the rest of the students. Engagement was higher, however, one student mentioned that he was not interested in the group interaction, and therefore was not connected to many students, because some colleagues would take tangent discussions of not much value to the rest.
In general, students agreed that the class environment was very competitive and enthusiastic. They think the course will help them in future, and unanimously recommend this positive, personalized intervention their professor introduced.

The discourse analysis of the students done on the recorded sessions provides some clear emerging concepts that the figure below summarizes:

Figure 4
Key concepts emerging from the discourse analysis of the focus groups

6. Impact on faculty

The direct voices of the faculty that participated in this pilot initiative are presented below. The text contains their personal impressions, reflections and learnings:

Professor 1, face to face course:
"It was a wonderful experience. The positive leadership book first talks about the philosophy of positive leadership as a concept and then a proper mechanism is given to practice it. Even after reading the book, I was slightly susceptible and doubtful about the practicality of this whole concept. However, I found that use of positive leadership strategies leads to positive deviance in the performance of students. Special attributes of positive leadership strategies are that these are outcome based.

This time I incorporated the strategies of positive leadership in my teaching pedagogy and the results were different in a measurable way. The strategies of positive leadership give the perspective of how to attain abundance in every aspect of life by focusing on one's strengths and capabilities. Many positive outcomes stimulated by positive communication and positive relationship, for example, discernible enhanced enthusiasm and desire to learn the concepts of the subject among students"

Professor 2, online course:

"The entire exercise of implementing positive leadership in class did take time and effort but the result made whole exercise worth it. The students who logged in regularly to the course remained quite engaged. They were very happy to get the feedbacks and prompt resolution of their concerns. Social presence of the instructor which was created through regular announcements and emails and discussions did create a human connection with the otherwise distant students. As compared to the other online courses, students enjoyed this one more because of the human connection created by implementing the positive leadership principles in the course.

Implementing positive leadership strategies in my online class was an enlightening experience. Through it, I consciously maintained a positive climate in the virtual class by appreciating the efforts of the students and providing feedbacks on a continuous basis. I also tried developing positive relationship with the students by positive communication. All these efforts resulted in higher levels of engagement of the students in the class. The student reviews reflected that they highly appreciated this positive connect with their instructor.

In this exercise, I realized that creating a human touch in our academic delivery definitely motivates the students. It particularly becomes crucial in an online environment, where the interactions between the student and the instructor are mediated by technology and most of the interactions may be asynchronous. Earlier I would knowingly maintain certain 'distance' with the students in the class because I believed that the students would value the academic delivery more than establishing 'positive climate' or 'positive communication' or 'positive relationship'. However, I realized that in addition to a good academic delivery in the class, students do value the 'positive leadership'. In fact, it is the positive leadership in class which catalyzes the absorption of academic content by the students.

The experiment has changed my fundamental belief about teacher-student relationship. I will definitely use positive leadership strategies in all my classes from now onwards and I am sure if other instructors do the same, they will get a positive result in terms of increased student engagement in the class".

6. Conclusions and recommendations

After the realization and analysis of the pilot study presented in this paper, the overall conclusion is that the introduction of the principles of Positive Leadership has created a favorable learning context and high satisfaction levels of students and faculty. Despite the limited scope of our study, it can be affirmed that Positive Leadership has also proven itself as a valuable tool in Higher Education.

By clearly defining the positive meaning of their subjects, creating a positive learning climate, boosting positive communication among students and faculty and generating positive relationships between them,

faculty have been able to improve learning and motivation of their students. The various components of the original hypothesis have all been validated in the research study, and therefore, in our context, it has been proved that Positive Leadership can humanize the teaching and learning process, increase faculty and student engagement, increase student satisfaction and improve learning effectiveness and academic outcomes.

There might be many other components that are crucial elements in the learning process and students´ readiness for a successful career, but the learning environment and the pedagogical approach of faculty are critical elements that have a lot to offer to the Higher Education arena, and it is the belief of the authors of this paper that Positive Leadership can constitute a very valuable approach that is worth exploring.

In the case of the university where the initiative took place, a phased rollout plan will be implemented, where an increasing number of volunteer faculty will be trained and supported to effectively incorporate Positive Leadership in their courses. Further research will determine if the positive effects can be confirmed at a greater scale.

7. References:

1. A. Arslan, & S. Staub , "Theory X and Theory Y Type Leadership Behavior and its Impact on Organizational Performance: Small Business Owners in the Åžishane Lighting and Chandelier District." *Procedia-Social and Behavioral Sciences*, Elsevier, (2013), 75, 102-111

2. American Psychological Association, "APA survey finds feeling valued at work linked to wellbeing and performance" (2012, March 8). Retrieved from: https://www.apa.org/news/press/releases/2012/03/well-being.aspx

3. P. Balthazard, D. Waldman, J. Howell, and A. Atwater, "Modeling performance in teams: the effects of media type, shared leadership, interaction style and cohesion", Paper presented at Academy of Management Meeting, Denver, CO , (August, 2002).

4. A. Benito and F. Scott Milligan, "Hearing the voice of faculty: Global recommendations for faculty recognition in Higher Education institutions", *Higher Learning Research Communication*, 8(2), PKP Publishing, (2018), pp. 1-8. http://dx.doi.org/10.18870/hlrc.v8i2.433

5. A. Benito, K. Canteri, M. Grimley, S. Khanka, C. Lajud Desentis, A. Moreno Melgarejo, S. Morley, N. Paul, T. Vasu, (2018): "Introducing Positive Leadership in the teaching & learning process of Higher Education", *International Journal of Arts and Social Science,* 1 (2), (2018), 33-42. http://www.ijassjournal.com/2018/V1I2/384657230.pdf

6. A. Benito, M. Jiménez-Bernal, C. Lajud-Desentis, & A. Moreno-Melgarejo, "Expanding the Limits of Positive Leadership into the World of Higher Education**",** *International Journal of Learning,*

Teaching and Educational Research, 18 (2), (2019), pp. 29-42. http://ijlter.org/index.php/ijlter/article/view/1347/pdf

7. A. Benito, B. Srinivasan, R. Yadav, N. Paul, R. Majithia, S. Mahajan, and N. Abraham, 2 "Improving learning in Higher Education: Case study of the effects of Positive Leadership on students and faculty", International Journal of Arts and Social Science, 2 (1), (2019) pp. 36-45. http://www.ijassjournal.com/2019/V2I1/414657277.pdf

8. D. Bott, H. Escamilia, S.B. Kaufman, M.L. Kern, C. Krekel, R. Schlicht-Schmälzle, A. Seldon, M. Seligman, and M. White, "The State of Positive Education", Presented at The World Education Summit & the International Positive Education Network (IPEN), (2016). Retrieved from: https://www.worldgovernmentsummit.org/api/publications/document/8f647dc4-e97c-6578-b2f8-ff0000a7ddb6

9. K. Cameron, Positive leadership: Strategies for extraordinary performance, Berret-Koehler Publishers, Oakland, CA, (2012).

10. K. Cameron, Practicing Positive Leadership: tools and techniques that create extraordinary results, Berret-Koehler Publishers, San Francisco, CA, (2013).

11. Kahai, S. S., Sosik, J. J., & Avolio, B. J, " Effects of leadership style, anonymity, and rewards on creativity-relevant processes and outcomes in an electronic meeting system context" (2003) . https://doi.org/10.1016/S1048-9843(03)00049-3

12. Positive Education Practices and Our Must-Read Book List. (2018). Retrieved March 8, 2019, from https://positivepsychologyprogram.com/positive-education-books-practices

13. Peterson, R. S., Smith, D. B., Martorana, P. V, & Owens, P. D.. The Impact of Chief Executive Officer Personality on Top Management Team Dynamics: One Mechanism by Which Leadership Affects Organizacional Performance. (2003) https://doi.org/10.1037/0021-9010.88.5.795

14. Roberts R.L. (May, 2005). *The relationship between rewards, recognition and motivation at an insurance company in the Western Cape*. [Masters Thesis]. University Of The Western Cape.

15. Universidad Tecmilenio - Filosofia institutional | Universidad Tecmilenio. (2009.). Retrieved March 8, 2019, from http://tecmilenio.mx/en/filosofia-institucional

16. White, M. A. Why won't it Stick? Positive Psychology and Positive Education. *Psychology of Well-Being*, *6*, 2. (2016). https://doi.org/10.1186/s13612-016-0039-1

Non-formal education: Development and learning

Marjorie Cristina da Cruz Bernardino, Cristina Schmidt Porteró, Vinicius Freitas
Universidade de Mogi das Cruzes
Brazil

ABSTRACT

It is proposed to study the learning and contribution of the social educator to human formation and its regulation as a professional of the educational area. It is a study of non-formal education and the role of the social educator, as well as its relationship with public educational policies and socio-cultural phenomena. It is based on the epistemological perspective on education (FREIRE, 1983; GADOTTI, 2005; GOHN, 2003, 2005, 2009; LIBÂNEO, 2012). It is an exploratory and descriptive research, of qualitative approach, according to socio-cultural studies, evaluation of public policies; Analysis and description of actions of education. The aim is to verify the extent of public policies to promote dignity in social and ethnic minorities, at national level, in addition to their participation in the emancipation of the individual and the promotion of the quality of life and human dignity.

Key words: Educational Policies. Emancipation. Regulation. Dignity

1. Introduction

This article deals with a qualitative research on the development of human knowledge and its forms of learning. Its purpose is to outline the profile of the social educator, a person who is active in non-formal education, who influences current society as a citizen educator and social facilitator.

The guarantee of education and citizenship is included in our Law of Guidelines and Bases of National Education No. 9394, of December 20, 1996 (LDBEN) art. 2, and it is an acquired right, according to the Federal Constitution of 1988, Chapter III Art. 205: Education, the duty of the family and the State, inspired by the principles of freedom and the ideals of human solidarity, aim at the full development of the student, his preparation for the exercise of citizenship and his qualification for work. (BRAZIL, 1996). It is the responsibility of all society represented by the government, acting, the culture of learning not only formal, guaranteed by the State, and linked to the school, but also the notion of knowledge and non-formal learning, such as the common sense we bring with us and we develop according to the history of life, culture and environment.

This is also the thinking expressed by Goldemberg, in a study published in 1993, emphasizing the need for a new education system that universalizes access, making the student a citizen. It is not enough to educate, just the scientific act of learning. Education must also seek the exercise of citizenship and the emancipation of the citizen. Education as a transversal actor, which is for human formation and seeks to analyze the relations of society with the whole articulating society in an effort of transformation.

2. WELFARE STATE AND THE QUALITY OF EDUCATION IN BRAZIL

The debate on the management and financing of public policies has occupied a prominent place in recent years, especially from the new state configuration resulting from the reform process promoted in Brazil in the 1990s. With the explosion of the international crisis of the capital system in 2008, the issue remains at the center of the concerns of those who govern the world's great powers as well as the rulers of peripheral countries, given the foreseeable limitations to the development of social policies, which become even more necessary in times of crisis such as has been affecting the entire planet. The provision of education and schooling, in the Brazilian case, is ensured through federated entities (Union, states, DF and municipalities) based on the structuring of their own educational systems. It is observed that this process is historically marked by the binomial "decentralization, deconcentration of educational actions" (CONAE, 2010, p.31).

An avalanche of evaluations has plagued educational institutions. National examinations or mechanisms were developed for a large-scale standardized evaluation of the first year of primary education, such as Provinha Brazil (BRASIL, 2007c), the Basic Education Evaluation System (BRASIL, 2005b), the National Higher Education Examination (ENEM) (BRASIL, 1998), the National Student Performance Exam (ENADE) (BRASIL, 2011b), the National System for the Evaluation of Higher Education (SINAES) (BRASIL, 2004a), the Exame (BRASIL, 2004b), the System of Indicators of Results (SIR) of the Postgraduate Program defined by the Commission for the Improvement of Higher Education Personnel (CAPES) (BRASIL, 2007d). Certainly, evaluative processes are part of the work routine of the teacher interested in knowing the level of appropriation by the students of the knowledge taught, to reorient their classes, to identify where the students' difficulties are, to review work methodologies. The process evaluation and at the end of the year allow to assess the possibility of the student to continue his studies or not. Assessing is accurate. However, in recent times, reification of quality, taken as an absolute value in evaluation debates, seems to have become the mainspring to generate animosities in the field of public policies and in relation to teachers. Many of the actions foreseen in the Education Development Plan (BRASIL, 2007b).

It is justified to consider educational public policies, based on the National Education Guidelines and Bases Law No. 9394, of December 20, 1996, and according to the UNESCO Report (DELORS, 1998). From these milestones, education presents principles that, in addition to reinforcing increasingly the responsibility on the cognitive knowledge adapted to civilization, since these are the bases of the competences of the future, they also include, in its scope, the social responsibility.

Since then, educational policies are considered not only as a permanent process of enriching knowledge, skills and know-how, but also a privileged way of building one's own person, of relationships between individuals, groups and nations. In the contemporary scenario, where the mobility of subjects imposes challenges to societies, the role of education and public policies in education and in dignity is relevant. In the second half of the 1990s, the pillars on which education must be sustained in the 21st century are seen as the Necessary Utopia, because in addition to cognitive knowledge, learning to learn, and skills, learning to do , for the development of humanity, are inserted: learning to live together, or to live together, to learn to be (DELORS, 1998).

The IDEB is an important indicator in that it shows weaknesses in Brazilian schools related to flow and school performance; however, it is insufficient to measure the quality of education by restricting itself to only these two variables, disregarding other equally important aspects of quality, such as school organizational culture, teaching practice, families' socioeconomic and cultural level, and the style of management and leadership.

Currently, the index is considered the great thermometer of the quality of Brazilian education. However, this only shows statistical or quantitative data. However, it hampers schools to comply with certain standards of conduct, especially school management, to achieve increasingly high marks in the IDEB and to achieve pre-defined expectations of school performance (CHIRINÉA, 2010). A survey conducted in 2010, comparing two schools - one with a higher (8.2) and another with a lower (2,4) IDEB - showed that the type of school management, the organizational climate and teachers' sense of belonging are conditions that favor quality.

In addition to these dimensions, it was shown that the socioeconomic and cultural condition of students and their families is also a determining factor for the quality of education. These dimensions are not considered in the composition of the IDEB note, nor in the results presented (CHIRINÉA, 2010).

Thus, in addition to flow and performance referrals, there are other attributes or factors that contribute to the quality of education but are neglected by external evaluation. As a result, and not a quality indicator, IDEB is unable to fully portray the reality of school institutions, because there are other variables that interfere with the quality of education, such as: school management; training and working conditions of teachers; educational environment; pedagogical practice and evaluation, and access and stay in school. Quality, in this sense, is not a watertight factor and cannot be sought only with tests that measure students' cognitive knowledge.

> Such variables lead to or contribute to the quality of education. The size of the school, for example, makes a difference in terms of quality. Smaller schools are easier to manage. Schools with more stable teams and lower teacher absenteeism tend to show better results in terms of quality. The director's profile and type of management can influence the quality of educational processes (CHIRINÉA, A. M.; BRANDÃO, 2015).

For the quality of school education to be formed, it is necessary to consider internal and external inputs, as well as their processes within the school units. The concept of quality can not be reduced only to school performance, nor can it be taken as a reference for a process of accountability and for building a ranking among schools that, in these perspectives, present themselves as a challenge to education, systems public schools, to professionals working in schools, since, in addition to having to initiate educational processes that allow the assumption and strengthening of local identities, attention must also be paid to the plurality of cultures of migrants, which are legitimate and, in turn, influencing and establishing new cultural constitutions in dialogue with local cultures.

In the area of education, two are the state perspectives to be considered. The first of these is the provider State, which acts effectively in the obligatory and free offer of basic education. The other perspective is the Evaluating State, which establishes mechanisms to assess the quality of education delivered in schools and in education systems, based on the same parameters of effectiveness, efficiency and productivity. In the case of education, the State Evaluator measures and evaluates the quality of education using large-scale tests, whose proposal promotes competitive ethos in school units, as well as passing on to schools' responsibility for the success or failure demonstrated in external evaluations. Based on these tests, tables of performance indicators are elaborated, such as the Basic Education Development Index (IDEB), which gathers information collected from the School Census and the performance averages reached in the Education Evaluation System (SAEB) and in the Brazil Test. The IDEB considers the school flow (promotion, repetition and avoidance) and the student performance averages in standardized tests (external

evaluation). The index proposal, therefore, considers only the purposes of education, not its processes, nor its specificities.

However, there are some dimensions that contribute to qualifying schools and raising the level of the IDEB, but which are neglected by standardized tests. The type of management, the educational environment, the training and working conditions of the school professionals, their physical structure and didactic pedagogical practice are not taken into account when assessing the IDEB. However, they are determining factors for quality, insofar as they are articulated in favor of a good school performance.

In this sense, it is not enough to take into account only indicators and quantifiable and measurable results without reflecting on the specificities of educational contexts and processes (AFONSO, 2007). It is necessary to understand how these dimensions are generated within the schools and how their delineations lead to the educational quality, in addition to the aspects considered by external evaluations and compiled by IDEB. When seeking to contribute with the theme of educational quality, this research aimed to understand the dimensions and dynamics produced within the school that guide or contribute to the qualification of its educational processes. As a parameter of quality analysis, the reference was made to the IDEB and the Quality Indicators in Education, documents elaborated by the MEC / INEP to mark policies, goals and actions that should be undertaken by Brazilian schools in the quest to qualify their educational processes. It should be noted that, while the IDEB is a statistical and quantitative reference of quality, the Quality Indicators in Education are configured in a more reflective perspective, since it articulates the school's own engagement in the struggle for quality improvement. In order to establish parameters for reflection and mobilization of the school, with regard to quality improvement, the Quality Indicators in Education establish fundamental elements called dimensions, namely: educational environment, pedagogical practice and evaluation, teaching and learning of reading and writing , democratic school management, training and working conditions of school staff, school physical space and, finally, access, permanence and success in school.

The IDEB is a statistical indicator, driver of public policies for the improvement of education. Their calculation is based on the length of time students spend in school and the average student performance on standardized tests. The goals of the IDEB are biennial and serve to trace the evolution of the indices of quality education in the country, as well as to mobilize a series of strategic actions of schools and education systems to achieve the established goals. However, these goals are related only to the means of academic performance of the students and the rates of school performance, there being no connection between the specific contexts of each school or its peculiarities. However, it is understood that these specific contexts lead the school to the results presented by IDEB, thus influencing the quality of education.

3. Development and Learning

The term development is often used in the sense of change. Humans develop mentally and organically. To Bock (et al, 2000), factors influencing development and learning are heredity, organic growth, neurophysiological maturation, and the environment, context and environment. This set will influence, shape and configure the human being, relating to other conditions offered by the environment, such as food, for example.

For Piaget (1896-1980), the process of knowledge occurs interactively through the perception that the subject has his world divided into stages. New stages arise only when there is balance, which is the result of assimilations and accommodations made in earlier stages. Knowledge comes from the action of the subject on reality (Piaget, 1994). Piaget writes: "... all morality consists in a system of rules, and the essence of all morality must be sought in the respect that the individual acquires through these rules." (Piaget 1994: 23). Still for Piaget, the learning is subordinated to the development of cognitive structures, which, often, determines the forms of pedagogic and didactic applications. Understanding these stages is an important part of the application and formulation of teaching activities and cognitive development.

Vygotsky (1896-1934), in historical-cultural theory, observed as Piaget that the subject constitutes his knowledge from interactions and therefore is interactive. The difference, however, is that Vygotsky says that knowledge internalizes through intra and interpersonal - gives more importance to the social issues that influence development. Vygotsky and his collaborators proposed three basic concepts: the relation man / world is a relation mediated by symbolic systems; the psychological functioning that is based on the social relations between the individual and the external world, which develops a historical process; and the psychological functions have a biological, because they are products of the cerebral activity. (Vygotsky, 1996).

These concepts or problems would serve to critically understand the psychology of the time, that man is taken basically as a body and seeks in other sciences to explain elementary processes. This proposition was intended to overcome both current lines and adopted great influence from the historical and dialectical materialism of Marx and Engels, which in turn proposed the principles of the historical formation of man, the difference between man and other beings is the ability to create and recreate , doing and redoing allows him to be called "homo faber" (MONDIN, 1982) and the work produces modifications in the world, as well as in our personality and adaptive modification to its result. The last principle is that of symbolic interaction to which we submit historically in society and culture. In this way, Vygotsky defines the historical as phylogenetic or phylogenesis, which determines the inheritances of the human species and the ontogenetic or ontogenesis history that deals with serial transformations that the human being passes from birth until adult life. Sociocultural history or sociogenesis establishes conditions of communication of groups and how culture conditions the development of the subject and its adequacy in society.

Culture comes from the semantic root color, which originated the term in Latin culture, of diverse meanings such as inhabiting, cultivating, protecting, honoring with veneration (WILLIAMS, 2007, p.117). To Edward Burnett Tylor (1832-1917) culture have ethnological and learning importance. Taking in its broad ethnographic sense [culture] is this complex whole which includes knowledge, beliefs, art, morals, laws, customs or any other capacity or habits acquired by man as a member of a society (TYLOR apud LARAIA, 1986, p.25).

Culture provides the individual with the symbolic systems of representation of reality and the infinity of meanings which gives permission to construct an interpretation about the real world. It gives a field of negotiation for the process of reinvention and reinterpretation of meanings. The relationship between formal education and non-formal education and scientific thinking on the social - "The myth made the

human being try to understand the world through the feeling and search for the order of things" (MEKSENAS, 1993, p.39).

With the development of consciousness, man feels the need to discover what governs the world and to rationalize all this understanding. The myth contributed to the acceptance of the world through historical and philosophy acted in the understanding of facts through reflection on them. Lakatos and Marconi (2009, p.19), say: "Philosophical knowledge is characterized by the effort of pure reason to question human problems and can right and wrong, only resorting to the lights of human reason. " It then makes philosophical knowledge a judgment of value, based on reason and supported in the formulation of hypotheses.

The reason, or rational ability of man to know reality, was defined as an essential element to confront religious dogmatism and ecclesial authority. The development of reason led to a new attitude towards the possibility of explaining social facts in a logical and coherent way (COSTA, 2005). According to Socrates: "... there is no ready, finished knowledge in the world, and if we wish to reach the root of knowledge, we must - first of all - criticize what we already know" (SOCRATES apud MEKSENAS, 1992, p. 41)

As for common sense, it is our first way of understanding the world and is the result of our cultural heritage. It is knowledge handed down from generation to generation through informal education. According to Barbosa, the new technologies are responsible for a new style of production, communication, management, consumption, in short, for a new way of life. They have assumed the dimension of instruments of social, economic and cultural transformation (BARBOSA, 2003, p.79). Within this theme, globalization is manifested in a visible way in education as change and evolution, encouraged by technological advances, communication and social communication, scientific production and knowledge aimed at meeting these needs. The new technologies enable the structuring of the productive process and transform society as a whole, unleashing a disorganized consumerism disintegrating societies, reigning uncertainties, ignoring the diversity of cultures and the reality of each community creating a situation of social discomfort (GOHN, 2005).

For Gohn (2005), social exclusion is not limited to the grassroots of the (popular) population, because it takes into account social income, health, housing and education. The challenges now are those imposed by the rising society, contemporary where economic factors oppress society and alienate the citizen from what is right, accelerates the growth of social inequalities and causes a decline in the supply and quality of work. To Libaneo: "Education should be understood as a factor for the achievement of citizenship, with standards of quality of supply and product, in the fight against overcoming social inequalities and social exclusion" (LIBÃNEO, 2012, p. 133).

In this way, the school no longer has only its bureaucratic role, but of transforming social reality. The comparison between formal and non-formal education is almost impossible not to happen. The formal education is systematized and composed by pedagogical planning of its school and has its foundation regulated by Law 9.394 / 96 of the Guidelines and Bases of National Education. In its article 26 establishes: Art. 26. The curricula of primary and secondary education should have a common national basis, to be supplemented in each school system and educational establishment by a diversified part required by the regional and local characteristics of society, culture, economy and of the clientele (BRASIL, 1996).

Its practice is to build the knowledge necessary to live and meet the demands of society. It is developed, therefore, in specific spaces with the teacher as subject of teaching and the student as subject of learning. The way the learning process manifests itself in different formal education environments can vary in different spaces. According to Gadotti (2005, p. 2), formal education has clearly defined objectives and means and has as its place of occurrence school environment. It responds to a normally centralized management that is organized through a hierarchical, bureaucratic structure that acts at the national level. This structure is perceived through the curricula and the oversight bodies of the ministry of education.

On the other hand, non-formal education takes place using a lesser degree of systematization and bureaucratization. Gadotti (2005) discusses the relationship between formal / non-formal education, but does not work with the concept of informal education. In its argument, non-formal education also operates in a discontinuous, casual and informal way, in multiple spaces, and can not be called, for these reasons, "informal education".

The formal education is that developed in the schools, with content previously demarcated; the informal as the one that individuals learn during their socialization process - in the family, neighborhood, club, friends, etc., loaded with values and cultures of their own, inherited belonging and feelings: and non-formal education is what one learns " in the world of life, "saw the processes of sharing experiences, especially in everyday collective spaces and actions (GOHN, 2006).

Gohn, lists some characteristics that can generate goals, planned processes of actions involving non-formal education: The learning of differences. One learns to live with others. Mutual respect is shared; Adapting the group to different cultures, recognizing the individuals and the role of the other, works the "estrangement"; Construction of the collective identity of a group; and the Balizaamento of ethical rules related to socially acceptable conducts.

These actions may rather enter the formal education environment, such as complementing the load of full-time schools, however, everything depends on the community's interaction and participation in the school and its intervention so that the collegians reflect their practices and not make the educational environment with formal education an exclusionary inclusion. We have sectors that are supposedly representing the public interest, but which in fact defend the interest of groups and corporations, or the maintenance of traditional power, whose role is to exercise control, vigilance due to false orderly participation and accountability of the community (parents, mothers and others) in actions in which the state is omitted (SILVA, 2003 apud GOHN, 2006).

2.1 Social educator as a profession

In Brazil, non-formal education had little importance and only emerged as a point of discussion after the 1980s, being seen as a process aligned to reach the participation of individuals and specific groups geared to rural areas. It was treated as a community-oriented effort to turn people's downtime into time for optimization and participation in society, skills improvement, basic education, and family planning. The majority of them attended adult literacy campaigns, that is, functional literacy (GOHN, 2005).

The education offered has as objective to meet the needs imposed by globalization, but with that, at the moment, it needs to be an education that offers quality in the information and the knowledge to be able to

compete in the spaces without frontiers where the question of the culture needs to be redefined. With the passing of the years and economic changes, society starts to value groups and their identity, skills and cultural values go into formal education. Moreover, "with the globalization of the economy, culture has become an important space of resistance and social struggle" (GOHN 2005).

Non-formal education currently takes place in diverse spaces such as churches, Civil Society Organizations (OSCS), Civil Society Organizations of Public Interest (OSCIP), trade unions, cultural spaces, among others. The differences in the time of the teaching and learning process are respected in these spaces because there is some flexibility in the content proposal. In this teaching format, two fields are highlighted: a) one that is aimed at literacy and transmission of knowledge that has been systematized in a different way from school organizations, such as youth and adult education and popular education. It occurs in alternative spaces, uses a differentiated methodology and presents flexibility in relation to the curricular contents. In this field, it serves groups of workers, youth groups and adults among others. They organize recycling or training depending on the interest of each group. The social practices, experiences and experiences of the groups and some situations problems can favor the production of knowledge: b) the other field turns to the actions of the collective being its main objective the citizenship, ie "human creativity goes through education non-formal "(GOHN, 2005).

In order to fulfill this demand of society, the number of Social Educators grows gradually, but there are no numbers that prove the effective participation of this professional in society - which would demonstrate the impact of the participation of the Social Educator in the human formation of the citizen. In Curitiba, according to the Association of Teachers of Paraná (APP-Union), the number of professionals with these characteristics is approximately 880 and, in the State of Paraná, about 2 thousand professionals work as government employees. It is estimated in a national scenario the number of 80 thousand professionals (APP-SINDICATO, 2014). Gohn (2009), locates the large area of non-formal education demands as the area of training for citizenship. This area unfolds in the following demands:

a) Education for social justice.
b) Education for rights (human, social, political, cultural, etc.).
c) Education for freedom.
d) Education for equality.
e) Education for democracy.
f) Education against discrimination.
g) Education through the exercise of culture, and for the manifestation of cultural differences.

It is important to emphasize that: non-formal education should not be seen, in any case as some kind of proposal against or alternative to formal, school education. It should not be defined by what it is not, but by what it is - a concrete space of formation with the learning of knowledge for life in collectives. This training involves both subjective-relative to the emotional and cognitive level of the people, as well as learning of corporal abilities, techniques, manuals etc., that enable them to develop a creative activity, resulting in a product as a result of the work done (GOHN, 2009).

Following Paulo Freire's pedagogy (FREIRE, 1983 apud GOHN, 2009), there would be three distinct phases in the construction of the social educator's work, namely: the diagnosis of the problem and its needs, the preliminary elaboration of the work proposal properly and the development and complementation of the process of participation of a group or the whole community of a given territory, in the implementation of the proposal.

Observing the professionalization of this, on 14.12.2011, the Brazilian National Congress approved a favorable opinion to the Bill 5346-2009, for regulation of Social Education. The bill of the Angolan rapporteur Mr. Angelo Vanhoni, declares the profession of pedagogical and social character, related to the accomplishment of affirmative, mediator and formative actions. Being its management and regulation of responsibility of the Ministry of Education (MEC), also the elaboration of the National Policy of Training in Social Education. The project establishes the average level of schooling for the professional exercise and contextualizes it for the creation of positions at public level, with the following functions:

I - People and communities at risk and / or social vulnerability, violence and physical and psychological exploitation;
II - The cultural preservation and promotion of remnant and traditional peoples and communities;
III - social segments hampered by social exclusion: women, children, adolescents, blacks, indigenous and homosexuals;
IV - The carrying out of socio-educational activities, in a closed, semi-free and open environment, for adolescents and young people involved in infractions;
V - The carrying out of educational programs and projects for the prison population;
VI - Persons with special needs;
VII - coping with drug addiction;
VIII - socio-educational activities for the elderly;
IX - The promotion of environmental education;
X - The promotion of citizenship;
XI - the promotion of art education;
XII - the diffusion of folkloric and popular manifestations of culture
Brazilian;
XIII - the tutelary, pastoral, community and community centers and / or
rights;
XIV - the recreational, sports and leisure entities. (DRAFT LAW 5346, 2009)

As late as 2018, Congress had not yet regulated it and did not recognize it as a profession - many of the discussions and demands arising. The role of the Social Educator is not that of a teacher, but a contributor to the environmental and social transformations of the citizen, very much fits with a teacher / educator equalization without higher education. It is not enough to insert this professional in the formal education environment without the necessary qualification and the training that is lacking for the teachers, it will also be lacking for the Social Educator. In summary, the Social Educator acts in a community within the framework of a socio-educational proposal, of knowledge production through the translation of existing

local cultures, and of the reconstruction and re-signification of some value axes, thematized according to what exists, in comparison with the that is incorporated (GOHN, 2009).

4. Conclusion

Contemporaneity, globalization and the transformations of society from the end of the XX century to the XXI century demand a new profile of citizen and human evolution. Learning is studied in many ways and forms, but collective knowledge is demonstrated in a scientific and technological context, so new methods and models of education and training are needed for the creation of professions and professionals that provide articulated and effective needs of the educational community. Non-formal education is not only a point of study for social teaching but the integration of an entire community into processes of collective citizenship. The individual develops in his personal relationships, in daily life and in routine with the family - which is positively reflected in his performance within formal education.

The different forms of education together form what we already know and study about the individual and its particularities, minimizing the exclusionary globalization that economic and social factors cause in the life of each one. Education, coupled with factors such as culture and citizenship, contribute to emancipation and the unique vision of society.

For Gohn (2009), when it is triggered in social processes developed with socioeconomically deprived communities, it enables processes of social inclusion in the recovery of the cultural wealth of those people, expressed in the diversity of previous practices, values and experiences. When present in the basic schooling of children, adolescents or adults, as we have observed in several of the analyzed social projects, it potentiates the learning process, complementing it with other dimensions that do not have space in the curricular structures.

Non-formal education is not only a complement to formal schooling or a "time" of relaxation that the individual can safely pass into the school environment. It is a form of citizens who are not taxed by ethnicity, age, or social and economic class, but are able to live the political culture and have a set of values that makes it part of the world.

5. Acknowledgement

This research is funded by the Coordination for the Improvement of Higher-Level Personnel

6. References

APP-SINDICATO. Entrevista: a regulamentação da profissão de Educador Social. 26 de Maio de 2014. Disponível em: < http://appsindicato.org.br/?p=5238/> Acessado em: 15/05/2018.

BARBOSA, A. O mundo globalizado: política, sociedade e economia. 2ed. São Paulo: Contexto, 2003.

BRASIL. Constituição (1988). Constituição da República Federativa do Brasil. Brasília, DF: Senado Federal: Centro Gráfico, 1988. 292 p

_____. Câmara dos Deputados. Projeto de Lei nº 5346/2009. Visa à criação da profissão do Educador e Educadora Social no Brasil. Disponível em:< http://www.camara.gov.br/proposicoesWeb/prop_mostrarintegra?codteor=1575957&filename=Parecer-CCJC-05-07-2017>. Acesso em: 15 de abril de 2018.

_____. Lei de Diretrizes e Bases da Educação nacional. Lei 9.394/96, de 20 dez. 1996. Brasília, DF. Disponível em http://www.planalto.gov.br/ccivil_03/Leis/l9394.htm. Acesso em: 28 de maio de 2018.

_____. Portaria Interministerial nº 17, de 24 de abril de 2007. Institui o Programa Mais Educação, que visa fomentar a educação integral de crianças, adolescentes e jovens, por meio do apoio a atividades sócio-educativas no contraturno escolar. Brasília, 2007a. Disponível em: <Disponível em: http://portal.mec.gov.br/arquivos/pdf/mais_educacao.pdf >. Acesso em: 30 jun. 2015. [Links]

CHIRINÉA, A. M.; BRANDÃO, C. D. F. [UNESP. O IDEB como política de regulação do Estado e legitimação da qualidade: em busca de significados. **Ensaio: Avaliação e Políticas Públicas em Educação**, p. 461–484, 1 jun. 2015.

_____. [UNESP. O índice de desenvolvimento da educação básica (IDEB) e as dimensões associadas à qualidade da educação na escola pública municipal. **Aleph**, p. 119 f., 2 dez. 2010.

CONFERÊNCIA NACIONAL DE EDUCAÇÃO (CONAE), 2010. Brasília, DF. Construindo o Sistema Nacional articulado de Educação: o Plano Nacional de Educação, diretrizes e estratégias; Documento-Base. Brasília, DF: MEC, 2010a. v. 1-2

_____. Brasília, DF. Construindo o Sistema Nacional articulado de Educação: o Plano Nacional de Educação, diretrizes e estratégias; Documento Final. Brasília, DF: MEC, 2010b. 164p. Disponível em: <http:// conae.mec.gov.br/images/stories/pdf/pdf/documetos/documento_ final.pdf>

DELORS, Jacques. LEARNING: THE TREASURE WITHIN. Report to Unesco of the International Commission on Education for the Twenty-first Century. Cortez, 1998 - 288 páginas

COSTA, C. Sociologia: introdução à ciência da sociedade. 3 eds. São Paulo: Moderna, 2005.

GADOTTI, Moacir. A questão da educação formal/não-formal. Droit à l'education: solution à tous les problèmes sans solution? Institut International des droits de l'enfant, Sion, 2005.

GOHN, M. G. Educação não-formal, educador(a) social e projetos sociais de inclusão social. V.1, n.1, p. 28-43. Meta: Avaliação. Rio de Janeiro, 2009.

_____. Educação não-formal, participação da sociedade civil e estruturas colegiadas nas escolas. Ensaio: Aval. Pol. Públ. Educ., Rio de Janeiro, v.14, n.50, p. 27-38, jan./mar. 2006

_____. Educação não-formal e cultura política. 3. ed. São Paulo: Cortez, 2005.

_____. Movimentos sociais e educação. 5. ed. São Paulo: Cortez, 2003.

_____. Teoria dos movimentos sociais paradigmas clássicos e contemporâneos. São Paulo: Loyola, 1997

LARAIA, Roque de Barros. Cultura: um conceito antropológico. 24. ed. Rio de Janeiro: Jorge Zahar, 2009.

LIBÂNEO, José Carlos. Pedagogia e pedagogos, para quê? 12. Ed. São Paulo: Cortez, 2012.

MEKSENAS, P. Sociologia. 2 eds. São Paulo: Cortez, 1993.

PIAGET, J. O juízo moral da criança. São Paulo: Summus, 1994.

_____. Estudos Sociológicos. Rio de Janeiro: Forense, 1973

VYGOTSKY, L.S. Teoria e método em psicologia. São Paulo: Martins Fontes, 1996.
WILLIAMS, Raymond. Um vocabulário de cultura e sociedade. Tradução de Sandra Guardini Vasconcelos. São Paulo: Boitempo, 2007.

WELFARE STATE: AN ANALYSIS ON THE EDUCATION DEVELOPMENT INDICES ON BRAZILIAN EDUCATION SYSTEM

Marjorie Cristina da Cruz Bernardino, Barbara Lucchesi Ramacciotti
University of Mogi das Cruzes, Brazil

Abstract

This text proposes to present briefly topics related to the state and social protection theme and their impact on the quality of education. They aim to scrutinize the historical order and evolution of the state of social protection and its emergence, as well as its importance not only in Brazil but also in the world within the field of public policies. The discussions about the quality of education in Brazil raise questions about teacher training, financing, physical structure of the building, pedagogical practice, socioeconomic profile of the student and school management - elements considered determinants of the quality of education in a school unit. Within the framework of the discussions are the external evaluations as a way of qualifying the schools and the education systems in the country. The application of tests that assess the academic performance of students from public and private schools in Brazil became a constant from the 1990s, after the State reform and with a new political agenda for the educational area, in view of the reconfiguration of the economy and the valuation of criteria such as efficiency, effectiveness, productivity and competences for Brazilian education. The guiding problem of work is pubic and social policies as an instrument of the Welfare State. It is based on the hypothesis of the need for public policies at the federal, state and municipal levels that relate to the quality of education and to what is the citizen's right or need in its basic aspects. It is a study described in documentary review and literature. It is hoped to contribute between the relationship of the state of social protection and education and reaffirm its importance for the social and political development of citizens and citizenship.

Keywords: Welfare State. Public Policies. Education.

1. An Introduction

Social scientists have developed several arguments about the importance of social policies, especially those related to the welfare states of the twentieth century. Structuralists and functionalists argue that the social policies of modern nations necessarily converge because of the underlying logic of industrialism, while Marxists treat such policies as responses of the state to the requirements of social reproduction of advanced capitalism. However, most social policy students are more attuned to history and politics - concentrating on two dozen or less industrial capitalist democracies, and they have not explored the alternative ways in which democratic political processes have helped to create programs and to expand social spending. Considerable interest in the independent impact of states in formulating autonomous (local) official social

policies and initiatives and their institutional structures can help shape the political processes from which social policies emerge. In turn, social policies, once implemented, transform the policies themselves.

Education, the right of all and the duty of the State and of the family, will be promoted and encouraged with the collaboration of society, aiming at the full development of the person, his preparation for the exercise of citizenship and his qualification for work (BRAZIL, 1988). The complexity of the Brazilian federal model, the regulatory gaps in cooperation norms, and the patrimonialist view that still exists in many sectors of public management make the task of educational planning quite challenging. To plan, in this context, implies making commitments with the continuous effort to eliminate the inequalities that are historical in Brazil. To do this, we must adopt a new attitude: to build organic forms of collaboration between the educational systems, even though the norms for federative cooperation have not yet been regulated. Constitutional Amendment No. 59/2009 (EC No. 59/2009) changed the condition of the National Education Plan (PNE), which went from a transitional provision of the Law on Guidelines and Bases of National Education (Law No. 9.394 / 1996) to a constitutional requirement at 10-yearly intervals, which means that multiannual plans should take this as a reference. The plan also came to be considered the articulator of the National Education System, with a forecast of the percentage of Gross Domestic Product (GDP) for its financing. Therefore, the PNE should be the basis for the elaboration of state, district and municipal plans, which, when approved by law, should provide budgetary resources for its execution.

The Federal Constitution of 1988 defines, in its Chapter III (Section I, of Education), the roles of each federative entity in the scenario of guaranteeing the right to education:

The federal government should organize the federal education system, finance federal educational institutions, and exercise educational and redistributive and supplementary functions in order to guarantee equalization of educational opportunities and a minimum quality standard of education through technical and financial assistance to states, Federal District and the municipalities. The municipalities should act primarily in primary education and in early childhood education; the states and the Federal District, primarily in elementary and middle schools (article 211, §§ 1, 2 and 3). (BRAZIL, 1988)

The discussions about the quality of education in Brazil raise questions about teacher education, financing, physical structure of the building, pedagogical practice, socioeconomic profile of the student and school management. Elements considered determinants of the quality of education in a school unit. Within the framework of the discussions are the external evaluations as a way of qualifying the schools and the education systems in the country. The application of tests that assess the academic performance of students from public and private schools in Brazil became a constant from the 1990s, after the State reform and with a new political agenda for the educational area, in view of the reconfiguration of the economy and the valorization of criteria such as efficiency, effectiveness, productivity and competences for Brazilian education. State regulation in education, constructed in the perspective of neoliberal governments, denotes a change in the state's own action from the point of view of non-intervention in the economy and in the market, except as an evaluator of services rendered.

In the area of education, two are the state perspectives to be considered. The first of these is the provider

State, which acts effectively in the obligatory and free offer of basic education. The other perspective is the Evaluating State, which establishes mechanisms to assess the quality of education delivered in schools and in education systems, based on the same parameters of effectiveness, efficiency and productivity. In the case of education, the State Evaluator measures and evaluates the quality of education using large-scale tests, whose proposal promotes competitive ethos in school units, as well as passing on to schools' responsibility for the success or failure demonstrated in external evaluations. Based on these tests, tables of performance indicators are elaborated, such as the Basic Education Development Index (IDEB), which gathers information collected from the School Census and the performance averages reached in the Education Evaluation System (SAEB) and in the Brazil Test. The IDEB considers the school flow (promotion, repetition and avoidance) and the student performance averages in standardized tests (external evaluation). The index proposal, therefore, considers only the purposes of education, not its processes, nor its specificities. However, there are some dimensions that contribute to qualifying schools and raising the level of the IDEB, but which are neglected by standardized tests. The type of management, the educational environment, the training and working conditions of the school professionals, their physical structure and didactic pedagogical practice are not considered when assessing the IDEB. However, they are determining factors for quality, insofar as they are articulated in favor of a good school performance.

About education, due to the discontinuities of propositions throughout the history of Brazilian education, it is commonly said that there was no public policy in the area. This expression, in fact, denotes that the action of the State was little effective in relation to the question. However, it is understood that State action can be shown in a continuous, effective and legitimate way, through structured programs, with large or small impacts depending on the way in which the interests of the actors involved in the political decision-making process. It is possible to conceptualize public policy from a statecentric or multicentric approach, considering the monopoly of state actors in the elaboration of policies or the participation of other private and non-governmental organizations in their elaboration, respectively (SECCHI, 2013). Thus, based on the multicentric approach, which includes the multiplicity of actors that participate in this decision-making process, about educational policies, it has become increasingly visible the participation of different actors in the definition of the directions of Brazilian education. This also applies to education policies at various levels and levels.

2. STATE PUBLIC POLICY AND WELFARE STATE

2.1 What is public policy and social policy

Public policies, in brief definition, bring the holistic conception of public management on sectoral social problems. Better exploiting, the State is recognized as the place of recognition, debate and resolution of existing problems in a given society, and public policy is responsible for identifying, planning and solving these problems through a strategic action involving society and the State. The Public Policies have a process of formation of long and medium term, consistent in the phases of recognition of the public problem; formation of a public agenda; formulation of the Public Policy itself; the political decision-

making process for the implementation of Public Policy; implementation of Public Policy; monitoring, evaluation and evaluation of Public Policy; finally, the decision on the continuity, restructuring or extinction of Public Policy.

According to Secchi (2013, p.13), it is important to distinguish essential terms related to public policy. In Bobbio's (2002) conception, Politics, it is human activity linked to the obtaining and maintenance of the necessary resources for the exercise of power over man. In this sense of "politics" may be the most present in the imaginary of people: that of political activity and competition. In a second sense, we have the term Policy, which has a completer and more concrete dimension, synthesizing the relation between decision and action. The term public policy is linked to these second sense of the word "politics". Public policies deal with the concrete content and symbolic content of political decisions, and with the progress made in building and acting on those decisions. (SECCHI, 2013)

Within a context, the Public Policies are form of execution of the decisions taken in the economic planning the mechanism of implementation (execution) of the decisions on the directions of the growth of country or another federated entity. However, when talking about economic planning, it is necessary to speak about the participation of private companies, a participation that, derives from the constitutional model adopted in 1988 that creates the so-called "State Capitalism". In this economic model, classical liberal economic principles are respected, but the "liberal" economy only develops with a strong state presence not only in direct productive activities, but also in the direction and coordination of the economy.

Rodrigues (2010, p.13) proposes a general definition of Public Policies as "the set of procedures that express relations of power and that is oriented to the resolution of conflicts with regard to the public goods". For Souza 2006, there is no public policy doctrine to formulate a General Theory of Public Policies valid for all sectors, but there is consensus about the existence of steps to be followed in each formulation of Public Policies.

Thus, from the theoretical - conceptual point of view, public policy in general and social policy are multidisciplinary fields, and its focus is on the explanations about the nature of public policy and its processes. Therefore, a general theory of public policy implies the search to synthesize theories built in the field of sociology, political science and economics. Public policies have repercussions on economics and societies, hence why any theory of public policy must also explain the interrelationships between state, politics, economy and society. This is also the reason why researchers in so many disciplines - economics, political science, sociology, anthropology, geography, planning, management and applied social sciences - share a common interest in the field and have contributed to theoretical and empirical advances. Public policy can be summarized as the field of knowledge that seeks at the same time to "put the government into action" and / or analyze this action (independent variable) and, when necessary, to propose changes in the course or course of these actions (dependent variable). The formulation of public policies constitutes the stage at which democratic governments translate their purposes and electoral platforms into programs that will produce results or changes in the real world. "(SOUZA, 2006, p.25)

Still in this area, for Souza (2006) one can then summarize public policy as the field of knowledge that seeks, at the same time, to "put the government into action" and / or to analyze this action (independent variable) and, when necessary to propose changes in the course or course of these actions (dependent

variable). The formulation of public policies is the stage at which democratic governments translate their purposes and electoral platforms into programs and actions that will produce results or changes in the real world.

2.2 Typologies (classifications) of public policies

The study of public policies has been building, over the years, its own theoretical body and a rich analytical tool that helps Policymakers in their task of elaborating public policies. Traditional political science has always viewed politics as a result of the dynamics of confrontation, power struggle and resolution of interests among actors (politics). According to Serafim and Dias (2012), the understanding of a public policy, in addition to identifying its content, must aggregate the assimilation of its purposes, its beneficiaries, the actors involved and its design important factors to capture the conformation and complexity. David Easton (1953) and his followers of the systemic school of political science understood politics as a product of the political process that transforms inputs into decisions and actions. Souza (2006) presents a compilation of the most well-known models used in the construction and analysis of public policies, which, when compared to the Secchi (2013) studies around the five analytical dimensions, can create an excellent nuance of analytical tools which help to explain the choices that support this research on the typologies of public policies' (1972) stated that "policies determine politics", that is, public policies determine the political dynamics. With the contribution of Lowi, the most basic element of a public policy analysis became the verification of the type of public policy being analyzed. The content of a public policy can determine the political process. (Secchi 2013, p.22)

Lowi's typology, formulated initially, is based on the criterion of "expected impact on society" (Lowi 1964, p.689). According to Lowi (1964), there are four types of public policies: regulatory public policies that develop predominantly within a pluralistic dynamic, in which the capacity of approving or not such a policy is proportional to the relation of forces of the actors and interests present in society. Distributive policies, which generate concentrated benefits for some groups of actors and diffuse costs for the whole collectivity / taxpayer. Redistributive policies that provide concentrated benefits to some categories of actors and imply concentrated costs on other categories of actors. Constitutive policies are those policies that define competencies, jurisdictions, rules of political dispute and the elaboration of public policy. (Secchi 2013, p.25). Wilson's (1983) typology is close to Lowi's, because he also works on the criterion of distribution of costs and benefits among the various actors. The policy will be classified according to whether it proposes distribution or concentration of costs and benefits to the whole community or to interest groups: majority politics, entrepreneurial politics, clientelist politics and interest group policies. According to Secchi (2013), Gormley's typology (1986) already innovates insofar as it constructs its categories on ideas of degree of impact on people (affects representative numbers of people) and complexity (in relation to the knowledge necessary for their elaboration). The typology of Gustafsson (1983), has as a criterion of distinction the knowledge and the interaction of the policymaker. It relates the interplay of implementation to public policy with the necessary knowledge for the elaboration and implementation of it, in this way we have the possible results as real politics and pseudo political (with intent to implement) and symbolic and meaningless

politics (without the to implement). The Bozeman and Pandey (2004) typology has only one variable, which is the categorization of content in technical or political, polarizing the analyst's gaze to this binomial.

2.3 Ebes Public / social policy as an instrument of WS or Ebes

Social policy consists of a politically defined attribution of citizens' rights and legal duties. These rights consist of the transfer of money and services in order to compensate conditions of need and risk for the citizen who enjoys that right, and who cannot access them with their own resources and / or individual gifts (Offe, 1993). For Santos (1989, p.35), there is a common original incapacity that analysts must clarify conceptually what social politics is, since it has been pointed out as everything that has as its object social problems. Santos still refers to Marshal's response to what social policy is: "Social policy is a widely used term, but it does not lend itself to a precise definition. The sense in which it is of convenience or convention ... and neither will explain what it really deals with matter "(p.35). When we talk about social policy, we are talking about scarcity, lack of resources available in society, negotiation of dissent, and declared difference. Social protection and social policy, in the course of history, are associated with individual and family security needs, which can be satisfied by the intervention of a plurality of public and private actors, capable of providing diverse titles and varying degrees of effectiveness, the protection and sustenance of the weakest subjects. (Girotti, 2000 in VIANA et al., 2005 p.15)

Still for Viana (2005), social protection is divided into three categories. Social assistance - distribution of goods and resources to specific strata of the population: targeted, residual and selective type actions; social insurance - distribution of benefits to specific occupational categories; social security - distribution of benefits, actions and services to all (universal) citizens of a given territorial unit. In this way, we have an important relationship that emerges as a significant variable in the political and social context. It highlights two dimensions that seem to guide the first significations: the first presents the social as that which is present in society, but which is not of the economic order. That is, the residue that remains when economic phenomena are excluded, where the classification of an investigation is given by the separation of what is purely economic (understood also as primordial) of what is left of the explanation, the social. The second is associated with the notion of human welfare in an assistance or humanistic perspective focused on human dignity, charity or mercy. That is, actions that incorporate an assistance dimension of immediate coverage. (DEMO, 1978).

3. WELFARE STATE (WS) CONCEPT

3.1 Concept of Social Welfare State

At the turn of the century. XXI to the XX, a new type of public intervention in the conservative Germany of Otto von Bismarck arises, decades later appear in Labor England of the post-World War II. The new line of action commits the State to protecting society, especially salaried workers, against the risks associated with participation in a market economy. The idea of the "origin" of the Welfare State leads to some historical antecedents of the intervention of the modern State focused on well-being, but, in general, as a localized action, to combat extreme poverty. In England to assist the disabled (meritorious poor) goes

back to the 16th century. XVI (Polanyi, 1980). This model replicated in several countries in Europe and the USA. (KERSTENETZKY, 2012).

The Welfare State is the historical form of the state, capitalism of the post-Second War, allows the exercise of current social rights and, at the same time, limits the socially differentiating effects of the market. The national social protection system constitutes the material and dynamic stature that defines and sustains this social dimension of the State. (DRAIBE 2015, p.1028)

Social policies and programs of a different nature, including social insurance, precede and predict, in time, the welfare state. But the novelty of the Welfare State was the consolidation of a particular mechanism of curbs on the gross forces of socially produced inequality by means of an integrated system of rights and social policies. It is in this sense that the welfare state constitutes the social regulation proper to mature capitalism, in the phases of Fordism and post-Fordism. (Agliata, 1976, DRAIBE, 2007)

For Arretche (1996), there are certainly some works by Harold Wilensky, Richard Titmuss and T. H. Marshall that best represent this explanatory concept. Although there are distinctions between them, especially about the reasons for the development of the welfare state - not the reasons for its emergence - there is a common nucleus in its argument, which concerns the impacts of the industrialization process on the form's intervention and performance of the State.

3.2 Periodization: 3 phases

The literature identifies several phases in the development of the welfare state, formalization, consolidation, and expansion. The formative phase of the late nineteenth century until the end of the First World War would have followed the consolidation of the interwar period and the period of frank expansion, known as the "golden years," which stretched from the late 1940s to the mid-1970s.

In the consolidation phase, there was a significant increase in social spending, partly due to the legislative innovations of the previous period, especially with the maturation of social security rights, but partly also because of the advance of labor and social-democratic policy in the period between the wars. (Kerstenetzsky, 2012) In this range, eligibility rules are extended, and coverage of various programs is expanded, benefit amounts are increased (fixed benefits are converted into benefits related to earnings), and compulsory programs become standard. The expansion from 1940 to the mid-1970s is attributed to demographic factors (not only the increase in the number of retirees, but the increase in the proportion of elderly in the population, intensive users of health services); to the material prosperity that generated the resources needed to increase the programs; labor mobilization, socialist parties and other manifestations, such as the civil rights movement in the United States; the role of social spending in the accommodation of capital and labor in the post-war consensus; the increasing density and capacity to mobilize interest groups in favor of sectional interests within the welfare state; increasing rates of urbanization and educational provision facilitating social and political mobilization. (Kerstenetzsky 2012, p.19)

3.3 Typologies: Titimuss, Esping-Andersen

3.3.1 Typology of Titimuss

Titmuss also notes that social policy itself risks fostering states of dependency when it is insensitive to social forces that disconnect individual merit and outcome. This unfortunate consequence would come from his involuntary contribution to the loss of respect, alien and proper, from the "problematic" individuals and groups that he singled out and stigmatized as responsible for his own failures. It is not hard to imagine the negative effects on effort and motivation (of the "poor") - not to mention the negative effects on the willingness for solidarity (of the "non-poor"), often involving underfunded policies. (Kerstenetzsky, 2012)

Titmus's proposal envisaged three Welfare State genres: Welfare State residual, characterized by selective policies, almost always done posteriori, when the "natural" and traditional channels of satisfaction of needs did not solve certain needs and requirements of individuals. The intervention would then have a temporally limited character and should cease with the elimination of social deprivation. The policies developed under this model (selective) would always be directed at particular social groups and referred to certain types of risks or deprivation. Welfare State meritocratic-particularistic (The industrial achievement performance model), that would be the model based on the individual capacities of performance, such as those related to the productivity and the capacity of individual gains. Thus, social policies should only interfere with the correction of certain market failures that might eventually become an obstacle for individuals to meet their needs. "As important as it may be, the welfare system is only complementary to economic institutions." Welfare State institutional redistributive (The redistributive model). In this model, outside the market, rights and welfare benefits are guaranteed to all citizens in terms of minimum levels of income or services, whether state-owned or through institutions with funds passed on by the State.

3.3.2 Typology of Esping-Andersen

In 1990, G. Esping-Andersen, in his book The Three Worlds of Welfare State Capitalism, proposed new groupings. The fundamental criterion of grouping used by Esping-Andersen is the degree of decommodification, that is, the extent to which the systems subtract the worker from the market dependence. The countries and clusters would be arranged in a continuum of decommodification that would be low in the liberal model, intermediate in the conservative-corporate and high in the social-democrat. In addition to the democratization criterion, the author employs a second empirical criterion called the "principle of stratification" in which six socio-political attributes of welfare systems are combined. (DI GIOVANNI 2016, p.10). In this way, the typologies were divided as:

Liberal - the social hegemony of the business bourgeoisie and the predominance of liberal values centered on private initiative and work ethics have obstructed social reformism and encouraged mercantile solutions also in response to protection needs.

Conservative-corporate - bourgeois hegemony comes in conjunction with the statist tradition, the social doctrine of the church and articulation by categories of the social body, promoting the expansion of

generous programs with neglected redistributive effects.

Social Democrat - Social-Democratic hegemony has produced the expansion of a Welfare State supported by public intervention replacing both the market and the family and aimed at promoting a higher standard of equality; guaranteeing the entire population access to the provision of high quality and high-level goods and services.

4. PUBLIC POLICY AND WELFARE STATE IN BRAZIL

4.1 Characteristics of the Welfare State

Institutionally, the State of Social Welfare in Brazil, consolidated between the decades of the thirties and seventies. For Medeiros (2001), the Brazilian Welfare State arises with the character of regulating aspects related to the organization of salaried employees of the modern sectors of the economy and bureaucracy, it is emphasized that, in the initial phase of industrialization, the possibility of using the Welfare State as an instrument of aggregate demand control was reduced due to at least two reasons. First, because problems of overproduction were much more related to the behavior of the external sector than to fluctuations in national demand, and second, because the limited number of beneficiaries of the system limited the effectiveness of policies as a mechanism of expansion of consumption.

The limited redistributive character of the Brazilian Welfare State throughout its development is treated from two angles the autonomy of the bureaucracy and the political power of the workers' movements. After the consolidation phase inaugurated by the military governments of 1964, the Welfare State model lost its populist character and assumed two defined lines, one of compensatory character and the other of a productivism character. The first sought to alleviate the impacts of a development model based on the concentration of wealth and the second sought to contribute to the conditions necessary for economic growth, such as the qualification of labor. However, both presented as characteristics the political and financial centralization in the federal government, the strong institutional fragmentation and regressive character in social expenditures (MEDEIROS 2001, p.4)

In this period, the new demands of society, not only for the State, but also for the Economy, lead to a transformation that aims at a better relationship between these two entities and pursuit, economic development. These changes are manifested in the emergence of national, public or state-regulated systems of education, health, integration and income replacement, social assistance and housing that, along with wage and employment policies, directly or indirectly regulate the volume, rates and the behavior of employment and wages of the economy, thus affecting the standard of living of the working population. Specifically, these are processes that, once transformed the state structure itself, are expressed in the organization and production of collective goods and services, in the assembly of schemes and social transfers, in the public interference on the structure of access opportunities to public and private goods and services, and finally in the regulation of production and private social goods and services. It is important to affirm that the Brazilian standard of meritocratic - particularism type "welfare state", as defined by Titmus. (DRAIBE 1993, p.19)

4.2 Phases: Government Vargas until Lula (1930 – 2010)

The circumstances of the emergence and development of the Welfare State in Brazil are different from those observed in the countries to which the theories referred to refer. In addition to occurring under a different position in the world economy, the Brazilian modernization process is markedly segmented, with modern industrial sectors coexisting with traditional sectors and with the agrarian-exporting economy. The control of the market for industrial products through policies of mass consumption was a secondary aspect for a state concerned with protectionist strategies, availability of inputs and investments in capital goods and infrastructure. (MEDEIROS 2001, P.8)

Still to Medeiros (2001), Social policies in the period before the 1930 Revolution were fragmented and emergentialist, although there are indications of the provision of a more global action by the State, such as the institution by law of the National Departments of Labor and Health and the promulgation, in 1923, of the Sanitary Code and the Eloy Chaves Law, the latter on social security matters. Conflicts between capital and labor were regulated by sparse legislation and were dealt with primarily by the police apparatus. Public health issues were dealt with by local authorities, and there was no program of action by the central government to address them. State action was restricted to emergency situations, such as epidemics in urban centers. Education was attended by a very small school network, of an elitist and academic character, that aimed to prepare students for higher education. The reforms of the time (new school) occurred regionally and in a partial way, that is, they were not part of a global education policy.

We have the following periodization of the process of constitution of the Brazilian Welfare State:

1930/1964 - Introduction and Fragmented Expansion

1930/1943 - Introduction

Social and labor legislation, in general, social policies were fragmented and emergency: public health issues, reduced school network and the housing issue was not the subject of public policy. The regulation of wage labor has resulted in the enactment of various laws concerning working conditions and the sale of the workforce. " (Rodrigues, 2010, p.70)

1943/1964 - Fragmented and selective expansion

In 1943, the institutes of retirement and pensions (INSS) were created and the CLT (Consolidation of Labor Laws) was consolidated. Under the populist regime of Vargas, it seeks to promote the regulation of the economy and national policies as a development strategy (national-developmentalism). (Rodrigues, 2010, p.72). Brazil lived a phase of populist democracy, in the relationship between State and working class occur the phenomena called patrimonialism, cooptation and corporatism. We can mention the relatively scarce (in comparison with the previous period) state activism in this area, in the limited democratic period between 1946 and 1964, in terms of the quantity of interventions and in general also of the maintenance of the corporatist orientation of the preceding period. However, there are signs of qualitative change emitted, for example, by the standardization of social security and health care schemes with the Organic Social Security Act of 1960; by the significant recovery of the real value of the minimum

wage at a time when urban workers are already a considerable contingent of the labor force; by the promulgation of the Rural Workers' Statute in 1963, which, despite not having been operationalized, was the subject of an attempt to regulate in 1964, and of an equally failed agrarian reform. Notwithstanding politically failed, it is visible in the period perhaps the most genuine attempt to inflect the welfare model toward universalistic redistributive initiatives experienced in the country. (Kerstenetzsky, 2012)

From the point of view of institutional milestones, the period 1946/1964 is marked by the creation of legal instruments aimed at the functioning of a democratic government. In it, authoritarianism loses space, but populism remains the fundamental feature of the State-Society relationship. (MEDEIROS, 2001)

1964/1985 - Institutional Consolidation and Conservative Restructuring

1964/1977 - Institutional Consolidation

In 1964, with the Military Coup, we have as basic characteristic the universalism, in which the incorporation of a gigantic clientele to social services was not accompanied by a proportional expansion of their provision, having as a result the segmentation of health services and education (the public segment being directed to the poor) and the “residualisation” of social protection.

The military governments initiated in 1964 inaugurated the system consolidation phase, accompanied by deep changes in the institutional and financial structure of social policies, which ran from the mid-1960s to the middle of the following decade. In this period, relatively broad coverage mass policies are implemented through the organization of national public or state-regulated systems for the provision of basic social services. Based on a strongly repressive regime, military governments restore many of the New State's corporatist traditions. This represented a retraction of the role of organized workers' movements in terms of a development model based on the idea that the concentration of income and power in the capitalist core of the economy was a prerequisite for growth. (MEDEIROS 2001, p.14)

1977/1987 - Massive Expansion and Beginning of the New Republic

In this period, cam militaries and the concentration of income - natural result of the previous government. The various changes that occurred after the 1970s to the universalization of the system reinforced its meritocratic-particularistic character. The redistributive character of the system was reduced to a set of assistance programs, with very low minimum levels:

From the point of view of the extension of social rights and the definition of access and eligibility criteria, it is true that universal tendencies have been introduced into the system. (...) However, such universalizing tendencies, which in fact mainly concerned the expansion of access possibilities to social subsystems, as well as the massive expansion of the system and the supply of socially organized social services, are far from giving the Brazilian system characteristics of the "institutional-redistributive" type, but rather reinforced its meritocratic-particularistic character. (Draibe, 1989, pp. 12-13).

Until the 1980s, the Brazilian Welfare State was characterized by federal political and financial

centralization, institutional fragmentation, technocracy, self-financing, privatization, and clientelist use of social policies. (Draibe, 1989, p.15, 1998a, p.302) These are characteristics of a social protection system that does not pretend to function as a redistributive mechanism of the product of the economy. As in the emergence phase, its constitution is directed to the legitimation of the political order and to the defense of the goals set by the government's leadership and expresses both the lack of political power of the workers' movements in general and the lack of autonomy of the bureaucratic machine. In this period, however, the Welfare State has some regulatory power over aggregate demand, since the development model adopted is explicitly based on a segmentation of the society in which the market for national products coincides with the elite of the policy beneficiaries.

1988 - Definition of the new profile (constituent)

After the reformist strategy, from 1985 to 1988, we started the New Republic, which marks the end of the military regime. The milestone of this period is the creation and approval of the Federal Constitution of 1988 that defined that access to free health services is a universal right, creating the Unified Health System.

Several observations must be made regarding the criteria used in this periodization proposal. First, the three major courts (1930, 1964, 1985) consider changes in the political regime and, for 1930 and 1964, changes in the form of the state, then the specific occurrences at the level of the institutions themselves of "Welfare". This criterion seems to us to be indispensable, either because the characteristics of the political regime strongly mark the conception, the molding and the profile of social protection, especially with respect to its universalist, welfare aspects; or, finally, redistributive. In addition, of course, the definition of the relations between social policy and economic policy (at the more structural level of economic and social regulation, as well as in the model of development or adjustment of the economy). (DRAIBE 1993, p.22)

With the democratic transition of 1985, serious social problems in Brazil, marked by pronounced social exclusion, by the spread of poverty, by the persistence or even worsening of wealth and income inequalities, and by delays in the educational system. (Rodrigues, 2010)

1992/2001 - From Collor to FHC:

In the early 1990s, the federative distribution of social charges derived less from constitutional obligations and more from the way historically these services were organized in each policy. Throughout the 1990s, however, the decentralization of charges in the social area took place. The decentralization process, as well as the federative distribution of competencies, assumed a trajectory in each sectorial policy.

2002/2010 - The Lula Government:

With the end of hyperinflation, a window of opportunity was opened for a new phase of social policies in Brazil, which was marked by the reduction of statism, the universalization of access to protection services, greater focus and political support for direct income transfer, such as the Minimum Income, the Continuous Progression Benefit (BPC) and more recently the Bolsa Escola and Bolsa Família programs - the latter of families with a per capita income of R $ 120 / month. (RODRIGUES 2010, P

77). For the IPEA, the increase in the minimum wage and other social policies generated a decrease in the Gini Index (inequality measure) in Brazil from 2002, from 0.6 to 0.5 in 2009. In the current context of global crisis, the challenge is to reinforce redistribution, reducing socioeconomic inequalities and increasing the quality of our democracy. (RODRIGUES, 2010, p.77)

4.3 Legal frameworks of public educational policies

In Brazil in the 1980s, centralization and authoritarianism were children of the dictatorship, while decentralization and democratization of decision-making and efficiency in public management would automatically move together. Paro (2001) warns that one must be alert to administrative autonomy in order not to confuse decentralization of power with "deconcentration" of tasks and, in relation to financial management, not to identify autonomy with abandonment and privatization. "Decentralization of power occurs insofar as it is increasingly possible for the recipients of the public service to effectively participate, by themselves or their representatives, in decision-making" (PARO, 2001, 84). According to Arretche, 2002, two phenomena occurred in Brazil: reform of political institutions throughout the 1980s, essentially with the resumption of direct elections at all levels of government since 1982, and the deliberations of the Federal Constitution of 1988, recovering the federative bases, extinguished during the military dictatorship. One can identify that Brazil, since 1982, underwent a process of changes in the organization and management of its state and municipal systems, when the framework of Laws 4024/61 and 5692/71 was reinterpreted and adjusted to incorporate the implementation of measures decentralization, municipalization and democratization of education, taking into account the proposals that had been formulated by the sectors of opposition to the authoritarian State. These experiences occurred in several Brazilian municipalities and states with their own nuances in accordance with the initiatives of governments and educational organizations articulated around these changes.

Already in the 1990s, an extensive program of decentralization was implemented, particularly in the areas of social policies. Arretche, draws attention to the fact that the simultaneous occurrence of democratization and decentralization in the same historical process does not mean the same thing - "the denial of authoritarianism and centralization - federalism and decentralization do not imply twin political engineering" (ARRETCHE, 2002, pp. 27). Recently, the Reference Document presented for the preparatory debates for the CONAE 2010 National Conference of Education makes reference to this theme, the educational political reforms in Brazil were oriented by the decentralizing and at the same time, regulating axis, having the educational sector assumed the discourse of modernization, management, decentralization, school autonomy, competitiveness, productivity, efficiency and quality of education systems, in view of the development of competencies to meet the new demands of the field of work (CONAE, 2010, p.37).

Successive attempts at decentralization are noted, while others have remained in manifestations of intent. The different trajectories of each policy, the multiplicity of cases and the different responses of the states generalize difficult. In this sense Arretche (1999) gives as an example:

the supply of school meals entirely managed by the states and municipalities in 1997; 33% of the Brazilian municipalities were able to manage the federal resources destined to the provision of care services; 58% of the Brazilian municipalities in any of the management conditions provided by the Unified Health System (SUS), and 69% of the medical consultations were carried out by federal or state providers (ARRETCHE 1999, 140).

There is a complex picture for the establishment of any parameter in this "unequal and combined scenario that characterizes Brazilian education" (CONAE, 2010, p.31). For Peroni (2003), despite the official discourse, the authoritarianism expressed in the constitutional amendment that instituted FUNDEF can be verified by the centralization by the government of political decisions and management and also in relation to the financing of education. It was established that it is no longer up to municipalities to decide on where to apply part of their resources, as provided by law, these were intended for the payment of teachers of Elementary School in the effective exercise of teaching, not less than 60% of the resources of each fund (15% of resources of the main taxes and transfers, and of the ICMS state quota). Thus, municipalities were restricted in their autonomy, since the definition on the application of all resources was previously defined by FUNDEF standards.

FUNDEF, according to José Marcelino Pinto (2000), had a strong effect inducing the municipalization of education, practically all over Brazil. For Arretche, the Ministry of Education under the Fernando Henrique Cardoso government had, among other points of its reform agenda, "the objective of promoting the municipalization and valorization of Elementary Education" (ARRETCHE, 2002, p.38). The MEC considered that this goal should be achieved even if at the expense of other levels of education. Data from the MEC School Census (BRASIL, MEC, 1997 and 2007) indicate that primary school enrollment in the municipal network, which accounted for 32.9% of public enrollments in 1996, accounted for 53.9% in 2006, with a relative increase of 21%. In practice, FUNDEF accelerated the process of municipalization of primary education and contributed to the improvement of teachers' small salaries, especially in the Northeast. However, it did not encourage the opening of kindergartens and preschools by prefectures and led to the abandonment of state funding. FUNDEB aims to promote the redistribution of resources linked to education. The investments are allocated according to the number of students in basic education - Infant, Primary and Secondary Education - according to data from the previous year's School Census. The monitoring and social control over the distribution, transfer and application of the resources of the program will be done by councils, which have already been created specifically for this purpose. The MEC will act in the capacitation of the members of the councils.

It refers to the main projects involving educational policy, such as the institutional evaluation and the National Curricular Parameters (NCPs) instituted by the MEC in the 1990s. It points to the contradiction of centralization / decentralization, since these projects were centralized as a form of control, "but at the same time they were decentralized, meaning decentralization as outsourcing and not as participation and social control of the representative sectors of the educational area" (PERONI, 2003, p. It should be noted that the Education Development Plan (PDE), presented in 2007, maintains the institutional evaluation policy already instituted by the MEC, emphasizing quality indicators through Prova Brasil and the institution of the Education Development Index IDEB) as a way of verifying the performance of public

education networks and schools in order to define short, medium and long term goals and policies aimed at improving the quality of education - to organize the curriculum of Elementary School: Prova Brasil; Literacy of children: Provides Brazil and the follow-up of the school flow per student - Educacenso.

5. WELFARE STATE AND THE QUALITY OF EDUCATION IN BRAZIL

The debate on the management and financing of public policies has occupied a prominent place in recent years, especially from the new state configuration resulting from the reform process promoted in Brazil in the 1990s. With the explosion of the international crisis of the capital system in 2008, the issue remains at the center of the concerns of those who govern the world's great powers as well as the rulers of peripheral countries, given the foreseeable limitations to the development of social policies, which become even more necessary in times of crisis such as has been affecting the entire planet. The provision of education and schooling, in the Brazilian case, is ensured through federated entities (Union, states, DF and municipalities) based on the structuring of their own educational systems. It is observed that this process is historically marked by the binomial "decentralization, deconcentration of educational actions" (CONAE, 2010, p.31). An avalanche of evaluations has plagued educational institutions. National examinations or mechanisms were developed for a large-scale standardized evaluation of the first year of primary education, such as Provinha Brazil (BRASIL, 2007c), the Basic Education Evaluation System (BRASIL, 2005b), the National Higher Education Examination (ENEM) (BRASIL, 1998), the National Student Performance Exam (ENADE) (BRASIL, 2011b), the National System for the Evaluation of Higher Education (SINAES) (BRASIL, 2004a), the Exame (BRASIL, 2004b), the System of Indicators of Results (SIR) of the Postgraduate Program defined by the Commission for the Improvement of Higher Education Personnel (CAPES) (BRASIL, 2007d).

Certainly, evaluative processes are part of the work routine of the teacher interested in knowing the level of appropriation by the students of the knowledge taught, to reorient their classes, to identify where the students' difficulties are, to review work methodologies. The process evaluation and at the end of the year allow to assess the possibility of the student to continue his studies or not. Assessing is accurate. However, in recent times, reification of quality, taken as an absolute value in evaluation debates, seems to have become the mainspring to generate animosities in the field of public policies and in relation to teachers. Many of the actions foreseen in the Education Development Plan (BRASIL, 2007b). It is justified to consider educational public policies, based on the National Education Guidelines and Bases Law No. 9394, of December 20, 1996, and according to the UNESCO Report (DELORS, 1998). From these milestones, education presents principles that, in addition to reinforcing increasingly the responsibility on the cognitive knowledge adapted to civilization, since these are the bases of the competences of the future, they also include, in its scope, the social responsibility.

Since then, educational policies are considered not only as a permanent process of enriching knowledge, skills and know-how, but also a privileged way of building one's own person, of relationships between individuals, groups and nations. In the contemporary scenario, where the mobility of subjects imposes challenges to societies, the role of education and public policies in education and in dignity is relevant. In

the second half of the 1990s, the pillars on which education must be sustained in the 21st century are seen as the Necessary Utopia, because in addition to cognitive knowledge, learning to learn, and skills, learning to do , for the development of humanity, are inserted: learning to live together, or to live together, to learn to be (DELORS, 1998).

The IDEB is an important indicator in that it shows weaknesses in Brazilian schools related to flow and school performance; however, it is insufficient to measure the quality of education by restricting itself to only these two variables, disregarding other equally important aspects of quality, such as school organizational culture, teaching practice, families' socioeconomic and cultural level, and the style of management and leadership.

Currently, the index is considered the great thermometer of the quality of Brazilian education. However, this only shows statistical or quantitative data. However, it hampers schools to comply with certain standards of conduct, especially school management, to achieve increasingly high marks in the IDEB and to achieve pre-defined expectations of school performance (CHIRINÉA, 2010). A survey conducted in 2010, comparing two schools - one with a higher (8.2) and another with a lower (2,4) IDEB - showed that the type of school management, the organizational climate and teachers' sense of belonging are conditions that favor quality. In addition to these dimensions, it was shown that the socioeconomic and cultural condition of students and their families is also a determining factor for the quality of education. These dimensions are not considered in the composition of the IDEB note, nor in the results presented (CHIRINÉA, 2010).

Thus, in addition to flow and performance referrals, there are other attributes or factors that contribute to the quality of education but are neglected by external evaluation. As a result, and not a quality indicator, IDEB is unable to fully portray the reality of school institutions, because there are other variables that interfere with the quality of education, such as: school management; training and working conditions of teachers; educational environment; pedagogical practice and evaluation, and access and stay in school. Quality, in this sense, is not a watertight factor and cannot be sought only with tests that measure students' cognitive knowledge.

Such variables lead to or contribute to the quality of education. The size of the school, for example, makes a difference in terms of quality. Smaller schools are easier to manage. Schools with more stable teams and lower teacher absenteeism tend to show better results in terms of quality. The director's profile and type of management can influence the quality of educational processes (CHIRINÉA; BRANDÃO, 2015).

For the quality of school education to be formed, it is necessary to consider internal and external inputs, as well as their processes within the school units. The concept of quality cannot be reduced only to school performance, nor can it be taken as a reference for a process of accountability and for building a ranking among schools that, in these perspectives, present themselves as a challenge to education, systems public schools, to professionals working in schools, since, in addition to having to initiate educational processes that allow the assumption and strengthening of local identities, attention must also be paid to the plurality of cultures of migrants, which are legitimate and, in turn, influencing and establishing new cultural constitutions in dialogue with local cultures.

In the area of education, two are the state perspectives to be considered. The first of these is the provider State, which acts effectively in the obligatory and free offer of basic education. The other perspective is the Evaluating State, which establishes mechanisms to assess the quality of education delivered in schools and in education systems, based on the same parameters of effectiveness, efficiency and productivity. In the case of education, the State Evaluator measures and evaluates the quality of education using large-scale tests, whose proposal promotes competitive ethos in school units, as well as passing on to schools' responsibility for the success or failure demonstrated in external evaluations. Based on these tests, tables of performance indicators are elaborated, such as the Basic Education Development Index (IDEB), which gathers information collected from the School Census and the performance averages reached in the Education Evaluation System (SAEB) and in the Brazil Test. The IDEB considers the school flow (promotion, repetition and avoidance) and the student performance averages in standardized tests (external evaluation). The index proposal, therefore, considers only the purposes of education, not its processes, nor its specificities. However, there are some dimensions that contribute to qualifying schools and raising the level of the IDEB, but which are neglected by standardized tests. The type of management, the educational environment, the training and working conditions of the school professionals, their physical structure and didactic pedagogical practice are not considered when assessing the IDEB. However, they are determining factors for quality, insofar as they are articulated in favor of a good school performance.

In this sense, it is not enough to consider only indicators and quantifiable and measurable results without reflecting on the specificities of educational contexts and processes (AFONSO, 2007 in CHIRINÉA, 2010). It is necessary to understand how these dimensions are generated within the schools and how their delineations lead to the educational quality, in addition to the aspects considered by external evaluations and compiled by IDEB. When seeking to contribute with the theme of educational quality, this research aimed to understand the dimensions and dynamics produced within the school that guide or contribute to the qualification of its educational processes. As a parameter of quality analysis, the reference was made to the IDEB and the Quality Indicators in Education, documents elaborated by the MEC / INEP to mark policies, goals and actions that should be undertaken by Brazilian schools in the quest to qualify their educational processes. It should be noted that, while the IDEB is a statistical and quantitative reference of quality, the Quality Indicators in Education are configured in a more reflective perspective, since it articulates the school's own engagement in the struggle for quality improvement. In order to establish parameters for reflection and mobilization of the school, with regard to quality improvement, the Quality Indicators in Education establish fundamental elements called dimensions, namely: educational environment, pedagogical practice and evaluation, teaching and learning of reading and writing , democratic school management, training and working conditions of school staff, school physical space and, finally, access, permanence and success in school.

The IDEB is a statistical indicator, driver of public policies for the improvement of education. Their calculation is based on the length of time students spend in school and the average student performance on standardized tests. The goals of the IDEB are biennial and serve to trace the evolution of the indices of quality education in the country, as well as to mobilize a series of strategic actions of schools and

education systems to achieve the established goals. However, these goals are related only to the means of academic performance of the students and the rates of school performance, there being no connection between the specific contexts of each school or its peculiarities. However, it is understood that these specific contexts lead the school to the results presented by IDEB, thus influencing the quality of education.

6. CONCLUSIONS

Public policy is generally conceptualized as the state in action, that is, the action of the State itself (Müller, 1990 in PARENTE, 2018).

It is the area of knowledge "[...] which seeks at the same time to" put the government into action "and / or analyze this action ... and, when necessary, to propose changes in the direction or course of these actions [...] "(SOUZA, 2006, p.25).

However, there are authors who define public policy also as what the State does not and should do, "[...] everything that governments chose to do or not do" (DYE, 2008, p.1 in PARENTE, 2018). About education, due to the discontinuities of propositions throughout the history of Brazilian education, it is commonly said that there was no public policy in the area. This expression, in fact, denotes that the action of the State was little effective in relation to the question. However, it is understood that State action can be shown in a continuous, effective and legitimate way, through structured programs, with large or small impacts depending on the way in which the interests of the actors involved in the political decision-making process. It is possible to conceptualize public policy from a state centric or multicentric approach, considering the monopoly of state actors in the elaboration of policies or the participation of other private and non-governmental organizations in their elaboration, respectively (SECCHI, 2013).

Thus, based on the multicentric approach, which includes the multiplicity of actors that participate in this decision-making process, about educational policies, it has become increasingly visible the participation of different actors in the definition of the directions of Brazilian education. This also applies to education policies. The models for the expansion of the school day and education are results of the construction of different actors, that is, there is a multiplicity of actors and institutions outlining alternatives and possibilities of building an expanded school. This is due to the action of the State, but the State action, in the configuration of public policies, does not occur in isolation; has received different interventions from various segments of society and public and private institutions. Therefore, we adopt here a concept of public policy that is associated to the multicentric approach; there are numerous education policies being drawn up by different levels of government (Union, states, Federal District, municipalities), but configured with the participation, negotiation and induction of different public and private spheres. This can be corroborated by the diversity of education policies that currently exist in Brazil: education policies formulated and implemented at the same administrative level or by different administrative spheres; education policies implemented with public resources or with public and private resources; education policies implemented within the scope of the Department of Education or intersect orally; policies implemented by the Public Power or through public-private partnerships (PARENTE, 2018).

In view of this conception, it is argued that the State, in the different administrative spheres, has the role of assuming the coordination of this education policy, so that the articulation of school times and times of life does occur and that the different subjects of education have their rights guaranteed to live fair and human times of schooling (PARENTE, 2018).

It is hoped to correlate the Ideb of the school simultaneously considering some factors that potentially impact its value and integrating it as a form of analysis for the education policies, measuring and constructing policies according to its point of view. This challenges educational research to widen its influence in the public debate that revolves around this theme based on well-grounded arguments. However, the one-dimensional use of Ideb, that is, the disclosure of its gross value without consideration of the contextual conditions of schools and their teachers, is what prevails in the public use of the indicator. In this sense, the work corroborates the effort of other empirical studies in order to unveil the conditions to reach the educational quality assessed by the Ideb and other indicators of the same type. It seeks to demonstrate, from the empirical data, that managers should be seen by the students' learning - the expression of the effectiveness of their social function - but also by the contextual conditions to obtain these results. An educational system can only be said of quality if its inequalities are also considered in the analysis of its performance.

REFERENCES

ARRETCHE, M.T.S. Emergência e Desenvolvimento do Welfare State: teorias explicativas. **Boletim Informativo e Bibliográfico em Ciências Sociais**. v. 39, p.3-40, 1995.

BOBBIO, N. (org.). **Dicionário de Política.** 2 ed. Brasília: Ed. UnB, 1986.

BRASIL. Constituição (1988). Constituição da República Federativa do Brasil. Brasília, DF: Senado Federal: Centro Gráfico, 1988. 292 p

_____. Portaria Interministerial nº 17, de 24 de abril de 2007. Institui o Programa Mais Educação, que visa fomentar a educação integral de crianças, adolescentes e jovens, por meio do apoio a atividades sócio-educativas no contraturno escolar. Brasília, 2007a. Disponível em: <Disponível em: http://portal.mec.gov.br/arquivos/pdf/mais_educacao.pdf >. Acesso em: 30 jun. 2015. [Links]

CHIRINÉA, A. M.; BRANDÃO, C. D. F. [UNESP. O IDEB como política de regulação do Estado e legitimação da qualidade: em busca de significados. **Ensaio: Avaliação e Políticas Públicas em Educação**, p. 461–484, 1 jun. 2015.

_____. [UNESP. O índice de desenvolvimento da educação básica (IDEB) e as dimensões associadas à qualidade da educação na escola pública municipal. **Aleph**, p. 119 f., 2 dez. 2010.

CONFERÊNCIA NACIONAL DE EDUCAÇÃO (CONAE), 2010. Brasília, DF. Construindo o Sistema Nacional articulado de Educação: o Plano Nacional de Educação, diretrizes e estratégias; Documento-Base. Brasília, DF: MEC, 2010a. v. 1-2

_____. Brasília, DF. Construindo o Sistema

Nacional articulado de Educação: o Plano Nacional de Educação, diretrizes e estratégias; Documento Final. Brasília, DF: MEC, 2010b. 164p. Disponível em: <http:// conae.mec.gov.br/images/stories/pdf/pdf/documetos/documento_ final.pdf>

DELORS, Jacques. **LEARNING: THE TREASURE WITHIN**. Report to Unesco of the International Commission on Education for the Twenty-first Century. Cortez, 1998 - 288 páginas

DIAS, Reinaldo; MATOS, Fernanda. **Políticas Públicas: Princípios, propósitos e processos**. São Paulo: Atlas, 2012. https://integrada.minhabiblioteca.com.br/#/books/9788522484478/cfi/6!/4/4@0.00:0.00

DI GIOVANI, G. E NOGUEIRA, M. A. (Orgs). **DICIONÁRIO DE POLÍTICAS PÚBLICAS**. 2 ed. São Paulo: Ed. Unesp, 2015.

DRAIBE, Sônia. Welfare State no Brasil: Características e Perspectivas. **Caderno de Pesquisa**, n.8, pp.1-50, Campinas, NEPP-Unicamp, 1993.

_____. Ciclos de Reformas de Políticas Públicas em ambiente de consolidação da democracia: a experiência brasileira recente de reforma dos programas sociais. **Caderno de Pesquisa**, n.63, pp.1-45, Campinas, NEPP-Unicamp, 2005a.

_____ et. all. Desenvolvimento Humano e Bem-Estar Social: estratégias para a política social do Estado de São Paulo. **Caderno de Pesquisa**, n.73, pp.1-93, Campinas, NEPP-Unicamp, 2005b.

ESPING-ANDERSEN, Gosta. As três economias políticas do Welfare State**. Lua Nova**, n. 24, pp.85-116, set./1991.

KERSTENETZKY, Celia Lessa. **O Estado do Bem-Estar Social na Idade da Razão**. Rio de Janeiro: Elsevier, 2012.

RODRIGUES, M.A. **Políticas Públicas**. (Coleção Folha Explica). São Paulo: Publifolha Editora, 2010.

SECCHI, Leonardo. **Políticas Públicas: conceitos, esquemas de análise, casos práticos**. São Paulo: Cengage Learning, 2013.

VIANA, A.L.D., LEVCOVITZ, E. Proteção social: introduzindo o debate. In: VIANA, A.L.D., ELIAS, P.E.M., IBAÑEZ, N. **Proteção social: dilemas e desafios**. São Paulo: Hucitec, 2005. p.15-57.

MARSHALL, Thomas H. **Cidadania, classe social e status**. Tradução de Merton Porto Gadelha. Rio de Janeiro: Zahar, 1967.

MEDEIROS, Marcelo. A trajetória do Welfare State no Brasil: papel redistributivo das políticas sociais dos anos 1930 aos anos 1990. Brasília: **Ipea**, 2001.

PARENTE, Cláudia da Mota Darós. (2018). **Políticas de Educação Integral em Tempo Integral à Luz da Análise do Ciclo da Política Pública. Educação & Realidade, 43(2**), 415-434. Epub November 06, 2017.https://dx.doi.org/10.1590/2175-623661874

PARO, Vitor Henrique. **Escritos sobre educação**. São Paulo: Xamã, 2001.

PERONI, Vera. **Política Educacional e Papel do Estado: no Brasil dos anos 1990**. São Paulo: Xamã, 2003.

PORCHMAN, Márcio. **Proteção Social na Periferia do Capitalismo: Considerações sobre o Brasil**. São Paulo: São Paulo em Perspectiva, 18(2), pp. 3-16, 2004.

SOUZA, Celina. Políticas públicas: uma revisão da literatura. Sociologias [online]. 2006, n.16, pp.20-45. ISSN 1517-4522. http://dx.doi.org/10.1590/S1517-45222006000200003.

The Oasis Skateboard Factory: Return to the One-Room Schoolhouse

William H. Robertson, Ph.D.
Teacher Education Department
College of Education
The University of Texas at El Paso

Abstract

How can you get young people interested in science and mathematics? What efforts are there to integrate the experiences of high school students into the things they need to do and learn in school? How can action sports, like skateboarding be used to teach science, mathematics, language arts, history and help at-rick and marginalized students to grow in their engagement and motivation in high school, as well as to graduate? This is in part answered at the Oasis Skateboard Factory (OSF) an alternative high school in Toronto, Canada. The factory, under the direction of founding teacher Craig Morrison, has enjoyed success since it opened in 2008. The OSF enrolls 25 students per semester and they earn academic credits as they develop their artwork, design and manufacturing skills through a skateboard-centric academic construction process. Additionally, students who are part of this academic program have a 95 percent graduation rate.

Keywords: curriculum, stem, action, science, physics, mathematics, skateboarding

Introduction

Walking down Queen Street to the Park, I headed north on a beautiful sunny fall day in Toronto, as I headed towards 707 Dudas Street West, where the Oasis Skateboard Factory is located. There, I met up with Craig Morrison, the leader and founding teacher of OSF and Lauren Hortie, his partner and fellow teacher. Together, they work with the 25 or so students who make up the group who attend this school.

Located in a non-descript room (Room 3) in the Scadding Court Community Center, the activity inside the room accentuates the actual happenings that are in this modern day makerspace. Students come in and begin their day, which begins at 10:30 AM and continues uninterrupted until 3:30 PM. This is partly by design, as Craig related to me, that it is better to get the students there and keep them working, rather than have too many breaks, where you might lose students or momentum within the classroom.

One thing Craig mentioned to me previously was that the OSF did not use project-based learning or a problem-based learning, they use a product-based learning approach. In that, the instructional approach centers on how the outcomes produced were most important for each student, as they need to pass benchmarks and achieve concrete results, not just grow through the experiences alone.

The Active Classroom is Constructivist

For education to be constructive, the traditional teacher-student relationship, which historically has been defined by a method of the teacher delivering content while students listen passively, is discarded. Instead, teachers must serve as facilitators, mentors, role models, co-inquirers and friends, while helping students to seek understanding to the content of the classroom curriculum (Mezirow, 2003). Teachers need to view themselves as respectful guides and compassionate helpers who provide students the opportunities to become actively involved in their own learning and in classroom operations. The importance of an active environment for learning that integrates oral, visual and kinesthetic strategies by the teacher allows for learning to center on the students (Tillman, 2016).

In this manner, teachers become change agents, linking the relevant life experiences of the students to the content of the curriculum, and in no area is this more needed than in high school alternative education. The teacher must work to establish links within their learning communities, and to try and engage their students in active learning projects that require them to interact with individuals inside and outside the school (Tillman, Zhang, An, Boren and Paez-Paez, 2015). In this pragmatic approach, the teacher needs to extend the content into the fabric of student's lives, not solely as a subject to be explored uniquely in a classroom.

To enable such an approach to be implemented practically, educators should utilize teaching strategies that emphasize providing experiences first, and content delivery second. One such method that is valuable as a pedagogical and curriculum organizer is Constructivism, which is a learning strategy that builds upon students' existing knowledge, beliefs, and skills (Brooks and Brooks, 1993). "It includes skills and activities that increase curiosity for research, satisfy student's expectations, and make the student focus on an active research for information and understanding" (Ergin, Kanli, & Unsal, 2008).

Within a constructivist approach, as students encounter new information, they work to synthesize new understandings based on their current experiences and their prior learning. Students self-assemble meaning while continually self-assessing their understandings of concepts set in a context of their own world experiences. In other words, the constructivist approach to learning states that learners of all ages build new ideas on top of their personal conceptual understandings (Eisenkraft, 2003). In this process, students and teachers experience common activities, while applying and building on prior knowledge.

A five-phased process known as the 5Es, which include the phases of engagement, exploration, explanation, elaboration and evaluation, characterize constructivism (Bybee, 2006). "The important point is that each (learner) has their own construction, their own understanding, rather than some common reality" (Duffy & Jonassen, 1992). With this co-learning approach, students and teachers are enabled to construct a deeper and more comprehensive understanding through activities that match their cognitive capabilities and are delivered in a framework with first sparks motivation, incites inquiry and as a result of collective experience, delivers content knowledge in conceptually correct contexts. The key to the constructivist method is to build on previous learning and to apply new learning in a meaningful context,

which centers in active learning and requires learners to address their own understandings in the context of new experiences and learning opportunities (Robertson, 2014).

Towards this end, a central goal at the Oasis Skateboard Factory is to keep everyone moving forward in order to continually grow and achieve both academically and productively. In this tight 1 room makerspace, Craig and Lauren continue to prod, to push and to encourage each student to keep on task without making it seem that they are calling them out, just letting them know that they need to keep moving forward. The teachers embody the stance of co-learners, working alongside the students, and staying flexible with each person and their individual progress. These are the guides on the side, keeping the momentum going, while they also keep an eye on the skills and knowledge the students need to gain in order to fulfill their graduation requirements.

For example, each one of the OSF students is responsible for a specialty skateboard deck that they have to create, utilizing a unique shape and a unique graphical technique. The boards ranged from longboards, cruiser short boards, pool boards, street boards as well as downhill boards. The students had to ensure that the dimensions were symmetrical and that the alignment for the trucks and wheels was accurate and precise. This required them to integrate mathematics into their designs, and to make practical connections between their ideas and the goals of the project to be functional and artistic.

Engagement and Motivation are Keys for Learning

Engagement activities should help the students to make connections between past and present learning experiences, to move the students to become thoughtfully involved in the concept, process, or skill to be learned. In other words, the student should relate to the problem being posed and be invested in pursuing a solution. Previous studies using skateboarding, specifically the constructions of ramps, as a hook to engage students in real world applications of mathematics "lend support to the argument that all students can benefit from and deserve the opportunity to engage with interesting and challenging problems" (Stephens, Botge and Rueda 2009).

For example, the OSF students are required to produce five distinct shapes of boards utilizing six different processes for graphics, which include the creation of stickers, screen printing, laser etching, spray painting, wood burning, and stencils. Each of the students is part of a team or multiple teams, depending on their interests and areas of expertise. In this way, the instructors not only employ a series of jigsaw techniques, they require that the students actually work with one another with multiple outcomes intended. In this way, they experience the pieces of the puzzle together and integrate in the other areas collaboratively. Additionally, previously marginalized students who have experience in these activities at OSF, but may have struggled in some specific content area, can become experts in their strengths and contribute greatly to the classroom processes while building their less developed academic skills in collaboration with others.

About twenty-five students can attend the Oasis Skateboard Factory in this one-room schoolroom setting at any given semester, and half of them are eligible to graduate in a given academic year. As an alternative school, this can be seen as a final option for many of the students, who did not succeed in a traditional high school. The irony is that the OSF has a 90-95% graduation rate, which far exceeds any other public school in the Toronto School District. Interestingly, this is also done without a dedicated school site, as the classroom is merely a room rented in a community center, that each night needs to be cleaned up, in case another activity is booked in the room for the evening. The budget for materials at the OSF is just around $5000, which is quite small in terms of the amount of work the students need to produce. It seems logical that if they had a dedicated space for this makerspace classroom, as well as an art gallery connected to a store front, they could in effect be a thriving educational business.

Key to this engagement strategy is providing students with opportunities to explore concepts with familiar materials in a hands-on manner, so that they can have experiences that are kinesthetic, visual and require collaboration. Hands-on learning plays a valuable role in the constructivist paradigm, as it is the process of learning by doing (Dewey, 1970) that is utilized in explorations and experiments.

Explorations are driven by Student Questions

Have you ever gotten a new computer or a new cell phone? What was the first thing you did? If you are like most people, the first thing you did was turn it on and begin to explore its functions based on what you have learned previously on your own or with the aid of others. Usually, this type of exploration will continue unbridled, until some problem is encountered or some aspect that needs further understanding is revealed (Robertson and Lesser, 2013). Generally, at that moment, a person will consult a manual or get some help from a friend or colleague in order to better understand exactly what is going on and how best to correct it. In this way, the importance of the exploration is that it provides an experience for the learning that builds a foundation for content delivery and understanding.

A quality exploration activity is central to building on the initial aspects of getting students engaged. In the case of the students engaged at OSF, specific interdisciplinary activities have been designed by the instructors to incorporate asking questions, developing teamwork and gathering data. In a constructivist framework, the exploration phase should provide students with a common base of experiences and build directly on the motivation to learn inspired by engagement activity (Tillman, An, Cohen, Kjellstron & Boren, 2014). As students actively explore through these experiences, they are already learning, and the teacher can provide an environment for inquiry, in which students identify and develop concepts, processes, and skills based on an open-ended approach. “The correlation between the subjects taught in Science and especially Physics lessons and daily life is very important” (Ergin, Kanli and Unsal, 2008). The purpose of this approach built on exploration, asking questions and seeking answers within the exploration phase allows students to explore meaningful science topics set in the context of something they enjoy doing.

In this active learning approach, the OSF students are in control of their learning and take responsibility for the work they are doing, both independently and collaboratively. The interesting thing is that the tasks

are laid out, in terms of outcomes, and the process is a bit open ended in design. Yet, the goals remain clear and to the point, the students need to produce their products, a custom designed skateboard deck complete with graphics, for which they will mount trucks and wheels to make it part of a catalogue for the final showcase, which culminates each end of semester. This will include descriptions of the work, as well as requiring them to talk about their work with synthesis, so that they gain skills in oral and written communication. The theme of native studies also comes out clearly in the artwork associated with each deck, that is done uniquely and well researched authenticity.

This approach maps well to the use of constructivism as a method for integrating transformative education as an approach designed to enhance the interest and motivation of students in completing high school requirements. By immersing students in a product-based learning approach that is based on skateboards and focuses on the goals and objectives of required academic standards, the process skills and overall content knowledge of the students have the potential to greatly increase (Robertson, 2014).

Located next to the OSF school site is a local skatepark, which the class often uses for research experiments, as well as to host a number of guest speakers and skateboarders. For example, the teacher may want teams of students to gather data from three different stations in a local skate park, which seems to be an unlikely place in which to study science. Of course, there would need to be real athletes who can perform specific maneuvers. In this three-station example, the first station could be a half-pipe, a semicircular ramp structure, where riders would move back and forth and where students could calculate angular motion. The second station could be an inclined plane approximately one-meter-tall and three meters long. As the riders drop in on the inclined plane ramp, students could record the time it takes each rider to reach the edge of the ramp. From this data, the students could calculate the acceleration of each rider. The third station in this example might be a grind bar, a metal pole affixed to the ground on which a rider would travel up and over. The student teams would need to calculate the velocity of the rider, as each athlete rode across the grind bar, and to determine at what minimal velocity a rider could encounter the grind bar and still make it to the end.

As students explore such science concepts as acceleration, velocity and angular motion in a real-world context, they develop a broader understanding of those principles through mathematics in the context of their own experiences. When students are able to share their collective observations and understandings through small group discussions, they are able to strengthen their understandings of these concepts. This approach has also been shown to increase congruence in teaching, an instructional strategy that aligns the coherent relevance of a curriculum with the specific content knowledge and skills of a lesson to create optimal learning (Bybee 2003). This sharing within cooperative groups is a fundamental strategy in the constructivist approach, as it allows the teacher to facilitate the learning process, and also helps students to develop a common base of experiences on which to make connections to content. The teacher can then best use the knowledge and skills from open-ended field-based experiences to students take responsibility for their own learning, which is a fundamental tenet of the constructivist method. In the areas of science and

mathematics, often called the "language of science", reasoning and making sense of content in context are critical factors that help students organize their knowledge in ways that enhance the development of conceptually correct understandings (Martin 2009).

Explanations are Times to Present Primary Content

Going back to the example of a new cell phone or new computer, once a problem is explored and a person cannot fully understand the next steps to follow, there is a need for content and a real self-directed desire that maps to the experiences found during exploration. In other words, a person is ready for the content because of the experience in which they have engaged, and terms applicable to specific functions or situations take on new meaning, as they are now presented in a connected manner to a learner's previous experience.

Studies have shown that students, who are involved in active learning in meaningful contexts, acquire knowledge and become proficient in problem solving. The long-term prospects of this approach seek to determine how the implementation of curriculum approaches built around student interests such as skateboarding can impact student achievement in the area of science content and conceptual understandings.

Taking this back to the Oasis Skateboard Factory, each student is responsible for developing their own brands, which include names like Volcano skateboards, Zim Skateboards and Black Light Wolfpack. The students have to plan, design, build, create, develop and implement all aspects from the construction of the deck, to the artwork on the bottom, as well as understanding the style of board complete with well-intended dimensions and alignment for the trucks and wheels, which will give the deck the ability to roll.

It also seems that the addition of community members, such as the many experts in skateboarding, design, manufacturing and graphics who regularly visit the Oasis Skateboard Factory. The volunteers all try to add to the discourse in the classroom, hoping to be an addition and not an obstruction to the flow of the learning, as the students go about their non-linear path, which so much resembles the way work is done in real life. Craig and Kristin, along with each student, are at times managing their processes, directing themselves, working to meet requirements and enjoying the collaboration of the others in the room.

Getting students engaged and exploring concepts must invariably help students to master content, and this approach should extend beyond purely prescriptive approaches. When students have authentic tasks that allow them to directly manipulate data, they uncover content that is relevant to the ideas they have been exploring (Buchanan and Stern, 2012). To return to the skate park example, after gathering the data in teams, students then made mathematical calculations, discuss their results, and justify their solutions within each group. This strategy requires student teams to actively interact with the content of the lesson, to collate the content from any provided worksheets, and to discuss their collective experience to provide logical solutions requiring analysis and synthesis of information (Robertson, 2009).

Elaborations Deepen Connections to Concepts

As students gain experiences and are able to direct their own learning, they can then look to understand through interacting with primary content, while the teacher can develop approaches to steer them deeper into topics that need clarification. This also provides an opportunity for students to move past memorizing content as facts, but to make the content part of their collective learning, so that the skills of analysis of information and its synthesis into new situations is explored and explained (Robertson, 2014). In the case of the OSF students, the products must be addressed in an interdisciplinary fashion that requires each student to demonstrate their understanding of the learning objectives presented in terms of student outcomes. For example, each student must design and create their own brand of skateboard, which includes the construction of physical board (mathematics and science), the marketing materials (language arts, graphic arts), and the connection to local indigenous cultures (history and cultural studies). The purpose is to provide students with a menu of activities based on their interests, as well as hands-on explorations that focused on specific concepts in physical science that are aligned with state and national academic standards.

This elaboration phase is designed to extend students' conceptual understanding into applications of skills and behaviors, and to deepen and broaden their content knowledge. During activities in the classroom, the students would again be assembled into teams, albeit it in new groups, in order to provide new perspectives and collaborations. The students then would gather data in order to solve problems in the focus areas that centered on the content that is being covered in the classroom. For the OSF students, this can be manifested in a needs assessment that includes members of the local community, surveys that are designed in class and administered to various constituents (students, parents, educators, community members) that are then analyzed and integrated into the marketing plans for various products within the classroom. This emphasizes the interdisciplinary nature of learning through classroom activities now extended in the elaboration phase, a connection that that fosters deeper and broader understandings of the connections and relevance of required content into real life (Bybee, 2003).

Evaluation Demonstrates the Progress

The use of creative learning situations, such as the skatepark to gather data from real athletes, can provide a context for students to ask their own questions about their learning experiences as they develop their own content knowledge as it relates to the overall curriculum. The worksheets, activities, quizzes and tests can all be part of the classroom evaluation for the teacher, and in the constructivist method, there is a need for a final demonstration by students. For example, students may have to construct their own catapult using a set of provided materials and then in three trials, launch an object, such as a marshmallow the farthest distance, an also explain the concepts of the lever and fulcrum as it pertains to their specific design.

Students also have the opportunity to present their work and products to community members at an open house that requires them to demonstrate their understanding to a variety of audiences. This ability to synthesize their learning into explanations, both orally and written, showcase their learning in pragmatic

manners that empathizes critical thinking. Within a culminating event such as this, students should have to demonstrate their understandings, as this type of evaluation then provides an opportunity for each student to gauge their own progress and for the teachers to see exactly what students understood as a result of their own experiences.

In summary, the evaluation phase requires learners to assess their own understanding and abilities, as well as to allow the teacher to evaluate students' understanding of key concepts and skill development (Robertson, 2014). The assessments should be both formal and informal and continuous, in order for the teacher to best help the students learn at their own levels. In the case of the Oasis Skateboard Factory, conducting the activities in a constructivist framework gives students a chance to assess their own understandings in the concepts they are required to learn.

Conclusion

How do educators get students to enjoy learning? The Oasis Skateboard Factory proposes to answer this question by filling each day in the classroom with exciting activities that allow students to discover connections between mathematics, science literacy, design, cultural studies and skateboarding. As key elements are presented to keep the students engaged and wanting to learn, the inherent motivation to learn within a student is activated and through the constructivist method, this desire for understanding is fostered and facilitated by the teacher. If students are "hooked" by an opening activity because they connect to skateboarding or enjoy visiting a local skateboard park to gather data, the teacher has in effect captured their interest and activated the student's abilities to relate effectively to the content.

By engaging, exploring, and explaining the content in relevant terms and experiences, the students could then elaborate on their skills and understandings by doing other activities directly connected to their various interests. Finally, students should have many opportunities to elaborate upon and to evaluate their own conceptual understanding by through each day's classroom activities. "Essential to expertise is mastery of concepts that allow for deep understanding. Such understanding helps the learner reformulate facts into useable knowledge" (Bybee 2003).

Often classroom teachers face the pressures of high stakes testing and of covering massive amounts of material in limited periods of time. In most high schools, students are not often engaged and do not seem to enjoy learning skills, nor do they see connections between the real world and the topics being studied. By implementing the constructivist approach of the 5E lesson model in an innovative and creative way as presented at the Oasis Skateboard Factory, students are immersed in required content and can participate at a higher cognitive level in an enjoyable and student-centered manner.

References

Brooks, Jacqueline, and Brooks, Martin. (2003). *In Search of Understanding: The Case for Constructivist Classroom*. Association for Supervision and Curriculum Development, Alexandria, VA.

Buchanan, M. T., & Stern, J. (2012). Pre-service teachers' perceptions of the benefits of peer review. *Journal of Education for Teaching, 38*(1), 37-49.

Bybee, Rodger W. (2003). The Teaching of Science: Content, Coherence, and Congruence. *Journal of Science Education and Technology,* 12 (4): 343-358.

Eisenkraft, Arthur. (2003). Expanding the 5E Model. *The Science Teacher* 70 (6): 57-59.

Duffy, Thomas, and Jonassen, David (1992). *Constructivism and the Technology of Instruction: A Conversation*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Ergin, Ismet, Kanli, Uygar, and Unsal ,Yasin. (2008). An Example for the Effect of 5E Model on the Academic Success and Attitude Levels of Students': Inclined Projectile Motion. *Journal of Turkish Science Education, 5* (3): 47-59.

Martin, Gary. (2009). *Focus in High School Mathematics: Reasoning and Sense Making.* Reston, VA: National Council of Teachers of Mathematics.

Mezirow, J. (2003). Transformative learning as discourse. *Journal of transformative education 1*(1), 58-63.

Robertson, W.H. (2014). *Action science: Relevant teaching and active learning*. Thousands Oaks, CA: Corwin Publishers.

Robertson, W.H. (2009). Dr. Skateboard's action science: Teaching physics in context, *The science education review, 8*(1), 30-34.

Robertson, W.H. & Lesser, Larry (2013). Scientific skateboarding and mathematical music: Edutainment that actively engages middle school students, *European Journal of Science and Mathematics Education*, *1*(2), 60-68.

Stephens, Ana, Bottge, Brian, and Rueda, Enrique. (2009). Ramping up on Fractions. *Mathematics Teaching in the Middle School* 114 (9): 520-526.

Tillman, D. A. (2016). Not just consumers: Finding space for student creativity during mathematics instruction. *Journal of Mathematics Education, 9*(2), 1-3.

Tillman, D. A., An, S. A., Cohen, J. D., Kjellstrom, W., & Boren, R. L. (2014). Exploring wind power: Improving mathematical thinking through digital fabrication. *Journal of Educational Multimedia and Hypermedia, 23*(4), 401-421.

Tillman, D. A., Zhang, M., An, S. A., Boren, R., & Paez-Paez, C. (2015). Employing rapid prototyping design technologies to support contextualized mathematics education. *Journal of Computers in Mathematics and Science Teaching, 34*(4), 455-483.

Socio-cultural theory and the "New Man": from post-revolutionary Russia of 1917 to the challenges of contemporary times

Marcelo Duarte Porto
Universidade Estadual de Goiás
Brasil
marcelo.porto@ueg.br

Luciano Alves de Almeida
Universidade Estadual de Goiás
Brasil
dadaimalu@hotmail.com

Zenaide Dias Teixeira
Universidade Estadual de Goiás
Brasil
zenaide.teixeira@ueg.br

Abstract

The aim of this article is to present the influences that the Soviet historical context of the Russian post-revolution of 1917 had on the construction of cultural historical theory, mainly in the perspective of the creation of a new society and a new man.. The predominance of the Marxist-Leninist vision inspired the thoughts of Lev Vygotsky, Alexander Luria and Alexei Leontiev on human development and learning. We also discuss some applications to the process of teaching learning that historical cultural theory, elaborated in the Soviet historical context, has managed to achieve. For example, the importance of mediation for the learning teaching process; the development of defectology and its influence on inclusive education and the contributions to the neurosciences that had repercussions in the school education. The methodology used was the bibliographic review. We conclude that understanding the context in which this theory emerges can bring significant contributions to the understanding of the cultural historical approach in our day, such as its potential, its limitations, its challenges and perspectives. The thesis on the importance of speech in social interaction as a promoter of development and the prospective approach of man as a come to be with the mediation of the other, opens a hopeful path for the education of present and future generations.

Keywords: Vygotsky, Defectology, Learning Neurosciences, Mediation in Learning.

1. Introduction

The thought of the principal representatives of socio-cultural theory, Vygotsky, Luria and Leontiev,

was born in a certain context of the post-revolution that occurred in the former Soviet Union. There was a Zeitgeist that permeated the elaboration of cultural historical theory. This was committed to a prospective vision of new society and human being, if not unprecedented in the history of mankind.

The impact of the Russian language should also be considered, for example, in the choice of the term used by the crack to refer to the teaching and learning process. According to Oliveira (2010), the term derives from the Russian word *obutchenie*, which means something like teaching learning occurring together and inseparable. Prestes (2010) criticizes the translation of the Russian word *obutchenie* into English, when this took on a limited meaning by pragmatism and interest in inserting cultural historical theory into the box of learning theories. O*butchenie* describes a guiding activity, an active synthesis between teaching and learning that engenders development. That is, teaching-learning is always ahead of development, as a cause for development. The teaching-learning does not need a previous development and nor walks along side of the development. Vygotsky sought in Karl Marx's thought the meaning for what he meant by *obutchenie* understood as a form of guiding activity. Marx asserts that man uses the instruments of labor in every historical and social context, changes the external nature, and thus changes his own nature. *Obutchenie* is also defined as an autonomous activity of the child oriented by an adult or colleague and causes it to appropriate cultural products and contextualized human experience itself (Prestes, 2010).

Keeping in mind this discussion of the original meaning of *obutchenie*, from now on we will use the expression teaching-learning as an attempt at translation. The idea of an active being appropriating knowledge is contained in teaching-learning as thought in the originality of cultural historical theory.

The traditional view on education, influenced by the positivist paradigm, thinks the process of teaching-learning in a neutral way and away from the conjuncture of the social, economic and political context. On the other hand, constructivist approaches in general, and cultural-historical theory in particular, think the social context making it the starting point for school learning. And not merely the reproduction of capitalist relations and of dominant ideologies that may be implicit in the presupposition of a neutrality. With this the current apathy of many classrooms can be transformed by a more instigating vision. Empowering students about how school knowledge can lead them to achieve their interests and promoting substantial changes in the teaching-learning process.

2. The influence of the Context

Lev Semyonovitch Vygotsky was born in the Orsha city, Belarus, on November 5, 1896. From the Jewish family he received primary education from a Jewish mathematician named Saloman Ashpiz. During his academic life, he studied Law, Literature, Medicine, Philosophy, but it was in Psychology that he went deeper and left his great legacy for humanity. In 1924 he was invited to participate in the Institute of Russian Psychology, where he worked with important collaborators of his work as Alexander Luria and Alexis Leontiev. Luria was introduced to Vygotsky in 1924 at the II Congress of Psycho-Neurology in Leningrad, and describes him as a brilliant mind, ahead of his time, a genial man. (Luria, 2016).

The context of Vygotsky's work goes back to the Russian Post-Revolution of 1917. There was a need for the creation of "a new man," as Vladimir Lenin put it. In this situation, Vygotsky develops his research

aiming to find a general theory of human development (Riviere, 1985). There were also practical needs in their studies, such as working with vulnerable children. Many of them with disabilities such as blindness, deafness and mental deficiency. The Soviet Government instructed him to draw up educational proposals for this demand. In this way, he created the Experimental Institute of Defectology in 1929.

The context of Vygotsky's work goes back to the Russian Post-Revolution of 1917. There was a need for the creation of "a new man," as Vladimir Lenin put it. In this situation, Vygotsky develops his research aiming to find a general theory of human development (RIVIERE, 1985). There were also practical needs in their studies, such as working with vulnerable children. Many of them with disabilities such as blindness, deafness and mental deficiency. The Soviet Government instructed him to draw up educational proposals for this demand. Hence he created the Experimental Institute of Defectology in 1929.

It is incontestable how much the Russian Revolution of 1917 influenced the scientific direction of Vygotsky as a researcher of that troubled but hopeful period. He experienced the early years of the Bolshevik Revolution of October 25, 1917. Russia came out of World War I with its problems. The Tsarist government (1547-1917) ended up having to leave the war because it fought a battle on its own territory. In a first act, he faced the Menshevik revolt, but remained in political power. Soon afterwards, the Bolsheviks seized power and ended 370 years of Tzarist absolutism in Russia, triggering a bloody war between the Tzarist government and the Red Army organized by Leon Trotsky.

The Russian Civil War brought profound consequences to an agrarian country and industrially backward like Russia. With 95% of its population illiterate and with the consequences of the military confrontations marking its economy and its politics and, as victims of these struggles, thousands of the underprivileged. It is in this context that there was a scientific effervescence based on the need and hope of building a new society and a new man.

Vygotsky was of Jewish family, of good economic situation. Bortolanza and Ringel (2016) say that at that time there was persecution and prejudice against Jews in Belarus, where Vygotsky was born, lived and studied. To be admitted to the University of Medicine, dream of his parents, he adapted to a college that guaranteed them such rights. He also studied at the Shaniavisky People's University, where he had contact with the social sciences. After spending some time in Moscow, he returned to Gomel, a city situated in his native region where he had his first contacts with disabled children, which awoke him to study this area. He worked on it with deaf, blind and mentally handicapped children. Sometime later, he returned to Moscow and inserted himself in the context of the Russian Revolution.

The new government brought with it new social demands. According to Bertolanza and Ringel (2016), the new government democratized the culture to end illiteracy, created the Faculty of Labor, opened jobs in public education, accelerated the training of workers and multiplied libraries.

In this period, Lenin urges youth to engage and not be isolated in schools and colleges, but participate with their respective formations in the education of workers and peasants. Great projects to combat illiteracy and also the construction of the economic development of the new nation was a new challenge to that youth. In the 1920s, the Union of Soviet Socialist Republics was born, or simply the Soviet Union. His government uses culture and education to build the socialist project in the country. Art and education served to consolidate the vision of the new man and a collective conscience. This reflected mainly

in the human sciences. According to Bertolanza and Ringel (2016), in Belarus these sciences started to develop the so-called "new man". The investment in developing the potential of each child and each young person took shape. This new conception of society thrilled the new scientists who enjoyed the incentives of the communist state.

There was also a social context marked by a serious economic crisis. The crisis of supply that led to the death between 1920 and 1922 of 13 million people, including millions of children. The birth of the Soviet Union brought a challenge for its reconstruction, a country with a population with immense cultural, ethnic and territorial scope. This was the basis for Vygotsky's research, such as semiotics, the importance of speech and the interest in understanding the impact of cultural diversity on the development of each subject. The new country had 15 republics, 20 autonomous republics, 8 autonomous regions, 10 autonomous areas, 100 ethnic groups, 80 different languages and 5 distinct alphabets, becoming a gigantic scientific experience and quite challenging.

The Soviet government wanted solutions to this demand and, according to Bertolanza and Ringel (2016), sponsored the new researchers and scientists for this purpose. In this sense, Vygotsky allied himself to this context and at the same time had this help for a certain theoretical freedom. He had much influence from the Marxist-Leninist current in his theoretical thinking. According to Dalla Santa and Baroni (2014), Vygotsky was a Marxist thinker and used the Marxist work in search of answers to his theoretical problems. He used the Marxist concept of work and created the concept of mediation as a conscious action mediated by the instruments that, on the psychological plane, are the culturally constructed signs in social and historical contexts.

Vygotsky, in the effervescence of these transformations, sought to study the processes of human transformation in the phylogenetic, ontogenetic and sociogenetic dimensions. (Riviere, 1985). At one point, when the Soviet Union was under Stalin's rule, Vygotsky did not revere Stalinism and its vanguard vision of the party. He chose dialectics as a method having much more affinity with the essential foundations of Marxism with Hegel's thought.

Gradually Vygotsky was distancing himself from the demands made by the Soviet government. He was struggling to do a research centered on scientific status, so he did not agree with any current of Soviet psychology in his context and sought other influences, such as gestalt and cognitivism. His use of the dialectic was not dogmatic, but a framework for understanding a problem and situating it in a dialectical genesis. In this Soviet context, Vygotsky endeavored to create a new man, not as the Leninist proposal of the "Homo Soviets", but with the sense of the one. Not as collectively determined, but as unique in its constitution. Hence, he was censored and had some of his publications forbidden by Stalin, especially his studies on pedology, understood as the science of the child. This is because although Vygotsky uses dialectical-historical materialism, his works have been labeled, even with this influence, right-wing ideas or right-wing Marxism. Luria said that Vygotsky was going beyond Marxism with his theses.

Thus, Vygotsky became the main reference of the historical-cultural approach. Although many vygotskyanas theses were developed and deepened after its death by Luria and Leontiev. Vygotsky argues that human characteristics (higher psychological functions), unlike the Piagetian approach, are not present in man from birth but are produced in relation to historical and cultural processes. In this thesis, we can see

the influence of Marx's thought according to which man is the product of the cultural, social and material transformations elaborated in history. (Engels, 1979). The child is born with its primary (biological) or elemental psychological functions. Only in the contact with the social and cultural world acquires the higher psychological functions (language, conscience, voluntary attention, memory, etc.). The child will form his mind through the active internalization of the cultural heritage built up by mankind thus far. In this context, the individual will not develop alone in contrast to the Piagetian perspective that bets on a child's self-determinism to learn. Vygotsky bets on the interaction of the child with an adult or a more capable person in the field to be learned, in order to arrive at socially validated knowledge. This was also known as a socio-interactionist approach.

Another thesis of Vygotsky concerns a semiotics of culture. Once again influenced by historical materialism, he affirms that man is not separated from the social and cultural environment in which he lives, just as he does not have a passivity towards it, but receives cultural and social influence that will be interpreted in an active internalization process . The language, concept worked by him in the book Thought and Language (Vygotsky, 2008), is formed by signs that are produced in the social context that the subject participates actively. Thus, each subject is also a constructor of the culture in which it is inserted.

Vygotsky left deep marks in scientific research on human development, many of them unfinished. He had an early death caused by tuberculosis in 1934 at age 38. Vygotsky's research on the formation of human thought, and especially on the importance of signs and language, will gain widespread recognition in his country only after his death, for his work has for a time been banned in the Soviet Union. His book “Thought and Language”, for example, had its first publication in 1962 in the United States, thanks to Luria's commitment. In fact, it was Luria, Leontiev and others to continue and publicize the work of Vygotsky.

3. Contributes to the transformation of man through the process of teaching learning

As previously shown, cultural historical theory built its assumptions based on the Soviet context of 1917 and its legacy has reached several areas of knowledge. These presuppositions, each in its own way, influenced with its discoveries the teaching-learning process. We had the important contribution of cultural historical theory in the mediation applied to the construction of knowledge in the teaching-learning process, in research on the brain and its applications to neuroscience and the impact of defectology on inclusive education. Each of these contributions will be presented below.

3.1 – Mediation and the transformation of man by speech

A fundamental thesis of Vygotskian thought is that the relation of man to the world is not direct but mediated. This conception plays a primordial role in the teaching-learning process. Humans use and need the mediation that is done through the signs and instruments. The signs are the symbolic representations or indices that the human being elaborates from the concepts learned about the objects inserted in its culture. In this way, signs are constructed culturally and socially by humanity, and transmitted, mainly by speech. Thus, speech is a form of social instrument. The term instrument, Vygotsky retrieved it from Marx's thought in which they are constructed by men according to historically created modes of production. Thus, the

instruments transform themselves according to historical transformations and, consequently, transform the man who created them (Engels, 1979). Since speech consists of signs, that is, symbolic social instruments, the speech created by man transforms this man according to the historical cultural context. In this sense, speech fulfills the primordial role in mediating between the adult and the child. Through the mediation of the speech, the child initiates the active internalization of the signs constructed by humanity in the course of time. (Vygotsky, 2008).

We realize that signs and instruments play an important role in Vygotsky's work in understanding human thought. For him the signs make the interaction of the individual with the world. Through the signs, the subject can remember, report, make decisions and choose to interconnect with the object in a symbolic way, that is, in a way that is not direct. These signs are the symbolic representations that this individual makes of the world around him and that constitute his thought. These representations free men from the need for direct interaction with objects. Signs are oriented to the subject and will build their higher psychological actions, that is, their way of being in contact with the world, with society and with themselves.

We choose the word "speech" to assume the meaning of a symbolic instrument, since it is linked to Vygotsky's original thought. According to Prestes (2010) the word "language" is not appropriate for Vygotsky's thinking. The Russian word "*retch*" is closer to the sense of "speech". Vygotsky argues that speech and thought are distinct psychic processes that come together in ontogenesis, early in childhood, and form verbal thinking. From this amalgamation between speech and thought, human thought is always linked to a symbolic representation provided by the use of speech. Speech is one aspect of language. But the language is broader. In this sense, not everything that refers to language concerns speech, but everything about speech is in language. Another argument of Prestes (2010) is Vygotsky's study of oral and written speech. He made important discoveries in this direction and claims that it is wrong to judge children's mental development by their written compositions, especially in the early years. Hence our choice for speech rather than language, for we believe we are in agreement with its original thinking.

Therefore, speech is a *sine qua non* instrument for the construction of thought. In fact, the concept of speech is for Vygotsky just as the concept of instrument is for Marx. For the instruments are external elements that change according to social, historical, cultural and economic transformations. And so is speech. In Marx the instruments dictate the ways of working the modes of production and these form the way of thinking of the man who is inserted in them. In a similar way, Vygotsky thinks of speech as an instrument that undergoes all social, cultural, historical and economic influence. This speech, in turn, forms the thinking of man. That is, by speech the way of thinking can be transformed. In Vygotsky says that: "Words as a means of communication with one another and as a generalization of experience play a central role not only in the development of thought but in the historical evolution of consciousness as a whole: The conscious word is the microcosm of human consciousness "(Vygotsky, 2010, pp.8-9).

Based on this principle, Vygotsky deepened his understanding of the role of speech in the construction of thought. He expounds this in several chapters of his book: "Thought and Language". From speech as the definitive separation of man from other species, even in the articulation of this as thought, which is also present in the book "The Social Formation of Mind." Vygotsky will speak of the evolution of this speech in the child with affective-cognitive thinking (crying, babbling, etc.). Then the phase of

intellectual speech, which is the encounter between speech and thought. Verbal thinking will be the product of this process.

Another important component for Vygotsky's understanding of the function and potential of speech is meaning. Being aware of the relevance of meaning is essential, for it is there that thought and speech come together to form verbal thinking, resulting in social exchange and generalized thinking. The meanings are in constant transformation, since they are produced in the socio-historical-cultural of the individuals.

The thesis on the importance of speech in social interaction as a promoter of development and the prospective approach of man as a come to be with the mediation of the other brings a hopeful perspective for the education of present and future generations if we compare with dominant views in Brazilian education in the last century. (Rezende,2009) specially in the 1980s where the individual was involved in the learning process dominated by the military dictatorship (1964-1985). This dictatorship formed a passive apprentice, to become a passive citizen who did not bring into question the status quo. Then, with the passing of the years and the implementation of democracy in Brazil, the challenge of rethinking education emerges from paradigms that put the student as a being who could hope to actively build his future..

By this necessary approach of the previous knowledge, one notices how important it is to understand the construction of the knowledge through the historical cultural theory of Vygotsky. In the fragment of the first translation of "Thought and Language", Vygotsky establishes three moments that are the levels of actual and potential development, and the zone of proximal development located between these two levels, described as follows by Coll *et all* (2004, p.156).

> "In the socio-interactionist view there are three levels of learning development, level of real development that the child owns or does alone, which he can achieve with the help of an adult that is the potential level of development and among these is what he will instrumentalize in the school that is the level of proximal development ".

According to Prestes (2010) the zone of proximal development lost its original meaning when translated into English. This meant that this concept was less Marxist and less committed to the socialist regime. Thus, zone of proximal development became very widespread and also very banalized. And the expression in Russian chosen by Vygosky was *blijaichego razvita*. In the original sense Vygotsky uses this expression to refer to a development zone with possibilities. The proximal term used in English means something immediately and with observable results. This is not what Vygotsky thought. The *blijaichego razvita* is intended to demonstrate functions not yet matured, but which are in process. Thus, it would be something like zone of imminent development, with characteristics of possibilities of development. Thus, we will continue in this text with the meaning that has become popular as a zone of proximal development. However, it is necessary to keep in mind the original sense of development possibilities zone

The proximal zone of today will be the actual level of development tomorrow (Vygotsky, 2006). The so-called proximal zone of development can be defined by Antunes (2012, p.229) as: "The distance between the level of resolution of a problem or a task that a person can achieve by acting independently and the level that can be achieved with the help of other people (parents, teachers, colleagues and others) "

These stages of development theorized by Vygotsky, bring us to the fore new paradigms with greater participation of the student in the process of teaching learning. Consequently a greater interest of the student by the process. Considering that their social and cultural background is taken into account, as well as their participation as fundamental, also increases the responsibility of the teacher. For Azevedo (2014) the teacher plays an extremely important role as mediator between the student and the knowledge, modifying the learning with problematizing, questioning and dialogue activities. Involving problem solutions and leading to concepts for students to build their knowledge mediation is a crucial point in the learning process within Vygotsky's theory, it brings to the teacher's work greater challenges. The teacher becomes a questioner and suggests a change from the teacher of traditional teaching to a mediating and guiding teacher. Therefore, Vygotsky's theories about learning development zones and their construction through teacher mediation are of fundamental relevance in the construction of these new paradigms for education.

3.2 – Defectology

As has been said Vygotsky also influence inclusive education, as he has worked hard with people with disabilities at the Institute of Defectology in Moscow. He sees important approaches to coping with inclusion such as compensation, mediation and the right of these children to have individualized follow-up.

The defectology was subject described by Vygotsky and his collaborators, like Luria and Leontiév. During his studies in the Soviet Union, in the decades of 1920 and 1930 was elaborated his work “Foundations of the Defectology”. In it, they address the limitation of the psychology of their time, supported only by quantitative research, carried out on children with disabilities. For them, this premise in quantification created methods and strategies that did not fit with the work with the disabled, only served to measure the degree of the defect, but left aside the defective. It also cites other currents such as anatomists and physiologists, which were based only on quantification, calculations, differentiations, but set aside the peculiarities of defective children.

For this reason, cultural historical theory proposed the creation of defectology as a science of specific objectives and methodologies of its own. This new science was based more on the qualification than on the quantification, with the premise of doing works so that the defective child could overcome his difficulties. In this sense, the concept of compensation and overcompensation was elaborated, which will be discussed later. Vygotsky relied on the studies of Sten and Adler, who worked on this term of compensation and proceeded from the assumption, which also refers to Nietzsche: "What does not kill me strengthens me." Compensation as a child's reaction to the defect is central and basic to defectology, and this assumption will be central to inclusive education.

In inclusive education Vygotsky left fundamental theoretical legacies such as social compensation applied to students with disabilities. This legacy was part of a larger view of Vygotsky himself who was to understand the aspects of the social genesis of higher psychological functioning and to create his general theory of human development (Riviere, 1985). Social compensation would be a reaction of the subject to disability, in order to overcome limitations based on artificial instruments such as symbolic mediation. For this Vygotsky fought for the creation of a new vision in the Soviet Union with regard to children with

disabilities. The relation with the other for the disabled student emerges from the socio-psychological plane, in this exchange is located the triggers of possibilities for him.

According to Freire and Costa (2015) in compensation the defect acts as an incentive to increase the development of other functions of the organism. It activates and awakens the body to redouble the activity that will compensate for the defect and overcome the difficulty. The defect acts as a developmental stimulus. The defect also contains the stimulus for the formation of compensation or overcoming. The high tendency towards development is originated by the defect, the law of compensation and overcoming reveals the creative character of development .

Vygotsky also defended the concept of plasticity in the construction of the development of the disabled student. According to him the intelligence is not static, but dynamic and with a tendency to evolve. Nor is it innate, but it is built in the exchange with the environment. Vygotsky argues that disability was neither an impediment to learning nor to mediation. It even argues that mediation is fundamental for the educational development of the student with a disability.

Therefore, work with the signs according to Freire and Costa (2015) is of fundamental importance for students with disabilities. In order to symbolically represent places, streets, sounds and to create concepts about objects, signs are instruments of psychological actuality, they will act together with languages in interpersonal relations, generating the inter-psychological relationship and putting an end to the intra- -psychological. Therefore, the teacher or other mediator is fundamental in the construction of the assumptions of cultural historical theory in inclusive education.

The main work of Vygotsky cited for his studies with people with disabilities is Fundamentals of Defectology. According to Porto and Oliveira (2010), this work covers studies that Vygotsky carried out in the 1920s, as previously described, in the city of Gomel when he worked with abandoned youths, orphans, people who were disconnected from their families and others with diseases caused by dementia. The Soviet Union was undergoing a serious supply crisis in 1921, which led to the deaths of 6 million children and aggravated the situation, including children with disabilities, disabilities, delinquency and prostitution. The defectology would be the area of knowledge that studies the person with what Vygotsky calls a defect, according to Porto and Oliveira (2010), for Vygotsky what mattered was the patient and not the disease, so it is necessary to give the conditions so that the patient to overcome their difficulties in the face of illness. In the case of the defect or deficiency, the important thing for him was the children he worked, not his physical state.

For Vygotsky the disabled child needs alternative paths and special and different resources to develop (Porto and Oliveira, 2010). This was well within the historical context of the newly created Soviet Union which sought all forms of inspiration and overcoming to rebuild the country ravaged by civil war and economic and political isolation. In defectology Vygotsky defended social relations as a means of overcoming the defects of the child. According to Porto and Oliveira (2010) defectology has its development based on social relations and experiences that favor the development of compensation of human potential. The authors argue that the environment plays a fundamental role in the development of children with disabilities, the contact with the culture and the social relations offered to them by the groups that surround them, are fundamental for this.

Another important point already mentioned is compensation in the faulty child. The term compensation according to Andrade and Smolka (2012), was coined by Vygotsky of Alfred Adler (1870-1937), a Viennese physician who created the idea of targeting a goal or purpose of behavior in his work with people with disabilities, Adler[1] used the concept of compensation for their research, which was also used by Vygotsky. Vygotsky's first texts on disability go back to 1924, when he came into contact with the deaf, blind and mentally handicapped. In them he came to the conclusion that children with defects were 95% healthy and with potential for normal development.

Compensation is a key means for success in building knowledge and development in children with disabilities. Porto and Oliveira (2010, p. 125) say that: "Psychic aspirations are so intense towards compensating for disability that it is possible to open new avenues for the development of other skills in children with disabilities."

According to the authors, the child will not be limited by disability. For example, the blind will remain blind, but will not be limited by blindness, as their limitation will be offset by the use of other senses, such as touch, hearing, and so on. This is the basis of the central thesis of defectology, that every defect creates stimuli to work out compensation. Vygotsky did not agree with the isolation treatment given to the disabled. Possibly he noted this in the Soviet Union's underdogs and in the treatments given by Soviet psychology and medicine of his period. He argued that the defective child should be linked to society as much as possible because they could overcome their limitations. This is why Vygotsky's uncompromising defense, regarding the role of mediation in the development of compensation for children with disabilities.

According to Porto and Oliveira (2010), Vygotsky defines the biological origin of the disability as the primary nucleus, but gives more importance to the social interactions that he defines as a secondary nucleus and where the development of the disabled occurs, so the authors cite the importance of understand the disability by social aspects. From there, the school plays a central role in advancing these premises in the child with disabilities and the teacher is an odd figure in the process of development and interaction of the disabled, since it is essential to mediate.

Another fundamental aspect raised by the authors is about the students' previous knowledge and their life experiences. Respect for their prior knowledge and appreciation of their life experiences are fundamental to contextualize teaching and create plausible strategies to achieve the goals mediated in the construction of knowledge in students with disabilities. These should have a distinct and individual form, which will require the hard work and responsibility of the teachers who will have to work to find alternatives to reach those objectives. It is challenging but at the same time exciting, it was surely the same feeling that defined the course of Vygotsky's theoretical construction when he encountered children and youth with disabilities in Gomel and combined it with a creative and revolutionary spirit that achieved giving it strength and at the same time seriousness in the elaboration of answers to these demands. It is in this way that the limitations of the students of inclusive education continue to be overcome, which are facing challenging struggles to have their rights respected.

3.3 - The Neurosciences

For Vygotsky the brain was not only a physical part of man, but was vital for its development, for

man is not only a biological being, but with the interaction and development of knowledge, he goes from being biological to being a historical partner. The human brain in this sense concentrates through knowledge all this social cultural charge that will influence how this brain works, because it is not in that sense a static organ but can be transformed. In this sense Oliveira (2010, p.24) comments on this Vygotsky's thesis: "The human brain is not a system of physical and immutable functions but an open system of great plasticity whose structure and modes of functioning are shaped throughout the history of the species and individual development".

Luria, one of Vygotsky's main collaborators, is one of the great exponents of neuropsychology. In this area, he carried out numerous researches on the functioning of the brain, but always remembering that his studies were based on the researches of Vygotsky. Luria, quoted by Andrade and Smolka (2012), said that the brain is like a concert, differentiating the functioning brain (what changes) and functional brain (what remains) and starting in different neurophysiological dynamics such as biochemical processes, electrochemical, sequencing of neural networks, teams, plasticity, energy metabolism and others. For this reason, Luria (1981) compared it to the concert, for the permanence of the dynamics as rules or laws of operation, as hierarchies in the periods of development and in the orders of maturation of specific areas. Vygotsky made many references to the plasticity of the brain when he theorized the concept of compensation in his research on defectology; in fact, his early writings on the brain in 1924 were related to working with people with problems of blindness, deafness, and mental retardation.

His works on the brain issue had much influence from Ivan Pavlov's theories on conditioned reflex, but he was also heavily influenced by Darwin's studies. His conception of the historical-cultural approach and its influence on the brain issue is inspired by studies by Durkhein, Lamarck, Skinner, but also writings by Marx and especially by Engels, who observed some differences that produced an abyss between men and animals , such as the upright position of the body, the use of hands, language and the brain, Engels (1979), in fact, bases the importance of the hands as a presupposition for the emergence of human tools and activities. Vygotsky based on these assumptions links the hand to the brain, studying perception and motor skills with more interconnected brain functioning (Andrade and Smolka, 2012).

Luria, in the continuation of Vygotsky's works, speaks of the genesis and structuring of the brain, as a two-way street understood according to a dialectic of development, for him the brain consists of three areas. The primary linked to its biological perception, the secondary areas linked to the contextual information it receives and the main area, the tertiary which are the most complex of the brain, so it was based on Vygotsky's proposal of the brain as a complex functional system. The tertiary areas play a decisive role in the organization, planning and verification of actions, their connections interconnect all areas of the brain, so it exercises dominance over the other areas. It also examines the importance of the prefrontal cortex as a key in regulating human activities.

Vygotsky was very interested in the cases of dementia, he read several articles from 1920, which were fundamental for the elaboration of his work: Fundamentals of Defectology. Where he demonstrates his confidence in his method of work and his conceptions of the social nature of man and the potential of human development (Andrade and Smolka 2012), this would substantiate the later work of Alexander Luria. According to Freitas (2006), he was very concerned with mental processes, such as sensation, perception,

language, thought and memory. For him, specifically on perception, he first has the necessary cortical tone, as he performs the analysis and synthesis of the information received and, thirdly, he deals with the movements that give the perceptive conduct its active character (Luria, 1981). On the sensations, they must stimulate and activate the functioning of the nerve cells joining them to the neurological process. It is up to the brain to organize a communication system with thousands of data.

The plasticity of the brain interested Luria and Vygotsky so much that both applied their research on the subject to the concept of defectology, trying to understand the process of brain plasticity. Abreu (2006) says that brain plasticity allows transformation through social interaction, as appropriate social functions become individual. Emiliano and Tomás (2015) say that the plasticity of the brain leads to its ability to adapt to environmental influences, both in childhood and in adulthood. Tthe plasticity of the brain reestablishes and restores functions disorganized by pathological conditions, this takes away the static condition of the brain. This phenomenon of brain plasticity and the development of the nervous system is intrinsically linked to the socio-historical-educational context, so the importance of cultural and historical constructions influence the cerebral functioning, providing important subsidies for the mediation of the individual with its social and historical context.

4. Final considerations

In this article, we aimed to demonstrate how much the post-revolutionary context of Russia of 1917 exerted a marked influence on the socio-cultural theory. It is interesting to note that this corroborates one of the main assumptions of this theory, according to which the mind is inseparable from its context.

It was also intended to shed light on the problem of Russian translation into English which, in some expressions, deformed the original meaning. Significance problems are specifically relevant within the Vygotskian theory which defends the thesis that the word is a microcosm of human consciousness, and it forms an amalgam between thought and language. Meanings that are not faithful to the original language will convey very different concepts than was intended.

In this work, a specific criticism was also made of traditional education, which does not consider the profound changes that occurred in our time. It is not interested in the reality of its students, it works in favor of the reproduction of a system that favors only a small elite and wants to guarantee its maintenance portentosa, delaying to bring significant improvements for the learning in the classroom. Cultural historical theory has been an important alternative to the teaching-learning process, since it includes a new dynamic for students and teachers who may become aware of their protagonist roles in this process, looking for a rupture with the old educational paradigms and a possible transformation of the school current. Making her attractive, persevering in her role and truly transforming reality.

Therefore, this is the contribution of this article to bring to light the reflection that we need changes in school everyday. That the knowledge of the student is important in the process and that the teacher is not a mere reproducer, but a reflective and conscious researcher.

Inclusive schools are a good example of how useful a cultural historical approach in practice will be in the classroom. Some strategies used in schools that work with inclusive students can be adapted in conventional classrooms; these would be shown through pedagogical workshops or betting on mini-courses

and lectures that will address to teachers the main assumptions of cultural historical theory and the results that are can get in class.

5. References

[1] Abreu, A.A psicologia histórico-cultural de Vygotsky, Filosofia, educação, sociologia e psicologia, Julho, 2006.

[2] Andrade, J., Smolka, A. L. B., Reflexões sobre o desenvolvimento humano e neuropsicologia na obra de Vygotsky, Psicologia em estudo, Maringá, v.17, n.4 p.699-709, out/dez 2012.

[3] Antunes, C. Vygotsky na sala de aula. Petrópolis. ed. Vozes, 2012.

[4] Azevedo, M. C. P. S. Ensino por Investigação: Problematizando as atitudes em sala de aula. in: Ensino de ciências: unindo a pesquisa a prática. São Paulo. Thompson, 2014.

[5] Bortolanza, A. M. E., Ringel, F. Vygotsky e as origens da teoria histórico-cultural: estudo teórico: educativa, Goiânia, v.19, n.1, p.1020-1042, set/dez. 2016.

[6] Coelho, L., Pisoni, S. Vygotsky: sua teoria e a influencia na educação, Revista de pedagogia. Vol.2. nº1. Agosto, 2012

[7] Cool, C. et al (org). Desenvolvimento psicológico e educacional. v.2 psicologia da educação escolas. Porto Alegre: Artmed, 2004.

[8] Costa, D., Freire. A Superando limites: a contribuição de Vygotsky para a educação especial. Revista Psicopedagogia, 23(72), 232-240.2006.

[9] Dala Santa, F., Baroni, V. As raízes marxistas do pensamento de Vygotsky: Contribuições teóricas para a psicologia histórico-cultural, Kenesis, Vol. VI, nº12, Dezembro 2014, p.1-16.

[10] Emiliano, J. M., Tomas, D. N., Vygotsky: A relação entre afetividade, desenvolvimento e aprendizagem e suas implicações na prática docente. Cadernos de Educação, Ensino e Sociedade, v.2, pp. 59-72, 2015.

[11] Engels, F. A dialética da natureza. Rio de Janeiro: Paz e Terra, 1979.

[11] Freitas, N. Desenvolvimento humano, organização funcional do cérebro e aprendizagem no pensamento de Luria e de Vygotsky, ciência e cognição. v. 09. UDESC, Florianópolis, 2006.

[12] Luria, A. Fundamentos de Neuropsicologia. São Paul: Ed. USP 1981.

[13] Oliveira, M. K. Vygotsky- aprendizagem e desenvolvimento um processo sócio histórico. ed. São Paulo, 2010.

[14] Porto, M. D., Oliveira, M. D. M. Educação Inclusiva: concepções e práticas na perspectiva de professores. ed. Aplicada, Brasília-DF, 2010.

[15] Prestes, Z. Quando não é quase a mesma coisa: traduções de Lev Semionovitch Vigotski no Brasil. Campinas, SP: Autores Associados, 2010.

[16] Rezende, L. A. Leitura e formação de leitores: vivência teórica prática. Eduel, 2009.

[17] Riviere, A. La psicologia de Vygotsky Madrid: Visor libros, 1985

[18] Vygotsky, L. S. Pensamento e Linguagem. São Paulo. FNDE. 2008.

[19] Vygotsky, L. S. A formação social da mente. São Paulo. FNDE, 2010.

Study of the Learning Performance and User Experience of the Interactive Systems of the Catavento Cultural Museum

Ana Grasielle Dionisio Corrêa
Programa de Pós-Graduação em Distúrbios do Desenvolvimento (PPG-DD)
Universidade Presbiteriana Mackenzie, Brazil

Marcelo Nogueira Rossi
Universidade Federal de São Paulo (UNIFESP)
Brazil

Irene Karaguilla Ficheman
Escola Politécnica da Universidade de São Paulo (EP-USP)
Brazil

Roseli De Deus Lopes
Escola Politécnica da Universidade de São Paulo (EP-USP)
Brazil

Abstract

Educational interactive technologies are placed in museums to enhance the visitor experience. Great time and money and hard work hours are spent to design, develop and deploy these systems. But do these systems actually achieve their pedagogical goals? Do they contribute to greater effectiveness and user experience (UX)? In this article we report the use of the technological attraction "Adventure in the Solar System", from the Catavento Cultural Museum, in São Paulo, Brazil. The attraction simulates an adventure in space through a spaceship composed of collaborative games designed to teach about astronomy, physics and mathematics. 129 students participated in this empirical study and were classified into three groups (ESI - Elemental Scholl I; ESII - Elemental Scholl II; HS - High Scholl), all aged between 7 and 16 years. The main objective of the study was to analyze learning performance and user experience (UX). The results showed that there were no statistically significant results betwen groups, but higher proportions of positive scores were observed in the ESII and SH groups. Regarding the user experience, ESI and ESII presented more expressive results than SH. The main results are discussed and ideas for future research are presented.

Keywords: Museums, interactive systems, educational games, user experience.

1. Introduction

Traditionally, museums were created to store and catalog real objects, works of art and important artifacts

to convey information to visitors. Traditionally, in this scenario the information is passively transmitted, that is, the visitor behaves like a mere spectator. This scenario has changed in the last two decades [1, 2]. There is an increase in the interest of museums in the implementation of exhibitions that allow greater involvement of visitors through innovative and interactive technologies [3]. Interactive systems in science museums have basically two main objectives [4]: to attract more visitors and to transmit information in a more participatory, engaging and effective way.

Museums are open to any kind of media that the new communication and information technologies force them to fulfill. The expectations of the millennium generation in particular, following the latest technological innovations, are driving museums to a technological dependency with unpredictable consequences [1]. Using multimedia technologies and supported by social media, visitors move from passive learning consumers to active learning consumers, where they participate as co-authors in a learning process [4, 5, 6].

But do these interactive systems really achieve their goals? Do they provide a good user experience (UX)? We know that developing an interactive museum system requires a lot of time, team effort, and a high cost. So is it worth investing in this kind of technology? In this article we evaluate the learning performance and the user experience (UX) of the attraction "Adventure in the Solar System", installed in the Catavento Cultural Museum in São Paulo, Brazil. The objective of this evaluation was to verify if the attraction is adherent to its purpose of teaching concepts related to astronomy, physics and mathematics through collaborative digital games.

The study was carried out with 129 elementary school students from public schools in the city of São Paulo - Brazil. A research carried out in the literature served as a theoretical reference for the construction of an evaluation model that made it possible to identify: (a) the level of motivation of the students when using the games; (B) whether the games offer a good user experience; And (c) the learning performance. To investigate whether the positive scores differed before and after the cognition questionnaire applications, we run General Linear Models (GLM) taking into account the grade and the gender of the students.

In the next section we present some works related to interactive systems installed in science museums, showing that there was a tendency to implant such systems to improve the experience of their visitors. Next, we present the evaluated system, the attraction "Adventure in the Solar System". The article then presents the research method, results and discussions. Finally, we present the conclusions and perspectives of future work.

2. Related Work

Many modern museums around the world have explored new technologies as a tool to attract and engage their visitors and to pass information more authentically [2, 3]. Technologically advanced systems can engage the user synestesically in various possibilities through audio, video and other directions, to convey information more effectively. Such systems have (or should at least have) a theoretical basis for transmitting scientific knowledge to as many people as possible. In this section we present a brief discussion of museum learning, and then we review some works involving interactive museum systems.

Museums have changed over time and many museums have gone from being a simple arts presentation

space to being an extension of the classroom [7, 8, 9]. According to Andre and Volman [10], museums and scientific centers stimulate students' curiosity and offer the opportunity to improve, at least in part, the needs of schools lacking laboratories, audiovisual resources, among other recognized resources to stimulate learning. In science museums, visitors have the opportunity to perform actions and discoveries, that is, they become active subjects, as they have a direct relationship with the devices through the manipulation or observation of how others manipulate them [11, 12].

Learning in museums should extend beyond cognitive gains. There is research emphasizing attitudinal, affective and social outcomes [13, 14, 15]. Thus, a successful outcome of a museum visit should be an enjoyable experience that cultivates positive attitudes toward the museum and its purpose. Upon leaving the museum, students can remove the knowledge learned. However, they must have the will and enthusiasm to continue their investigation outside the walls of the museum, giving the teacher a solid platform to base the post-visit school work.

A review of learning aspects obtained through science museum technology was done by Hawkey [16]. The author discusses learning experiences in museums and asks the question: should museums propose to offer content or engagement? Should reasoning be passive (information transmission only) or active (constructivist)? The author then proposes different learning taxonomies that were considered relevant to his time.

In recent years, emphasis has been placed on the construction of interactive museum systems [3, 4, 5, 6, 17, 18). Many of these systems place visitors in a constructive process where they are faced with several possible paths and learning possibilities [19]. These new developments take into account the learning taxonomies of the digital age as an active process where they can build new knowledge.

Zaharias [4] classifies interactive museum systems into two categories: those accessible remotely through multimedia systems or Virtual Reality and those within the physical spaces of the museum. The first case puts the participant in contact with a virtual museum, with representations of works and exhibitions in 3D, for example [3, 20, 21, 22). In the second case, the interactive systems that are located within the spaces of the museum, aim to attract more visitors and give them a different way of obtaining information pertinent to that museum. Such systems provide innovative ways of learning in order to generate pleasure and satisfaction in your visitors. Several systems allow 3D visualization including applications running on Virtual Reality and Augmented Reality systems [3, 5]. These technologies combine, to a large extent, entertainment, education and learning.

Several studies have investigated issues such as engagement and motivation of learners, increased learning performance and knowledge retention [6, 12, 23, 24]. The evaluation of these types of systems is a relevant question of research and should be valued, since they are used by different profiles of visitors with different age, knowledge and cultures. Despite the growing interest in the evaluation of interactive technologies in science museums, studies on the user experience assessment (UX) issue are still scarce.

Vavoula et al. [11] presented an evaluation of the Myartspace system that uses mobile phones to support learning in museums. This system allowed students to collect data during an out-of-school experience. The data was automatically sent to a site where students could later obtain this information and share it with others. The evaluation of this study was based on questions of usability, learning effectiveness and impact

of this technology in the context of museums.

In the MuseumScoutts project [12] a visitor-centered approach to museums was adopted. In this project, students use collaborative authoring tools to collect information during the museum visit and create multimedia presentations. The focus is on the possibility of providing a tool for creating authentic works developed by students.

Reynolds et al. [25] presented a three-track evaluation program at the Victoria and Albert Museum in London. Evaluations were successful, but usability issues with device and network usage were found from these assessments. However, students' feedback enabled the authors to note that there was an improvement in learning and increased their interest in exploring the museum's other spaces.

Zaharias et al. [4] developed an interactive 3D holographic projection system for use in experimental learning based on physiology. Students manipulate three-dimensional learning objects (targets) through the non-tactile somatosensory mode to learn about the characteristics of the physiological structure in the 3D holographic projection environment. The study explored the usability factors of the system to improve human-computer interaction. Four important usability factors of the system were proposed through Principal Component Analysis (PCA): Labeling, Continuity, Backlash, and Ambiences.

The MuseumEye project explored the user experience (UX) of Augmented Reality applications in museums. The study contributes to synthesize a UX design model for AR applications to achieve the optimal levels of user interaction required, which ultimately reflect the entire museum experience [5].

Studies of human-computer interaction in museums can not only show the wisdom of these tools to the experimenter, but also present new methods of design and evaluation for the scientific community and professionals. In addition, these studies should be valued as they allow us to see improvements that can impact the usability of the system and consequently the learning. This work meets this need and proposes an evaluation model to analyze learning performance and user experience (UX) with the interactive system "Adventure in the Solar System".

3. The attraction "Adventure in the Solar System"

The Catavento Cultural Museum, located in the city of São Paulo, emerged through the movement of interiorization of science in Brazil. It was inaugurated in 2009, was designed with the function of integrating science and social problems in an attractive and interactive way. It has about 250 attractions in four sections whose subjects interrelate: Universe, Life, Engineering and Society [26].

The "Adventure in the Solar System" is an installation of the Universe section of the Catavento Museum designed to simulate an interactive space journey through a projection system and interactive activities presented in game format. The activities of the museum are carried out in three moments: setting, simulation and reflection. The scenario occurs at the beginning of the activity and allows familiarization with the interaction spaceship and the purpose of the space mission. The simulation proposes the interaction of the participants with the environment, through collaborative games. The moment of reflection aims at provoking in students questions about the subjects addressed during their visit to space

Through a set that reproduces the interior of a spaceship, using Virtual Reality technologies, narration, soundtrack and sound effects, the installation increases the sensation of immersion in the activities (Figure

1). The trajectories of the spaceship through the universe are visualized through a set of televisions that display images of the spaceship, simulating its windows.

Figure 1. Images of the spaceship "Adventure in the Solar System"

Inside the spaceship, a group of up to 24 participants is distributed on four workstations. Each station is sized to accommodate six members, who interact with the system through touch screens (blue team), joystick (red time) or a set of buttons (yellow time) show in Figure 1.

2.1 Summary of the spaceship's activities

Hélio, the character who represents the spaceship's commander explains the procedures for making the space voyage. Before the spaceship flies into space, it is necessary to charge the spaceship's batteries and power the solar power systems. This procedure is implemented in the game of calibrating the solar panels (Game 1). After the spacecraft takes off, students are assigned the task of helping the crew of the International Space Station who need supplies, so by means of a game they must dock the spaceship with the International Space Station and transfer the supplies (Game 2). Then the students learn that there was a problem with the Hubble telescope. At that time, students learn that there is a telescope that captures images a thousand times more than the human eye and must interact with a game to mend the telescope (Game 3). Students begin to receive information about Mars: its color is red, it has been discovered that there is water in the liquid state and that, therefore, there may be life on Mars. A robot was sent to Mars to check for water, but it gets stuck in the rocks (Game 4). Then students are given a mission to help the robot (Game 5). Students also receive information about Venus who is known as Earth's twin brother. It is reported that there is garbage in space, so students are given the mission to ward off space junk (Game 6). Then the commander informs them that they will return to Earth. The spaceship is landed and the game ends. Depending on the performance of all students, the game may end with a mission accomplished or they should come back next time to be able to win the game.

2.2 Pedagogical aspects of the attraction "Adventure in the Solar System"

The main objective of the attraction is to provide more interactivity and increase the engagement and participation of the visitors. The attraction has been developed to provide different ways to explore the universe and solve problems related to astronomy, physics and mathematics. The experience lasts 25 minutes and was built from a guided pedagogical approach. Astronaut Marcos Pontes interacts with students all the time through videos, guiding them throughout the experiment, always inquiring questions and providing clues to solving problems through games. Learning is based on collaborative games and videos with concepts and information relevant to the content being explored. Educational games are considered important strategies for museums since they entertain at the same time that they allow to simulate situations and transmit and reinforce concepts [27].

3. Methods

3.1 Research design

It is a quantitative and exploratory empirical study. Three groups of students (ESI - Elemental Scholl I; ESII - Elemental Scholl II; HS - High Scholl) were compared that interacted with the attraction "Adventure in the Solar System" in the Catavento Cultural museum. The objectives of the research were defined, aiming to obtain information about the affective (user experience) and cognitive (learning performance) gains of "Adventure in the Solar System". A study carried out in the literature served as a theoretical reference for the construction of an evaluation model that made it possible to identify (Bloom 1956; Keller 2010; Savi et al., 2010): (a) the level of students' motivation to use the games; (B) whether the games offer a good user experience (UX); and (c) the learning performance. The following research questions were investigated: are there differences in learning performance between the EI, EII and ES groups? Is there a difference in user experience between EI, EII and ES?

3.2 Participants

The students were selected randomly by the time of arrival at the museum. Students entered the ship in groups of up to 24 students, usually students of the same class, but this was not a rule. There were rounds in which there were students of different classes and/or series of teaching. 129 children participated in the study, 62 boys and 67 girls, ranging in age from 7 to 16 years (Table 1). All participants are university students from public schools in the city of São Paulo - Brazil. In order to improve the analysis, the participants were graduated in three groups (Table 1): ESI - Elementary School I (2nd, 3rd and 4th grades); ESII - Elementary School II (5th, 6th, 7th and 8th grades) and HS - High School (11th, 12th, 13th grades).

Table 1. Distribution of students by group

School degree	**N**	**% Sample**	**Age group**	**Boys**		**Girls**	
				N	%	N	%
ESI (2ª, 3ª e 4ª)	44	34,1%	7-9	23	52,27	21	47,72

ESII (5ª, 6ª, 7ª, e 8ª)	56	43,4%	10-13	25	44,64	31	55,35
HS (11ª, 12ª, 13ª)	29	22,5%	14-16	14	48,27	15	51,72

3.3 Learning assessment models

The model proposed by Keller [28], defined as ARCS (Attention, Relevance, Confidence and Satisfaction) was used to assess the level of student motivation. According to the author, motivation in the educational context is related to voluntary engagement in continuing to learn about a particular subject and, for this to happen, the student must: maintain a satisfactory level of attention during the experiment (A-Attention); Students must realize that the educational proposal is consistent and helps them connect the content with the professional or academic future (R-Relevance); Students need to succeed in the experiences derived from their skills (C-Confidence); And let them experience positive learning experiences accompanied by recognition and rewards (S-Satisfaction).

To evaluate if the user experience is satisfactory, the models proposed by Savi et al. [29] was used. Experiences resulting from interaction with games, such as changes in people's emotional state. Thus, the evaluation of the experience of use can be made through the evaluation of the elements of interaction, such as: fun, immersion, challenge, control and social interaction. Fun provides feelings of pleasure, relaxation, distraction, and satisfaction. For the authors, a fun experience is usually accompanied by the desire to rejoin and to recommend it to friends. Immersion is related to engagement and deep involvement with the game. Time is a factor that makes it possible to check the immersion in the game, for example, where the player does not notice the time passing and remains hours or weekends playing uninterruptedly. The challenge is related to the levels of difficulty of the game and these should be adequate to the level of skill of the player. New obstacles, situations and variations of activities should be appropriate to minimize player fatigue and provide an experience that maintains their willingness to continue participating. Control is related to the sense of autonomy over the interface that should be easy to learn to use. Social interaction is measured by engaging the participant with others to achieve group success.

The Bloom's Taxonomy [30] was used to assess the degree of retention of information. It is a framework that can be applied to plan, design and evaluate learning effectiveness defined at six levels: Knowledge (remembering information about facts, dates, words, places, procedures, etc.), Understanding (grasping the meaning of Information), Application (applying knowledge in real situations), Analysis (identifying the parts and their interrelationships), Synthesis (combining the parts to form a whole) and Assessment (judging the value of knowledge).

In the evaluation model proposed in this paper, only the first level of the Bloom's Taxonomy was considered to evaluate a learning performance: Knowledge, which involves memory. According to cognitive theories of learning [31, 32], accessing the information that is recorded in memory, brings direct influences on learning, since the structure and material to be learned are largely dependent on the knowledge retained in memory, that is, what the individual already knows and can remember. Current knowledge not only influences the learning of new knowledge and information, but also the way that knowledge and information is organized, so that it can be retrieved in the future.

Data Collection

Quantitative data were collected and observations were made by the authors who accompanied the evaluations in the museum. To obtain more expressive statistical data, valid in the context of quantitative research, it was established that the sample size should be greater than 100 students. At the same time, the evaluation model was elaborated, in which Keller's ARCS model [28] was included to evaluate the motivation; The model of Savi et al. [29] to evaluate the experience with games (fun, immersion, challenge, control and social interaction); And Bloom's Taxonomy [30], to assess the learning performance.

Based on the designed model, pre-test and post-test questionnaires were created based on the parameters that make up the evaluation model (Table 2). In order to evaluate the level of knowledge (cognition), questions were asked related to the contents covered in the games with the following scale of answers: "Yes", "No" and "Do not Know". These questions were responded individually, before (pre-test) and after (post-test) to each participate in the experiment.

Table 2 - Data Collection Questionnaires

Pre-test and Post-test (cognition)	**Post-test (affective)**
1. Do spacecraft use solar energy?	1. Attention: I was very focused on the games.
2. Does the International Space Station receive fuel and supplies carried by a small unmanned spacecraft?	2. Relevance: I learned about the solar system.
3. Is there a telescope in space that sees a thousand times more than the human eye?	3. Confidence: I scored in the games.
4. Are robots sent to Planet Mars to do research?	4. Satisfaction: I feel happy after playing.
5. Is there life on Mars?	5. Fun: I find the games very fun.
6. Is there trash in space?	6. Immersion: I did not even see the time pass as I played.
	7. Challenge: I wanted to keep playing.
	8. Control: I find it easy to use game control.
	9. Social Interaction (optional question): My colleague and I were able to interact and play together.
	10. Ranking of favorite games (optional question). Mark with an X the games you liked best: (a) Calibrate the solar panels; (B) Bring food to the International Space Station; (C) Repair the Hubble telescope; (D) Decrypt distress message; (E) Save the robot on Mars; (F) Take away the space junk.

The post-test questionnaire (affective) was applied shortly after the visitation. Items related to motivation (attention, relevance, confidence and satisfaction) and experience of interaction with games (fun, immersion, challenge, control and social interaction) were added. These items were presented in the form of statements, see Table 2, so that students could indicate their degree of agreement or disagreement based on the 5-point Likert scale: ranging from "5-Totally agree" to "1-Totally disagree". To facilitate the understanding of the answers, considering the elementary school children, we use the smiles images (Figure 2). The last two questions in the questionnaire are optional: the first to identify whether students would like to play on another team and the second to rank preferred games.

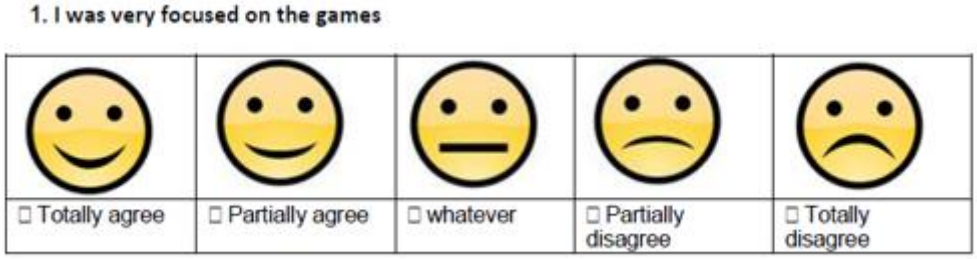


Figure 2. Post-test questionnaire responses (affective)

3.4 Procedure

The responsible researcher announced the research objectives and procedures for the students and invited them to volunteer. They then completed the questionnaire with demographic information (gender, age and school grade) and the cognition questionnaire (pre-test). Then a group of up to 24 students was invited to board the spaceship. In cases where there were a greater number of students, they were invited to participate in another activity with assembly of laymen, while waiting their turn to participate.

The experience on the spaceship is a simulation of a journey in space. Soon, all the groups went through all the stages that included: a) a greeting of the astronaut Marcos Pontes contextualizing the experience and explaining that the group would have to take off the spaceship for a mission in the space; b) interaction with games to solve problems; c) presentation of the commander Marcos Pontes on the victory or failure of the group in the mission, followed by a greeting.

Students were free to choose their accents that directly impacted on the use of interaction devices. For example, there were students who preferred to use the touchscreen interface (blue accent) rather than the buttons (yellow accent) or joystick (red accent). They were free to negotiate between them their accents (Figure 3a).

Figure 3. a) Children interacting in spaceship; b) children responding to post-test questionnaire

A researcher was always present in a session observing and making notes. This showed that there was great enthusiasm and curiosity of the students. At the end of the experiment, the researcher led the students to express and share their opinions. The students were then given 20 minutes to complete the cognition questionnaire (post-test, Figure 3b).

3.5 Data analysis

To investigate whether the positive scores differed before and after the cognition questionnaire applications (named as "period"), we run General Linear Models (GLM) taking into account the grade (Elemental Scholl I, Elemental Scholl 2 and High Scholl) and the gender (girls and boys) of the students. Since data was analyzed as proportions, the GLMs were structured with binomial errors [33]. We started the modeling process fitting the most complex model, containing the interaction of all explanatory variables. After that, the interaction terms were either removed or kept in the model throughout model simplification. The Akaike's information criterion (AIC) was used to find the minimal adequate model. The AIC penalizes unnecessary parameters in the model (penalized log-likelihood), and the minimal adequate model is credited to the smallest AIC found after all simulation steps[33].

The same analysis (GLM with binomial errors) and modeling simplification procedure described above were done to compare the type of games preferred by students, indicated by the frequencies (proportions) with which the answers were marked in the affective questionnaire. The analyses were conducted taking into account the team, grade, gender and type of game (explanatory variables). Finally, following the likert scale, we compared the frequencies of the type of answers provided by students for each of the nine questions of the affective questionnaire, according to the team, grade, gender and likert (explanatory variables). In this case, however, there were an excess of warning messages during modeling due to null values, and frequencies were compared as a contingency table [34], using count data. Therefore, the GLMs were structured with Poisson errors [33]. In both cases described above, modeling simplification started with the most complex model, containing the interaction among the four explanatory variables.

When the structure of the minimal adequate models contained interactions between the explanatory

variables, the results were summarized to observe whether the interactions should be kept in the models. When significant results were not found for the interaction terms, they were removed from the final models. All modeling process was carried out in the R System for Windows, version 3.4.1 (R Development Core Team, 2017), using the "step" function.

4. Results and Discussions

4.1 Pre-test and Post-test (cognition)

When the proportion of positive scores in the questionnaires was compared considering the different periods of evaluation, taking into account the grade and gender, we found that the minimal adequate model contained the different periods, grades and genders within its structure, without the interaction term (Table 3). Therefore, results from GLM showed differences between the period, the grade and gender (Table 4). As expected, the highest proportion of positive scores was observed after students have undergone the experience in the spaceship (Figure 4a). However, it is interesting to note that the greatest proportions of positive scores were observed on grades ESII and HS (Figure 4b), which did not differ from each other (estimate = 0.270; Std. error = 0.166; z-value = 1.623; P = 0.105). In addition, the boys had a slightly higher proportion of positive scores than the girls (Figure 3c).

Although the level of attention has been satisfactory in all groups, there may have been distraction from the ESI at the end of the game, where the subject "Life on Mars" is dealt with: the game "saving the robot on Mars" lasts approximately 13 minutes. In it, players have the expectation that the robot found life on Mars. There are several mini-games and videos around this idea. However, at the end of this game the commander says there was no life on Mars through a short explanatory video of only a few seconds. This may have led the participants to keep the first information (of which there may be life on Mars), but not the second (that there is no life on Mars). Another point to consider is that, when the game reveals that there is no life on Mars, the younger students are exalted, celebrating the victory of the game and the video of the commander goes unnoticed. It is therefore necessary to correct this explanatory video that there is no life on Mars to last longer or to add a new game that reinforces this concept.

Table 3. Results of positive scores in the questionnaires, before and after the students have undergone the experience in the spaceship (Period), according to the grade and gender

AIC for each step	Model complexity (main effects kept in the model)	DF	Deviance	AIC
711.55	Period*Grade*Gender	2	391.91	709.88
709.88	Period* Gender	1	392.45	708.42
	Grade* Gender	2	394.80	708.77
	Period*Grade	2	395.60	709.58

708.42	Grade* Gender	2	395.16	707.14
	Period*Grade	2	396.07	708.05
707.14	Period*Grade	2	398.60	706.58
	Gender	1	400.55	710.52
706.58	Gender	1	403.95	709.93
	Grade	2	441.55	745.52
	Period	1	608.18	914.16

Each model was fitted using a general linear model (GLM) with binomial errors. The Akaike's information criterion (AIC) was used to find the minimal adequate model.

Table 4. Results from the general linear model (GLM) comparing the proportion of positive scores in the questionnaires, before and after the students have undergone the experience in the spaceship

Source of variation*	Estimate	Std. error	z-value	P†
Intercept	−0.354	0.121	−2.933	0.003
After	1.789	0.134	13.348	< 0.001
Fundamental 2	0.669	0.139	4.816	< 0.001
Médio	0.972	0.169	5.745	< 0.001
Boys	0.286	0.124	2.305	0.021

*For contrasts (estimate), the ESI was compared with ESII and HS, the period "before" was compared with "after", and the gender "girls" was compared with "boys". †Significant effects are shows at $P < 0.05$.

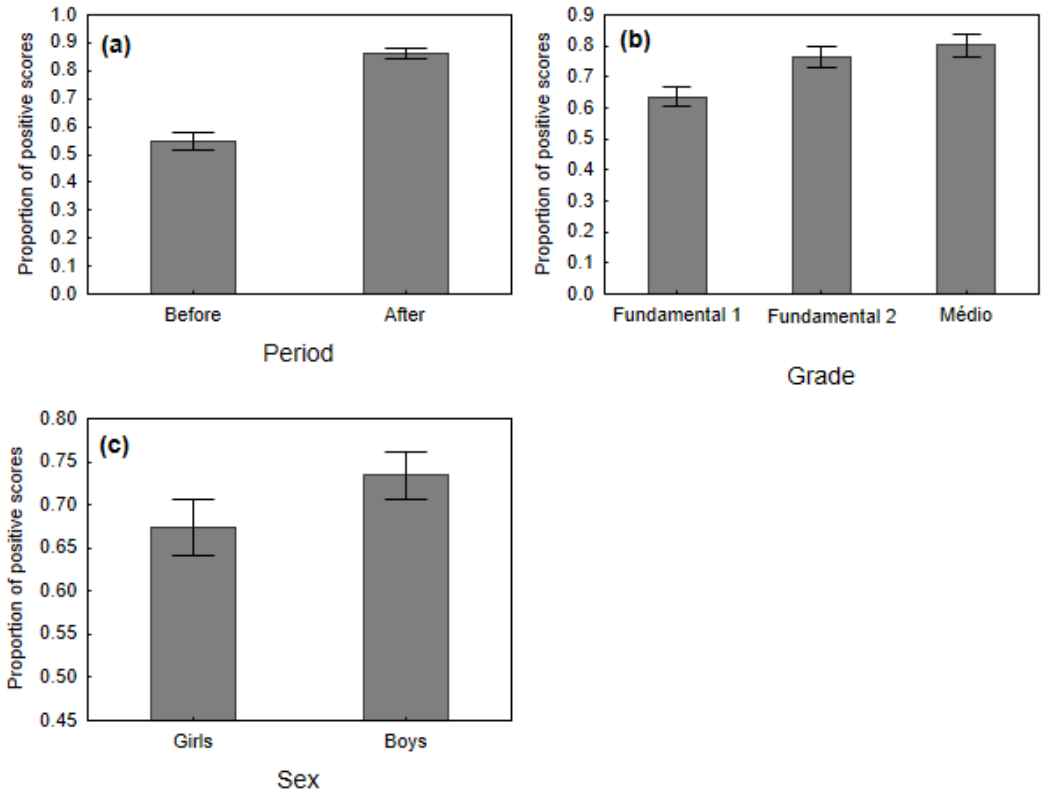


Figure 4. Comparisons of the mean proportion (± 1.0 SE) of positive scores in the questionnaires, before and after the students have undergone the experience in the spaceship (a), among grades (b) and between the genders (c). For grades, ESI differed from ESII and HS, but ESII did not differ from HS.

4.2 Post-test (affective)

With respect to the games preferred by the students, it was observed that minimal adequate model took into account the interaction between grade and the type of game (Tables 1S and 2S; supplementary material in Appendix 1). For the ESI, for example, game 3 (Bring food to the International Space Station) and 4 (Fix the Hubble telescope) presented the highest frequencies marked in the forms, followed by games 2 (Calibrate the solar panels) and 1 (Take away the space junk), with games 5 (Save the robot on Mars) and 6 (Decrypt distress message) showing the lowest proportions. On the other hand, the Game 1 was the most preferred by students on ESII, with the other Game 5 presenting similar preferences (Figure 5); in this case, the lowest preference was observed on Game 5 (Figure 5). The students on HS showed preferences for Game 1, 2 and 3 in similar magnitude, with lower preferences for games 4, 5 and 6 (Figure 5).

Figure 5 sows games preferred by the students according to grades, indicated by the frequency (mean proportions ± 1.0 SE) with which they were marked in the forms. Significant effects were found for the interaction Grade*Type of games, after applying a general linear model (GLM) with binomial errors (AIC = 333.44; df = 10; deviance = 153.23; $P < 0.05$; see Tables 1S and 2S, supplementary material in Appendix 1). The numbers scribed to the games are: 1 = Take away the space junk; 2 = Calibrate the solar panels; 3 = Bring food to the International Space Station; 4 = Fix the Hubble telescope; 5 = Save the robot on Mars; 6 = Decrypt distress message.

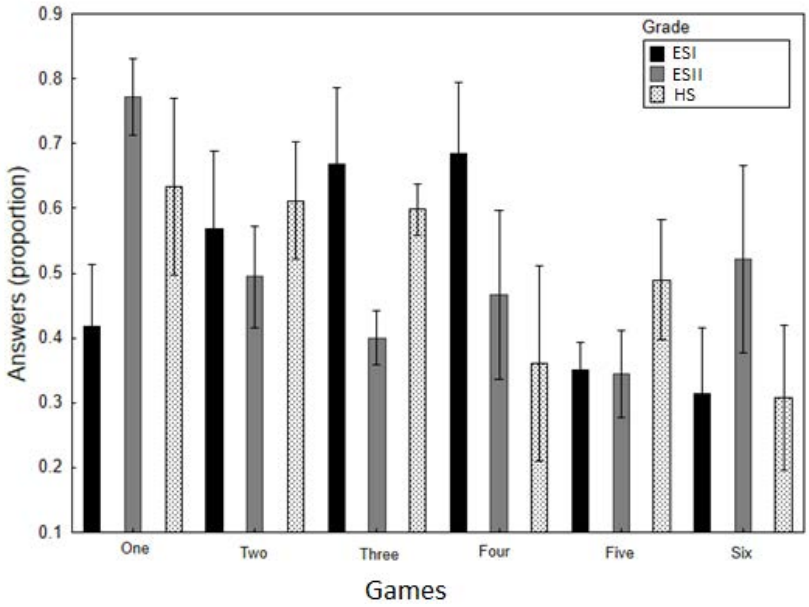


Figure 5. Games preferred by the students according to grades

The minimal adequate model for the answers provided in effectives questionnaire, considering the likert scale, varied according to the question under investigation. For example, for questions one to three, and questions five, seven and eight, the best model contained the different grades and the likert within its structures, without the interaction term (Table 5). However, for questions four, six and nine the interaction term was kept in the model (Table 5); the interaction between grade and likert was kept for questions four and six, and the interaction between gender and likert (plus grade) was maintained in the models for question nine (Table 5). Detailed results obtained during the whole modeling process are shown as supplementary material in Appendix 1 (Table 3S to Table 15S).

Table 5 showing the final minimal adequate models throughout the modeling process using the step function, considering the frequencies about the type of answers provided by students for all questions proposed, according to the team, grade, gender and likert. Each model was fitted using a general linear model (GLM) with Poisson errors. The Akaike's information criterion (AIC) was used to find the minimal adequate model.

Table 5. Effectives questionnaire considering the likert scale

Questions	Final model	Deviance	AIC
One	Grade + Likert	50.360	164.61
Two	Grade + Likert	53.084	175.11
Three	Grade + Likert	45.714	172.59
Four	Grade*Likert	34.252	166.32

Five†	Grade*Likert	50.812	179.94
	FMAM = Grade + Likert		
Six†	Gender *Likert + Grade*Likert	46.869	183.88
	FMAM = Grade*Likert		
Seven†	Grade*Likert	47.065	183.48
	FMAM = Grade + Likert		
Eight	Grade + Likert	51.445	203.67
Nine	Grade + Gender *Likert	56.672	184.94

Those models with " + " sign means that both fixed effects must be retained in the model, and those with " * " sign means that the interaction between fixed effects are important. †After summarizing the models, it was verified that the interactions Grade*Likert, Gender*Likert and Grade*Likert for questions five (Table 13S), six (Table 14S) and seven (Table 14S), respectively, did not need to be maintained in the minimal adequate models. FMAM = Final Minimal Adequate Model. Details of all the modeling process can be found in Tables 3S-15S (supplementary material in Appendix 1).

Considering all grades, "totally agree" was the most common answer, which confirms the differences among likerts (Figure 6). Differences were also observed for the answers provided among the grades, particularly between ESI (Figure 6a), ESII (Figure 6b) and HS (Figure 65c), confirming that the grade level was an important explanatory variable for all questions (i.e., either considering or not the interaction between variables). Results for the type of answers (mean proportions ± 1.0 SE) provided by students for all questions proposed. For each question, variations for each likert are shows for the ESI (a), ESII (b) and HS (c). Indifferent means neither agree nor disagree.

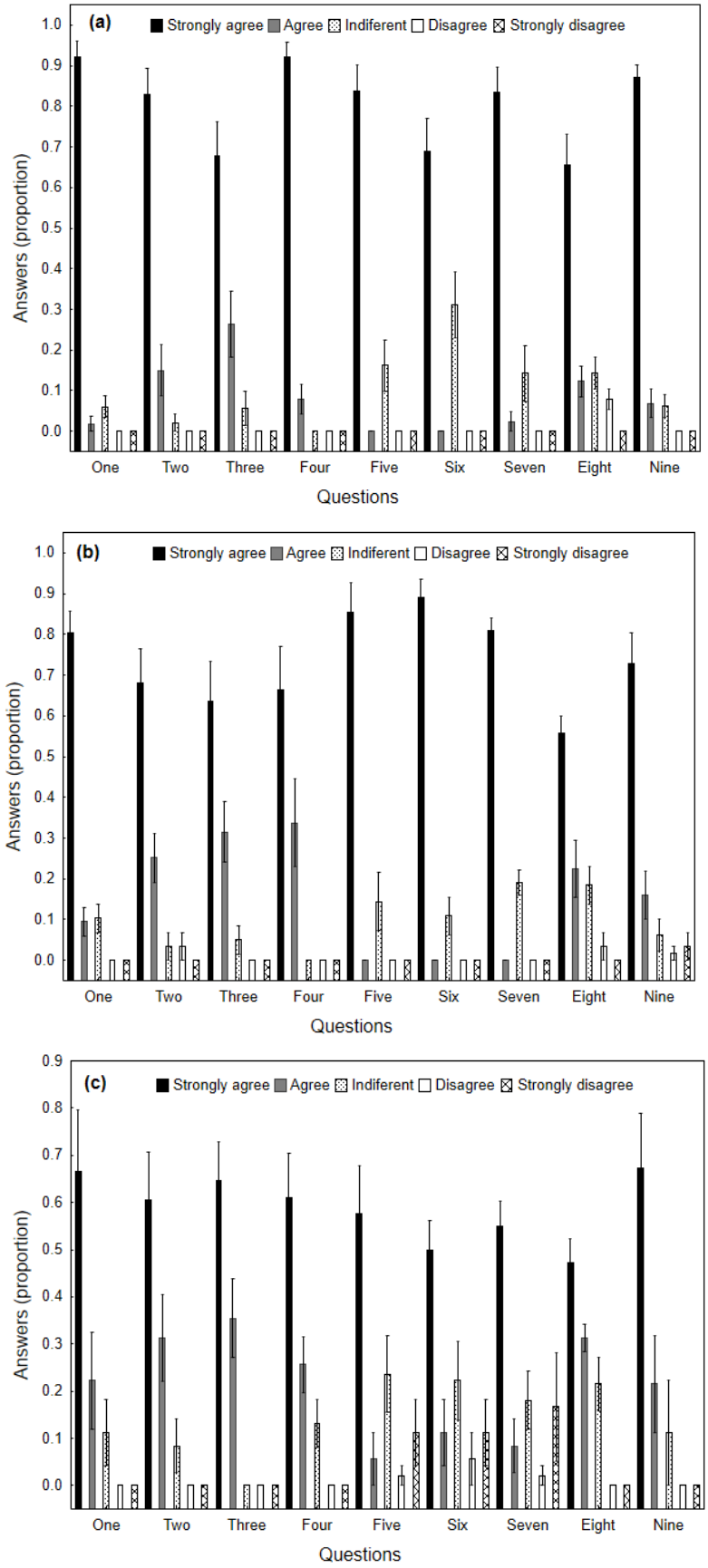


Figure 6. Results for the type of answers (mean proportions ± 1.0 SE) provided by students particularly for question nine, according to sex and likert. SA = strongly agree; A = agree; I = indifferent (neither agree nor disagree); D = disagree; SD = strongly disagree.

It was found that ESI students presented the highest levels of attention, followed by ESII and HS students, and the same pattern was observed with respect to relevance (Figure 6, questions one and two). However, the results showed that high school students showed greater confidence than students in elementary school (Figure 6, question three).

Regarding satisfaction and fun (questions four and five, respectively), clearly the ESI and ESI students presented more expressive results than the students in high school (Figure 6). Interestingly, ESII students were the ones most immersed in games (question six), and ESI and ESII students found games more challenging than HS (Figure 6; question seven).

Regarding the control, the students of HS were the ones that presented greater ease in the handling (Figure 6, question eight). Finally, social interaction was more present in ESI and ESII than in high school (Figure 6, new question). In particular, for question nine, comparing the responses provided by girls and boys on the likert scale, it was found that the "agree" response was more accentuated for the girls, differing from the responses provided in the other likerts (Figure justifying the difference found in the interaction between gender and likert (Table 5).

5. Conclusion and Future Works

This study aimed to analyze learning performance and user experience (UX) with the interactive games of the "Adventure in the Solar System" attraction of the Catavento Cultural Museum, located in the city of São Paulo - Brazil. For this purpose, a sample of 129 students from public education - 44 from Elementary School I; 56 from Elementary School II and 29 High School - were sampled. Through the construction of an evaluation model, it was possible to obtain results on: (a) the level of student motivation in using the games; (b) the experience of using interactive games; and (c) the learning performance. We provide an evaluation model of a system that can be reused and / or intensified in searches by us in search of interactive systems in museums.

This research showed that the attraction "Adventure in the Solar System" reached its purpose of learning that is to transmit and reinforce concepts of astronomy, physics and mathematics within a technological space installed in the museum. This was verified through the cognition questionnaire (containing questions related to the subjects mentioned) before and after the experience in the spaceship. Although learning performance increased statistically significantly in both groups (comparing knowledge before and after the visit), there was no significant difference in learning performance between the three groups, but higher proportions of positive scores were observed in the ESII and SH grades.

As far as user experience issues are concerned, the results of this study show that the ESI has an experience in higher education levels. They were the most experienced with environmental spaces which other students of ESII and HS, being engaged and expressed the largest plan object of general visit. These findings also confirm relevant data from other studies. But the usability study also showed the need for an adjustment at the end of the experiment with the video about "does life exist on Mars?". It is necessary to increase the time of this video with an explanation as to why there is no life on Mars, or propose a new game that reinforces this concept. Such enhancements can lead to a greater contribution to the learning effectiveness and the visitor experience. This could be investigated in a future study.

The study has some specific limitations. The knowledge test we developed (cognition questionnaire) was quite short and focused on factual type of knowledge and short-term retention. In a future study, we intend to carry out another type of study with retention of knowledge in the longer term. To this end, future studies require post-museum visit activities so that students reflect on what was learned during the museum visit and assess whether this knowledge can be maintained and propagated.

To conclude, this study demonstrates that the use of new types of interactive systems can contribute to a better experience of museum visitors, increasing their level of participation and engagement and their intention to repeat visits. As for the learning gains that the visitor is expected to capture with museum visits, it can be argued that such interactive technologies provide learning experiences no less important than conventional display methods. Past the novelty effect these technologies provide, one can provide more authentic learning and entertainment simultaneously

6. References

[1] H. Kraemer. "Media Are, First of All, for Fun: The Future of Media Determines the Future of Museums", The Future of Museums, Springer, Cham, 2018, pp. 81-100.

[2] H. Setiadi. "Designing a Supplementary Reading Using Cultural Language Learning Approach (CLLA)", International Journal for Innovation Education and Research, 5(8), 2017, pp. 111-128.

[3] H.C. Huang and M.C. Chuang. "An Aesthetic Practice in Higher Education through Exhibition Transformation", International Journal for Innovation Education and Research, 3(3), 2015, pp. 117-131.

[4] P. Zaharias, D. Michael and Y. Chrysanthou. "Learning through multi-touch interfaces in museum exhibits: An empirical investigation", Journal of Educational Technology & Society, 16(3), 2013, pp. 374-384.

[5] R. Hammady, M. Ma and A. Powell, A. "User Experience of Markerless Augmented Reality Applications in Cultural Heritage Museums:'MuseumEye'as a Case Study", In: International Conference on Augmented Reality, Virtual Reality and Computer Graphics. Springer, Cham, 2018, pp. 349-369.

[6] H. Huang, C.W. Chen, and Y.W. "Hsieh. Factors Affecting Usability of Interactive 3D Holographic Projection System for Experiential Learning", In: International Conference on Learning and Collaboration Technologies, Springer, Cham, 2018, pp. 104-116.

[7] C.C. Chen, an T.C. Huang, "Learning in a u-museum: Developing a context-aware ubiquitous learning environment", Computers & Education, 59(3), 2012, pp. 873–883.

[8] K.E. Chang, C.T. Chang, H.T. Hou, Y.T. Sung, H.L. Chao and C.M. Lee. "Development and behavioral pattern analysis of a mobile guide system with augmented reality for painting appreciation instruction in

an art museum", Computers & Education, 71(1), 2014, pp. 185-197.

[9] M.S. Horn, B.C. Phillips, E.M. Evans, F. Block, J. Diamond and C. Shen, C. "Visualizing biological data in museums: Visitor learning with an interactive tree of life exhibit", Journal of Research in Science Teaching, 53(6), 2016, pp. 895-918.

[10] L. Andre, T. Durksen and M.L. Volman. "Museums as avenues of learning for children: A decade of research", Learning Environments Research, 20(1), 2017, pp. 47-76.

[11] G. Vavoula, M. Sharples, P. Rudman, J. Meek and P. Lonsdale. "Myartspace: Design and evaluation of support for learning with multimedia phones between classrooms and museums", Computers & Education, 53(2), 2009, pp. 286-299.

[12] J. Wishart and P. Triggs P. "MuseumScouts: Exploring how schools, museums and interactive technologies can work together to support learning", Computers & Education, 54(2), 2010, pp. 669-678.

[13] L.J. Rennie and T.P. McClafferty." Science centres and science learning", Studies in Science Education, 27(1), 1996, pp. 53–98.

[14] J.H. Falk and M. Storksdieck. "Using the Contextual Model of Learning to Understand Visitor Learning from a Science Center Exhibition", Science Education, 89(1), 2005, pp. 744–778.

[15] S.D. Coll, R. Coll and D. Treagust. "Making the most of out-of–school visits: How does the teacher prepare? Part II: Implementation & Evaluation of the Learner Integrated Field Trip Inventory (LIFTI)", In: International Journal of Innovation in Science and Mathematics Education (formerly CAL-laborate International), 26(4), 2018, pp. 1-19.

[16] Hawkey, R. Learning with digital technologies in museums, science centres and galleries [Report 9, Futurelab Series]. London, UK: King's College, 2004.

[17] K.F. Lee, Y.L. Chen, H.C. Hsieh and K.Y. Chin, K. Y. "Application of intuitive mixed reality interactive system to museum guide activity", In: 2017 IEEE International Conference on Consumer Electronics-Taiwan (ICCE-TW), IEEE, 2017, pp. 257-258.

[18] Z. Mu, M. Liu and Z. Tan. "On the Interactive Display of Virtual Aerospace Museum Based on Virtual Reality", In: 2018 IEEE International Conference on Robots & Intelligent System (ICRIS), IEEE, 2018, pp. 144-146.

[19] A. Caraban, T. Paulino, R. Pereira, R. Spence, M.I.M.I. Madeira-ITI and P. Campos). "The Monarch

Room: An Interactive System for Visualization of Global Migration Data", In: Proceedings of the 32nd International BCS Human Computer Interaction Conference. BCS Learning & Development Ltd., 2018. p. 1-5.

[20] T. Kunkel, M. Averkiou and Y. Chrysanthou, Y. "A web-based virtual museum application", In M. Ioannides, A. Addison, A. Georgopoulos, L. Kalisperis (Eds.), Proceedings of the 14th International Conference on Virtual Systems and Multimedia Budapest, Hungary, 2008, pp. 275-277.

[21] P. Patias, Y. Chrysanthou, S. Sylaiou, C. Georgiades, D. Michael and S. Stylianidis. "The development of an e-museum for contemporary arts", In M. Ioannides, A. Addison, A. Georgopoulos, L. Kalisperis (Eds.), Proceedings of the 14th International Conference on Virtual Systems and Multimedia Budapest, Hungary, 2008, pp. 1-7.

[22] Y. Day. "Visitor centered design in contemporary art museum. Research on the interactive development trend and digital strategy of contemporary art museum", Tesi Specialistiche/Magistrali in Design della comunicazione, Politecnico di Milano, 2018.

[23] A. Origli, E. Leone, A. Sorgente, P. Vanacore, M. Parascandolo, F. Mele and F. Cutugno. "Designing interactive experiences to explore artwork collections: a multimedia dialogue system supporting visits in museum exhibits", In: Proceedings of the 10th AI*IA 2016, 1772, 2016, pp. 26–33.

[24] R. Rosales, M. Castañón-Puga, F. Lara-Rosano, J.M. Flores-Parra, R. Evans, N. Osuna-Millan and C. Gaxiola-Pacheco. "Modelling the Interaction Levels in HCI Using an Intelligent Hybrid System with Interactive Agents: A Case Study of an Interactive Museum Exhibition Module in Mexico", Applied Sciences, 8(3), 2018, pp. 1-21.

[25] R. Reynolds, K. Walker and C. Speight. "Web-based museum trails on PDAs for university-level design students: Design and evaluation", Computers & Education, 55(3), 2010, pp. 994-1003.

[26] M.L. Hallack and M.C. Lavalhegas. "Discurso Científico: Um estudo de caso do Museu Catavento Cultural no Município de São Paulo", Sensos-e, 4(1), 2017, 88-97.

[27] G.G. Bitter, J. Puglisi, A. Gorges and H.P. Uppal. "The effects of an online collaborative elementary math program using team-based games to improve student math achievement, attitude and motivation", International Journal for Innovation Education and Research, 4(7), 2016, pp. 113-138.

[28] Keller, J.M. Motivational design for learning and performance: the ARCS model approach. New York, Springer, 2009.

[29] R. Savi, C.G. von Wangenheim and A.F. Borgatto. "A model for the evaluation of educational games

for teaching software engineering", In: 2011 25th Brazilian Symposium on Software Engineering (SBES), IEEE, 2011, pp. 194-203.

[30] Bloom, T. M. E. Bloom's taxonomy of educational objectives. Longman, 1965.

[31] Moore, B. J. Situated cognition versus traditional cognitive theories of learning. Education, 1998.

[32] Moore, B. J. Cognitive Theories of Learning, 1999.

[33] Crawley, M.J. The R book. John Wiley & Sons, Chichester, UK, 2007.

[34] Zar, J.H. Biostatistical analysis. Prentice Hall, Upper Saddle River, NJ, 1999

Appendix 1

Table 1S. Results from the modeling process using the step function, considering the games preferred by students (proportions), according to the team, grade, sex and type of game. Each model was fitted using a general linear model (glm) with binomial errors. The main effect results are presented with or without interactions throughout the modeling simplification. The Akaike's information criterion (AIC) was used to find the minimal adequate model, which is credited to the smallest AIC observed after all simulation steps.

AIC for each step	Model complexity (main effects kept in the model)	DF	Deviance	AIC
393.75	Team*Grade*Sex*Type of game	20	37.897	391.65
391.65	Team*Grade*Sex	4	38.065	383.82
	Team*Sex*Type of game	10	53.293	387.05
	Grade*Sex*Type of game	10	56.914	390.67
	Team*Grade*Type of game	20	78.856	392.61
383.82	Team*Sex*Type of game	10	53.321	379.08
	Grade*Sex*Type of game	10	56.922	382.68
	Team*Grade*Type of game	20	78.860	384.61
379.08	Grade*Sex*Type of game	10	68.405	374.16
	Team*Grade*Type of game	20	88.861	374.62
	Team*Sex	2	53.322	375.08
374.16	Team*Sex	2	68.410	370.16
	Grade*Sex	2	68.419	370.17
	Sex*Type of game	5	75.334	371.09
	Team*Grade*Type of game	20	105.771	371.53
370.16	Grade*Sex	2	68.423	366.18
	Sex*Type of game	5	75.334	367.09

	Team*Grade*Type of game	20	105.771	367.53
366.18	Sex*Type of game	5	75.334	363.09
	Team*Grade*Type of game	20	105.775	363.53
363.09	Team*Grade*Type of game	20	111.941	359.70
	Sex	1	75.334	361.09
359.70	Team*Type of game	10	119.69	347.44
	Team*Grade	4	111.94	351.70
	Sex	1	111.94	357.70
	Grade*Type of game	10	146.82	374.57
347.44	Team*Grade	4	119.69	339.44
	Sex	1	119.69	345.44
	Grade*Type of game	10	153.23	360.99
339.44	Team	2	119.69	335.44
	Sex	1	119.69	337.44
	Grade*Type of game	10	153.23	352.99
335.44	Sex	1	119.69	333.44
	Grade*Type of game	10	153.23	348.99
333.44	Grade*Type of game	10	153.23	346.99

Table 2S. Results (coefficients) from the general linear model (glm) with binomial errors comparing the games preferred by students, including the interaction between the main effects grade and type of game (minimal adequate model).

Source of variation*	Estimate	Std. error	z-value	$P^{\dagger}$
Intercept	−0.747	0.405	−1.847	0.065
Fundamental 2	0.097	0.539	0.179	0.858
Médio	0.673	0.559	1.205	0.228
Game (2)	1.183	0.560	2.112	*0.035*
Game (4)	1.664	0.582	2.858	*0.004*
Game (6)	−0.169	0.582	−0.291	0.771
Game (3)	1.494	0.572	2.611	*0.009*
Game (1)	0.312	0.560	0.557	0.577
Fundamental 2*Game (2)	−0.589	0.745	−0.791	0.429
Médio*Game (2)	−0.578	0.788	−0.733	0.463
Fundamental 2*Game (4)	−1.301	0.763	−1.705	0.088
Médio*Game (4)	−2.283	0.809	−2.823	*0.005*
Fundamental 2*Game (6)	0.992	0.762	1.301	0.193
Médio*Game (6)	−0.807	0.825	−0.978	0.328
Fundamental 2*Game (3)	−1.132	0.756	−1.497	0.134
Médio*Game (3)	−1.046	0.793	−1.318	0.187

Fundamental 2*Game (1)	1.555	0.776	2.004	*0.045*
Médio*Game (1)	0.627	0.800	0.784	0.433

*For contrasts (estimate), the grade Fundamental 1 was compared with Fundamental 2 and Médio, and the game (5) was compared with games (1), (2), (3) and (6).

†Significant effects at $P < 0.05$.

Table 3S. Results from the modeling process using the step function, considering frequencies of the type of answers provided by students for question one, according to the team, grade, sex and likert. Each model was fitted using a general linear model (glm) with Poisson errors. The main effect results are presented with or without interactions throughout the modeling simplification. The Akaike's information criterion (AIC) was used to find the minimal adequate model, which is credited to the smallest AIC observed after all simulation steps.

AIC for each step	Model complexity (main effects kept in the model)	DF	Deviance	AIC
280.25	Team*Grade*Sex*Likert	16	3.864×10^{-10}	248.25
248.25	Team*Grade*Likert	16	21.275	237.52
	Team*Sex*Likert	8	10.748	243.00
	Grade*Sex*Likert	8	14.650	246.90
	Team*Grade*Sex	4	7.556	247.80
237.52	Team*Sex*Likert	8	24.407	224.66
	Grade*Sex*Likert	8	27.682	227.93
	Team*Grade*Sex	4	24.914	233.16
224.66	Team*Likert	8	26.183	210.43
	Grade*Sex*Likert	8	31.007	215.61
	Team*Grade*Sex	4	27.364	219.61
210.43	Grade*Sex*Likert	8	33.338	201.59
	Team*Grade*Sex	4	29.458	205.71
201.59	Grade*Likert	8	40.904	193.15
	Sex*Likert	4	34.292	194.54
	Team*Grade*Sex	4	36.614	196.86
193.15	Sex*Likert	4	41.723	185.97
	Team*Grade*Sex	4	44.180	188.43
185.97	Team*Grade*Sex	4	45.00	181.25
	Likert	4	317.94	454.19
181.25	Team*Grade	4	46.10	174.34
	Grade*Sex	2	45.62	177.87
	Team*Sex	2	47.32	179.56
	Likert	4	321.22	449.47
174.34	Grade*Sex	2	46.76	171.01
	Team*Sex	2	48.46	172.70

	Likert	4	322.32	442.56
171.01	Team*Sex	2	49.12	169.37
	Grade	2	54.44	174.69
	Likert	4	322.98	439.23
169.37	Team	2	50.29	166.54
	Sex	1	49.19	167.44
	Grade	2	56.80	173.05
	Likert	4	325.34	437.59
166.54	Sex	1	50.36	164.61
	Grade	2	57.97	170.22
	Likert	4	326.51	434.76
164.61	Grade	2	58.04	168.28
	Likert	4	326.58	432.83

Table 4S. Results from the modeling process using the step function, considering frequencies of the type of answers provided by students for question two, according to the team, grade, sex and likert. Each model was fitted using a general linear model (glm) with Poisson errors. The main effect results are presented with or without interactions throughout the modeling simplification. The Akaike's information criterion (AIC) was used to find the minimal adequate model, which is credited to the smallest AIC observed after all simulation steps.

AIC for each step	Model complexity (main effects kept in the model)	DF	Deviance	AIC
288.02	Team*Grade*Sex*Likert	16	9.999	266.02
266.02	Team*Grade*Likert	16	18.774	242.80
	Team*Sex*Likert	8	10.486	250.51
	Grade*Sex*Likert	8	15.863	255.89
	Team*Grade*Sex	4	14.066	262.09
242.80	Team*Sex*Likert	8	22.100	230.12
	Grade*Sex*Likert	8	26.475	234.50
	Team*Grade*Sex	4	22.484	238.51
230.12	Team*Likert	8	26.466	218.49
	Grade*Sex*Likert	8	29.408	221.43
	Team*Grade*Sex	4	25.702	225.73
218.49	Grade*Sex*Likert	8	33.459	209.48
	Team*Grade*Sex	4	29.742	213.77
209.48	Grade*Likert	8	40.195	200.22
	Team*Grade*Sex	4	36.735	204.76
	Sex*Likert	4	38.190	206.21
200.22	Team*Grade*Sex	4	43.471	195.50
	Sex*Likert	4	44.448	196.47
195.50	Team*Grade	4	44.569	188.59

	Sex*Likert	4	47.724	191.75
	Grade*Sex	2	44.097	192.12
	Team*Sex	2	45.789	193.81
188.59	Sex*Likert	4	48.821	184.84
	Grade*Sex	2	45.236	185.26
	Team*Sex	2	46.928	186.95
184.85	Grade*Sex	2	49.489	181.51
	Team*Sex	2	51.181	183.20
	Likert	4	279.526	407.55
181.51	Team*Sex	2	51.849	179.87
	Grade	2	57.167	185.19
	Likert	4	280.194	404.22
179.87	Team	2	53.014	177.04
	Sex	1	51.918	177.94
	Grade	2	59.527	183.55
	Likert	4	282.554	402.58
177.04	Sex	1	53.084	175.11
	Grade	2	60.692	180.72
	Likert	4	283.719	399.74
175.11	Grade	2	60.762	178.79
	Likert	4	283.789	397.81

Table 5S. Results from the modeling process using the step function, considering frequencies of the type of answers provided by students for question three, according to the team, grade, sex and likert. Each model was fitted using a general linear model (glm) with Poisson errors. The main effect results are presented with or without interactions throughout the modeling simplification. The Akaike's information criterion (AIC) was used to find the minimal adequate model, which is credited to the smallest AIC observed after all simulation steps.

AIC for each step	Model complexity (main effects kept in the model)	DF	Deviance	AIC
292.88	Team*Grade*Sex*Likert	16	3.287	264.17
264.16	Team*Grade*Likert	16	23.173	252.05
	Grade*Sex*Likert	8	9.272	254.15
	Team*Sex*Likert	8	12.164	257.04
	Team*Grade*Sex	4	9.047	261.93
252.05	Grade*Sex*Likert	8	24.403	237.28
	Team*Sex*Likert	8	27.232	240.11
	Team*Grade*Sex	4	26.729	247.61
237.28	Grade*Likert	8	27.927	224.81
	Team*Sex*Likert	8	28.574	225.45
	Team*Grade*Sex	4	28.115	232.99

224.81	Team* Sex*Likert	8	31.696	212.57
	Team*Grade*Sex	4	31.203	220.08
212.57	Team*Likert	8	34.831	199.71
	Sex*Likert	4	34.030	206.91
	Team*Grade*Sex	4	34.972	207.85
199.71	Sex*Likert	4	37.079	193.96
	Team*Grade*Sex	4	38.107	194.99
193.96	Team*Grade*Sex	4	40.355	189.23
	Likert	4	257.181	406.06
189.23	Team*Grade	4	41.452	182.33
	Grade*Sex	2	40.981	185.86
	Team*Sex	2	42.673	187.55
	Likert	4	260.457	401.33
182.33	Grade*Sex	2	42.119	179.00
	Team*Sex	2	43.812	180.69
	Likert	4	261.554	394.43
179.00	Team*Sex	2	44.479	177.36
	Grade	2	49.798	182.68
	Likert	4	262.221	391.10
177.36	Team	2	45.645	174.52
	Sex	1	44.549	175.43
	Grade	2	52.158	181.04
	Likert	4	264.747	389.46
174.52	Sex	1	45.714	172.59
	Grade	2	53.323	178.20
	Likert	4	265.747	386.62
172.59	Grade	2	53.393	176.27
	Likert	4	265.817	384.69

Table 6S. Results from the modeling process using the step function, considering frequencies of the type of answers provided by students for question four, according to the team, grade, sex and likert. Each model was fitted using a general linear model (glm) with Poisson errors. The main effect results are presented with or without interactions throughout the modeling simplification. The Akaike's information criterion (AIC) was used to find the minimal adequate model, which is credited to the smallest AIC observed after all simulation steps.

AIC for each step	Model complexity (main effects kept in the model)	DF	Deviance	AIC
282.07	Team*Grade*Sex*Likert	16	6.649	256.72
256.72	Team*Grade*Likert	16	10.812	228.88
	Team*Sex*Likert	8	13.762	247.83
	Grade*Sex*Likert	8	14.993	249.06

	Team*Grade*Sex	4	12.485	254.56
228.88	Team*Sex*Likert	8	15.413	217.48
	Grade*Sex*Likert	8	18.303	220.37
	Team*Grade*Sex	4	14.448	224.52
217.48	Team*Likert	8	16.854	202.93
	Grade*Sex*Likert	8	22.992	209.06
	Team*Grade*Sex	4	19.209	213.28
202.93	Grade*Sex*Likert	8	24.527	194.60
	Team*Grade*Sex	4	20.130	198.20
194.60	Sex*Likert	4	25.616	187.69
	Team*Grade*Sex	4	27.803	189.87
	Grade*Likert	8	49.871	203.94
187.69	Team*Grade*Sex	4	28.892	182.96
	Grade*Likert	8	51.001	197.07
182.96	Team*Grade	4	29.989	176.06
	Grade*Sex	2	29.518	179.59
	Team*Sex	2	31.210	181.28
	Grade*Likert	8	54.277	192.35
176.06	Grade*Sex	2	30.657	172.73
	Team*Sex	2	32.349	174.42
	Grade*Likert	8	55.374	185.44
172.73	Team*Sex	2	33.016	171.09
	Grade*Likert	8	56.042	182.11
171.09	Team	2	34.182	168.25
	Sex	1	33.086	169.16
	Grade*Likert	8	58.402	180.47
168.25	Sex	1	34.252	166.32
	Grade*Likert	8	59.567	177.64
166.32	Grade*Likert	8	59.637	175.71

Table 7S. Results from the modeling process using the step function, considering frequencies of the type of answers provided by students for question five, according to the team, grade, sex and likert. Each model was fitted using a general linear model (glm) with Poisson errors. The main effect results are presented with or without interactions throughout the modeling simplification. The Akaike's information criterion (AIC) was used to find the minimal adequate model, which is credited to the smallest AIC observed after all simulation steps.

AIC for each step	Model complexity (main effects kept in the model)	DF	Deviance	AIC
279.13	Team*Grade*Sex*Likert	16	6.521	253.65
253.65	Team*Grade*Likert	16	21.686	236.82

	Grade*Sex*Likert	8	6.781	237.91
	Team*Sex*Likert	8	10.863	242.00
	Team*Grade*Sex	4	8.860	247.99
236.82	Grade*Sex*Likert	8	21.960	221.09
	Team*Sex*Likert	8	26.587	225.72
	Team*Grade*Sex	4	24.700	231.83
221.09	Team*Sex*Likert	8	26.853	209.99
	Team*Grade*Sex	4	25.058	216.19
	Grade*Likert	8	39.439	222.57
209.99	Team*Likert	8	35.274	202.41
	Team*Grade*Sex	4	30.707	205.84
	Sex*Likert	4	34.583	209.72
	Grade*Likert	8	45.089	212.22
202.41	Team*Grade*Sex	4	38.549	197.68
	Sex*Likert	4	42.177	201.31
	Grade*Likert	8	52.618	203.75
197.68	Team*Grade	4	39.647	190.78
	Grade*Sex	2	39.158	194.29
	Team*Sex	2	40.868	196.00
	Sex*Likert	4	54.452	196.59
	Grade*Likert	8	55.893	199.03
190.78	Grade*Sex	2	40.316	187.45
	Team*Sex	2	42.006	189.14
	Sex*Likert	4	46.550	189.68
	Grade*Likert	8	56.991	192.12
187.45	Team*Sex	2	42.675	185.81
	Sex*Likert	4	47.217	186.35
	Grade*Likert	8	57.658	188.79
185.81	Team	2	43.841	182.97
	Sex*Likert	4	49.577	184.71
	Grade*Likert	8	60.018	187.15
182.97	Sex*Likert	4	50.743	181.88
	Grade*Likert	8	61.183	184.32
181.87	Sex	1	50.812	179.94
	Grade*Likert	8	68.085	183.22
179.94	Grade*Likert	8	68.155	181.29

Table 8S. Results from the modeling process using the step function, considering frequencies of the type of answers provided by students for question six, according to the team, grade, sex and likert. Each model was fitted using a general

linear model (glm) with Poisson errors. The main effect results are presented with or without interactions throughout the modeling simplification. The Akaike's information criterion (AIC) was used to find the minimal adequate model, which is credited to the smallest AIC observed after all simulation steps.

AIC for each step	Model complexity (main effects kept in the model)	DF	Deviance	AIC
287.01	Team*Grade*Sex*Likert	16	4.984	259.99
259.99	Team*Grade*Likert	16	10.665	233.67
	Team*Sex*Likert	8	8.478	247.49
	Grade*Sex*Likert	8	9.778	248.79
	Team*Grade*Sex	4	12.164	259.17
233.67	Team*Sex*Likert	8	12.976	219.98
	Grade*Sex*Likert	8	14.525	221.53
	Team*Grade*Sex	4	17.467	232.47
219.98	Grade*Sex*Likert	8	16.062	207.07
	Team*Likert	8	25.262	216.27
	Team*Grade*Sex	4	18.714	217.72
207.07	Team*Likert	8	27.693	202.70
	Team*Grade*Sex	4	21.165	204.17
	Sex*Likert	4	28.419	211.43
	Grade*Likert	8	48.495	223.50
202.70	Team*Grade*Sex	4	30.969	197.98
	Sex*Likert	4	38.234	205.24
	Grade*Likert	8	57.348	216.36
197.98	Team*Grade	4	32.066	191.07
	Grade*Sex	2	32.331	195.34
	Team*Sex	2	33.287	196.29
	Sex*Likert	4	41.509	200.52
	Grade*Likert	8	60.624	211.63
191.07	Grade*Sex	2	33.596	188.60
	Team*Sex	2	34.426	189.43
	Sex*Likert	4	42.607	193.62
	Grade*Likert	8	61.721	204.73
188.60	Team*Sex	2	35.956	186.96
	Sex*Likert	4	43.274	190.28
	Grade*Likert	8	62.389	201.40
186.96	Team	2	37.122	184.13
	Sex*Likert	4	45.634	188.64
	Grade*Likert	8	64.749	199.76
184.13	Sex*Likert	4	46.000	185.81

	Grade*Likert	8	65.914	196.92

Table 9S. Results from the modeling process using the step function, considering frequencies of the type of answers provided by students for question seven, according to the team, grade, sex and likert. Each model was fitted using a general linear model (glm) with Poisson errors. The main effect results are presented with or without interactions throughout the modeling simplification. The Akaike's information criterion (AIC) was used to find the minimal adequate model, which is credited to the smallest AIC observed after all simulation steps.

AIC for each step	Model complexity (main effects kept in the model)	DF	Deviance	AIC
286.41	Team*Grade*Sex*Likert	16	6.710	261.12
261.12	Team*Grade*Likert	16	8.964	231.38
	Grade*Sex*Likert	8	10.286	248.70
	Team*Sex*Likert	8	13.073	251.49
	Team*Grade*Sex	4	10.801	257.21
231.38	Grade*Sex*Likert	8	13.389	219.80
	Team*Sex*Likert	8	18.028	224.44
	Team*Grade*Sex	4	14.503	228.92
219.80	Team*Sex*Likert	8	22.278	212.69
	Team*Grade*Sex	4	19.085	217.50
	Grade*Likert	8	38.035	228.45
212.69	Team*Likert	8	30.236	204.65
	Team*Grade*Sex	4	26.980	209.39
	Sex*Likert	4	32.067	214.48
	Grade*Likert	8	45.955	220.37
204.65	Team*Grade*Sex	4	33.512	199.92
	Sex*Likert	4	38.429	204.84
	Grade*Likert	8	52.241	210.65
199.92	Team*Grade	4	34.609	193.02
	Grade*Sex	2	34.480	196.89
	Team*Sex	2	35.830	198.24
	Sex*Likert	4	41.705	200.12
	Grade*Likert	8	55.516	205.93
193.02	Grade*Sex	2	35.713	190.13
	Team*Sex	2	36.969	191.38
	Sex*Likert	4	42.802	193.22
	Grade*Likert	8	56.614	199.03
190.13	Team*Sex	2	38.072	188.49
	Sex*Likert	4	43.470	189.88
	Grade*Likert	8	57.281	195.69
188.49	Team	2	39.238	185.65

	Sex*Likert	4	45.830	188.24
	Grade*Likert	8	59.641	194.05
185.65	Sex*Likert	4	46.995	185.41
	Grade*Likert	8	60.806	191.22
185.41	Sex	1	47.065	183.48
	Grade*Likert	8	68.564	190.98
183.48	Grade*Likert	8	68.633	189.05

Table 10S. Results from the modeling process using the step function, considering frequencies of the type of answers provided by students for question eight, according to the team, grade, sex and likert. Each model was fitted using a general linear model (glm) with Poisson errors. The main effect results are presented with or without interactions throughout the modeling simplification. The Akaike's information criterion (AIC) was used to find the minimal adequate model, which is credited to the smallest AIC observed after all simulation steps.

AIC for each step	Model complexity (main effects kept in the model)	DF	Deviance	AIC
318.22	Team*Grade*Sex*Likert	16	10.275	296.50
296.50	Team*Grade*Likert	16	20.419	274.64
	Grade*Sex*Likert	8	14.271	284.49
	Team*Sex*Likert	8	15.696	285.92
	Team*Grade*Sex	4	13.965	292.19
274.64	Grade*Sex*Likert	8	22.444	260.67
	Team*Sex*Likert	8	23.845	262.07
	Team*Grade*Sex	4	23.837	270.06
260.67	Team*Sex*Likert	8	25.843	248.06
	Grade*Likert	8	32.995	255.22
	Team*Grade*Sex	4	25.683	255.91
248.07	Team*Likert	8	30.854	237.08
	Sex*Likert	4	26.864	241.09
	Grade*Likert	8	36.392	242.61
	Team*Grade*Sex	4	29.084	243.31
237.08	Sex*Likert	4	32.135	230.36
	Grade*Likert	8	41.439	231.66
	Team*Grade*Sex	4	34.130	232.35
230.36	Grade*Likert	8	42.809	225.03
	Team*Grade*Sex	4	35.410	225.63
225.03	Team*Grade*Sex	4	46.085	220.31
	Likert	4	184.424	358.65
220.31	Team*Grade	4	47.182	213.40
	Grade*Sex	2	46.711	216.93
	Team*Sex	2	48.404	218.63

	Likert	4	187.700	353.92
213.40	Grade*Sex	2	47.850	210.07
	Team*Sex	2	49.542	211.76
	Likert	4	188.797	347.02
210.07	Team*Sex	2	50.210	208.43
	Grade	2	55.528	213.75
	Likert	4	189.464	343.69
208.43	Team	2	51.375	205.60
	Sex	1	50.280	206.50
	Grade	2	57.888	212.11
	Likert	4	191.824	342.05
205.60	Sex	1	51.445	203.67
	Grade	2	59.054	209.28
	Likert	4	192.990	339.21
203.67	Grade	2	59.123	207.35
	Likert	4	193.059	337.28

Table 11S. Results from the modeling process using the step function, considering frequencies of the type of answers provided by students for question nine, according to the team, grade, sex and likert. Each model was fitted using a general linear model (glm) with Poisson errors. The main effect results are presented with or without interactions throughout the modeling simplification. The Akaike's information criterion (AIC) was used to find the minimal adequate model, which is credited to the smallest AIC observed after all simulation steps.

AIC for each step	Model complexity (main effects kept in the model)	DF	Deviance	AIC
284.27	Team*Grade*Sex*Likert	16	1.190	253.46
253.46	Team*Grade*Likert	16	11.715	231.99
	Team*Sex*Likert	8	2.091	238.36
	Grade*Sex*Likert	8	13.504	249.77
	Team*Grade*Sex	4	12.252	256.52
231.98	Team*Sex*Likert	8	14.798	219.07
	Grade*Sex*Likert	8	23.236	227.51
	Team*Grade*Sex	4	17.636	229.91
219.07	Grade*Sex*Likert	8	26.241	214.51
	Team*Grade*Sex	4	20.538	216.81
	Team*Likert	8	29.082	217.35
214.51	Grade*Likert	8	35.766	208.04
	Team*Grade*Sex	4	30.654	210.92
	Team*Likert	8	39.202	211.47
	Sex*Likert	4	40.303	220.57
208.04	Team*Grade*Sex	4	39.042	203.31

	Team*Likert	8	48.106	204.38
	Sex*Likert	4	48.442	212.71
203.31	Team*Grade	4	40.139	196.41
	Team*Likert	8	51.382	199.65
	Grade*Sex	2	39.668	199.94
	Team*Sex	2	41.389	201.66
	Sex*Likert	4	51.718	207.99
196.41	Team*Likert	8	52.479	192.75
	Grade*Sex	2	40.807	193.08
	Team*Sex	2	42.543	194.81
	Sex*Likert	4	52.815	201.09
192.75	Grade*Sex	2	53.147	189.42
	Team*Sex	2	54.839	191.11
	Sex*Likert	4	65.111	197.38
189.42	Team*Sex	2	55.507	187.78
	Grade	2	60.825	193.09
	Sex*Likert	4	65.779	194.05
187.78	Team	2	56.672	184.94
	Grade	2	63.185	191.46
	Sex*Likert	4	68.139	192.41
184.94	Grade	2	64.351	188.62
	Sex*Likert	4	69.304	189.57

Table 12S. Results (coefficients) from the general linear models (glm) with Poisson errors considering only those models with significant results. Results are shown for questions one, two, three and eight, which had Grade + Likert as the minimal adequate model.

Questions	Source of variation*	Estimate	Std. error	z-value	$P^{\dagger}$
One	Intercept	2.010	0.142	14.111	*< 0.001*
	Fundamental 2	−0.120	0.200	−0.600	0.549
	Médio	−0.603	0.231	−2.611	*0.009*
	Likert (2)	−22.088	3633.992	−0.006	0.995
	Likert (4)	−2.389	0.330	−7.230	*< 0.001*
	Likert (3)	−2.389	0.330	−7.230	*< 0.001*
	Likert (1)	−22.088	3633.992	−0.006	0.995
Two	Intercept	1.862	0.148	12.624	*< 0.001*
	Fundamental 2	−0.120	0.200	−0.600	0.549
	Médio	−0.603	0.231	−2.611	*0.009*
	Likert (2)	−4.543	1.005	−4.519	*< 0.001*
	Likert (4)	−1.142	0.210	−5.446	*< 0.001*
	Likert (3)	−3.157	0.511	−6.184	*< 0.001*

	Likert (1)	−20.930	2193.735	−0.010	0.992
Three	Intercept	1.773	0.151	11.757	*< 0.001*
	Fundamental 2	−0.120	0.200	−0.600	0.549
	Médio	−0.603	0.231	−2.611	*0.009*
	Likert (2)	−21.840	3614.100	−0.006	0.995
	Likert (4)	−0.817	0.195	−4.193	*< 0.001*
	Likert (3)	−2.845	0.460	−6.184	*< 0.001*
	Likert (1)	−21.840	3614.100	−0.006	0.995
Eight	Intercept	1.650	0.156	10.587	*< 0.001*
	Fundamental 2	−0.120	0.200	−0.600	0.549
	Médio	−0.603	0.231	−2.611	*0.009*
	Likert (2)	−2.721	0.462	−5.894	*< 0.001*
	Likert (4)	−1.035	0.224	−4.619	*< 0.001*
	Likert (3)	−1.286	0.247	−5.217	*< 0.001*
	Likert (1)	−20.710	2185.946	−0.009	0.992

*For contrasts (estimate), the grade Fundamental 1 was compared with Fundamental 2 and Médio, and the Likert (5) was compared with Likerts (1), (2), (3) and (4).

†Significant effects are shown at $P < 0.05$.

Table 13S. Results (coefficients) from the general linear models (glm) with Poisson errors considering only those models with significant results. Results are shown for questions four and five, which had the interaction Grade*Likert as the minimal adequate model.

Questions	Source of variation*	Estimate	Std. error	z-value	$P^{\dagger}$
Four	Intercept	2.100	0.143	14.700	*< 0.001*
	Fundamental 2	−0.458	0.230	−1.995	*0.046*
	Médio	−1.059	0.282	−3.761	*< 0.001*
	Likert (2)	−22.403	6344.939	−0.004	0.997
	Likert (4)	−2.506	0.520	−4.818	*< 0.001*
	Likert (3)	−22.403	6344.939	−0.004	0.997
	Likert (1)	−22.403	6344.939	−0.004	0.997
	Fundamental 2*Likert (2)	0.458	8973.099	0.000	0.999
	Médio*Likert (2)	1.059	8973.099	0.000	0.999
	Fundamental 2*Likert (4)	1.844	0.604	3.052	*0.002*
	Médio*Likert (4)	1.752	0.674	2.599	*0.009*
	Fundamental 2*Likert (3)	0.458	8973.099	0.000	0.999
	Médio*Likert (3)	20.956	6344.939	0.003	0.997
	Fundamental 2*Likert (1)	0.458	8973.099	0.000	0.999
	Médio*Likert (1)	1.059	8973.099	0.000	0.999
Five	Intercept	1.992	1.508×10^{-1}	13.216	*< 0.001*
	Fundamental 2	-1.206×10^{-1}	2.199×10^{-1}	−0.548	0.583

	Médio	$-9.510x10^{-1}$	$2.856x10^{-1}$	−3.330	*0.001*
	Likert (2)	−22.300	6345.000	−0.004	0.997
	Likert (4)	−22.300	6345.000	−0.004	0.997
	Likert (3)	−1.587	$3.658x10^{-1}$	−4.338	*< 0.001*
	Likert (1)	−22.300	6345.000	−0.004	0.997
	Fundamental 2*Likert (2)	$1.206x10^{-1}$	8973.000	0.000	0.999
	Médio*Likert (2)	19.460	6345.000	0.003	0.997
	Fundamental 2*Likert (4)	$1.206x10^{-1}$	8973.000	0.000	0.999
	Médio*Likert (4)	19.460	6345.000	0.003	0.997
	Fundamental 2*Likert (3)	$2.845x10^{-3}$	$5.334x10^{-1}$	0.005	0.996
	Médio*Likert (3)	$6.997x10^{-1}$	$5.792x10^{-1}$	1.208	0.227
	Fundamental 2*Likert (1)	$1.206x10^{-1}$	8973.000	0.000	0.999
	Médio*Likert (1)	20.560	6345.000	0.003	0.997

*For contrasts (estimate), the grade Fundamental 1 was compared with Fundamental 2 and Médio, and the Likert (5) was compared with Likerts (1), (2), (3) and (4).

†Significant effects are shown at $P < 0.05$.

Table 14S. Results (coefficients) from the general linear models (glm) with Poisson errors considering only those models with significant results. Results are shown for questions six and seven, which had the structures "Sex*Likert + Grade*Likert" and "Grade*Likert" as the minimal adequate models, respectively.

Questions	Source of variation*	Estimate	Std. error	z-value	$P^{\dagger}$
Six	Intercept	1.797	$1.959x10^{-1}$	9.174	*< 0.001*
	Sex (Boys)	4.349x10-2	$2.086x10^{-1}$	0.208	0.835
	Likert (2)	−40.710	$1.122x10^{4}$	−0.004	0.997
	Likert (4)	−22.000	8520.000	−0.003	0.998
	Likert (3)	$-8.164x10^{-1}$	$3.664x10^{-1}$	−2.228	*0.026*
	Likert (1)	−22.000	8520.000	−0.003	0.998
	Fundamental 2	$1.027x10^{-1}$	$2.268x10^{-1}$	0.453	0.651
	Médio	$-9.719x10^{-1}$	$3.138x10^{-1}$	−3.097	*0.002*
	Boys*Likert (2)	18.540	6575.000	0.003	0.998
	Boys*Likert (4)	−19.410	5608.000	−0.003	0.997
	Boys*Likert (3)	$-4.349x10^{-2}$	$4.205x10^{-1}$	−0.103	0.918
	Boys*Likert (1)	−19.410	5608.000	−0.003	0.997
	Likert (2)*Fundamental 2	$-1.027x10^{-1}$	$1.286x10^{4}$	0.000	0.999
	Likert (4)*Fundamental 2	$-1.027x10^{-1}$	$1.205x10^{4}$	0.000	0.999
	Likert (3)*Fundamental 2	−1.083	$5.297x10^{-1}$	−2.045	*0.041*
	Likert (1)*Fundamental 2	$-1.027x10^{-1}$	$1.205x10^{4}$	0.000	0.999
	Likert (2)*Médio	20.200	9090.000	0.002	0.998
	Likert (4)*Médio	21.170	8520.000	0.002	0.998
	Likert (3)*Médio	$2.787x10^{-1}$	$5.347x10^{-1}$	0.521	0.602

	Likert (1)*Médio	21.170	8520.000	0.002	0.998
Seven	Intercept	1.992	0.151	13.216	*< 0.001*
	Fundamental 2	−0.147	0.222	−0.662	0.508
	Médio	−1.012	0.292	−3.465	*0.001*
	Likert (2)	−21.295	3848.400	−0.006	0.996
	Likert (4)	−3.784	1.011	−3.742	*< 0.001*
	Likert (3)	−1.705	0.384	−4.435	*< 0.001*
	Likert (1)	−21.295	3848.400	−0.006	0.996
	Fundamental 2*Likert (2)	0.147	5442.4598	0.000	0.999
	Médio*Likert (2)	18.522	3848.400	0.005	0.996
	Fundamental 2*Likert (4)	−17.364	3848.400	−0.005	0.996
	Médio*Likert (4)	1.705	1.259	1.354	0.176
	Fundamental 2*Likert (3)	0.264	0.534	0.495	0.621
	Médio*Likert (3)	0.724	0.614	1.179	0.238
	Fundamental 2*Likert (1)	0.147	5442.460	0.000	0.999
	Médio*Likert (1)	19.909	3848.400	0.005	0.996

*For contrasts (estimate), the grade Fundamental 1 was compared with Fundamental 2 and Médio, the sex "girls" was compared with "boys", and the Likert (5) was compared with Likerts (1), (2), (3) and (4). †Significant effects are shown at $P < 0.05$.

Table 15S. Results (coefficients) from the general linear model (glm) with Poisson errors considering the model nine, which had Grade + Sex*Likert as the minimal adequate model.

Question	Source of variation*	Estimate	Std. error	z-value	$P^{\dagger}$
Nine	Intercept	2.019	0.171	11.797	*< 0.001*
	Fundamental 2	−0.120	0.200	−0.600	0.549
	Médio	−0.603	0.231	−2.611	*0.009*
	Sex (Boys)	−0.136	0.198	−0.689	0.491
	Likert (2)	−4.007	1.009	−3.971	*< 0.001*
	Likert (4)	−2.909	0.593	−4.906	*< 0.001*
	Likert (3)	−2.398	0.467	−5.134	*< 0.001*
	Likert (1)	−3.314	0.720	−4.604	*< 0.001*
	Boys*Likert (2)	−16.950	3112.204	−0.005	0.996
	Boys*Likert (4)	1.603	0.670	2.391	*0.017*
	Boys*Likert (3)	−0.780	0.860	−0.908	0.364
	Boys*Likert (1)	−17.643	3112.204	−0.006	0.995

*For contrasts (estimate), the grade Fundamental 1 was compared with Fundamental 2 and Médio, the sex "girls" was compared with "boys", and the Likert (5) was compared with Likerts (1), (2), (3) and (4). †Significant effects are shown at $P < 0.05$.

Effectiveness of laboratory practical for Students' Learning

G.W.T.C. Kandamby
Division of Civil Engineering Technology
Institute of Technology, University of Moratuwa
Diyagama, Homagama, Sri Lanka.
kndamby@yahoo.com, +94 0773752935

Abstract

Modules relating to engineering disciplines mostly comprise laboratory hands on practical in order to demonstrate the application of theory in practice. Guided sheet is usually followed by the instructor while carrying out the practical and students are allowed to work as a team by following the instructions. Since it is a common practice in almost all engineering laboratories, students' learning was investigated using two soil experiments in civil engineering technological programme in 2018. Interviews were conducted to search what students learn from the practical by recalling learned materials from sample of students after completion of the practical and the method adopted by the instructors were collected through the questionnaire. Analysis based on recalling learning showed that students remember observable aspects of practical task such as identification of apparatus and the testing procedure within one year but it does not assist them to learn theory and calculations though it has been totally covered during the practical lesson. It is noted that students highly involved in doing practical in laboratory rather than attending theory and calculation. Students' active involvement in learning before the commencement of practical with the assistance of the instructor, observing physical outcomes while doing and searching additional information at the end through internet have showed better results. Preset process is found partially effective and learning on theory and calculation need to be improved to make the process success.

Keywords: Laboratory practical, students' learning, recalling learning, effectiveness,

1. Introduction

Under engineering education, performance of laboratory practical takes major role in demonstrating engineering principles and theories in practice. Students who follow higher education in civil engineering discipline carry out practical in laboratory environment or in the field under the supervision of instructors to enhance their knowledge and skills on materials and methods which need to be applied for civil engineering industry. There are four laboratory experiments related to material of soil in second year program of National Diploma in Technology in civil engineering. Under this module, students are able to learn properties of soil as a material and the method of construction according to the standard and specification of earth work constructions by following lectures and laboratory experiments. Teacher who is in charge of this module designs the delivery of information to suit to the intended learning outcomes of this module and practical work at soil laboratory which is conducted as group work with five students in a

group. In addition, guided laboratory sheet is given to each student to read and understand the total process of conducting practical at the beginning. Practical is supervised by the instructor while performing and observation sheet is certified at the end of the practical. Students are instructed to prepare and submit the report which is considered as a coursework in order to assess students' learning by marking them. Usually students are keen to carry out the practical as expected and submit the coursework during the allotted time frame. Feedback is given by marking coursework out of ten marks and corrections are noted for resubmission. Since this learning process spends considerable investment in terms of money and time, it is decided to investigate the achievement of students' learning by following the present process of laboratory practical and propose suggestions if necessary for its development.

2. Aim of Study

Aim of this study is to investigate achievement of students' learning in laboratory environment for practical works related to soil mechanics in civil engineering programme. Specific objectives are to;

1. Develop framework for analyzing students' learning from practical.
2. Analyze students' learning using developed framework.
3. Verify the effectiveness of practical by recalling learning.
4. Suggest improvements.

3. Literature Review

3.1 Learning from Laboratory Practical

Studying science is commenced by the students from ordinary school level understanding fundamentals of science and knowledge of science is gradually developed in advanced level classes engaging in laboratory learning environment. Roberts (2002) has highlighted that the quality of school science laboratories are to be concerned on the supply of people with science, technology, engineering and mathematics skills [1]. From the practical lessons, students are able to catch the information required for both carrying out the practical and gaining knowledge on theory and finally ending with expected results which are obtained scientifically through evidence. Laboratory instruction develops students' experimental skills, ability to work in teams and communicate effectively, learn from failure, and be responsible for their own results [2]. There is also evidence that students find practical work relatively useful and enjoyable as compared with other science teaching and learning activities [3]. A learning environment that allows active participation of students in the learning process makes it possible for the students to have control over their learning and this leads to improvement in students' learning outcomes [4]. Similarly, Tobin, Capie & Bettencourt (1988) explained that the laboratory learning environment allows students to interact physically and intellectually with instructional materials through hands-on experiences, and through minds-on and inquiry-oriented activities [5]. Laboratory activities appeal as a way to learn with understanding and, at the same time, engage in a process of constructing knowledge by doing science [6]. Getting students into the use of intended scientific ideas is important. What is urgently needed is an educational program in which students become interested in actively knowing, rather than passively believing [7]. Many research studies have

been conducted to investigate the educational effectiveness of laboratory work in science education in facilitating the attainment of the cognitive, affective, and practical goals [6]. Laboratory sessions are an integral part of most science courses and the reasons for having them include: engaging students, converting theory into practice, affirming and illustrating concepts, gaining technical expertise, data and uncertainty analysis, report writing and research skills development [8]. There is a need to restructure traditional laboratory classes to enable students to learn by discovery, interact more effectively with peers and tutors, and begin to appreciate the excitement of performing experiments [9]. A recipe-based laboratory will provide the students with all of the steps they need to take to complete the practical, and while this will give them the chance to focus on technical expertise and analysis, it does not engage them in the experimental design process [10]. Tamer & Lunetta (1981) reported that laboratory handbooks do not provide students with expected opportunities to investigate and use the scientific inquiry method of teaching [11]. A number of subsequent studies showed that most practical tasks in science laboratory manuals provided students with little or no opportunity for open-ended or enquiry learning [12].

3.2 Laboratory Practical in Civil Engineering Education

Nuttgens (1988) suggested that engineering is almost the obverse of science. Most science-based courses include practical experimental activity in the laboratory [13], [14]. All technological courses related to engineering disciplines comprises with science based module with hands on practical in order to develop students' knowledge and skills. Applying science to everyday life requires both theory and hands-on practicum [15]. Engineering education is inconceivable without laboratory instruction and the educational goals of laboratory instruction are fully implemented in various types of hands-on laboratories and such an opinion still prevails among engineering educators [2]. The function of the engineering education is to manipulate materials, energy and information thereby creating benefit for humankind [16]. The overall goal of engineering education is to prepare students to practice engineering and, in particular, to deal with the forces and materials of nature [15]. Students are able to understand the scientific knowledge and its value as its phenomena is applied meaningfully for day to day requirements. Laboratory practical is necessarily to be designed to cover the expected learning outcomes of the particular modules such as identifying apparatus, carrying out specific way of practical, recording observations, learning theory, applying data to the calculation, finding results and interpreting them for the actual applications. Laboratory practical in civil engineering field is a good tool for teaching theory and demonstrate the theory for finding properties and selecting correct material or method in civil engineering applications. Aim of conducting this particular soil practical is also designed to give knowledge and skills required for carrying out the practical and applying its results in the civil engineering industry. Laboratory classes are integral part of an engineering course. In traditional laboratory a student follow a given procedure to obtain pre-determined outcome. Laboratories and fieldwork were clearly a major part of the engineering education experience [15]. From the beginning of engineering education, laboratories have had a central role in the education of engineers. While there has been an ebb and flow in the perceived importance of laboratory study versus more theoretical classroom work, it has never been suggested that laboratories can be foregone completely [16]. The purpose of laboratory work is well articulated as it is a place to learn new and developing subject

matter as well as insight and understanding of the real world of the engineer [17]. Civil engineering students should be taught how to develop engineering judgment for the size of elements, expected dimensions, quantities, values and the sense of proportion which help to judge the results of calculation against reasonableness [18].

4. Methodology and Data Collection

1. Literature review was conducted to study the students' learning by following laboratory practical and framework was developed using the information collected.
2. Data was collected through questionnaire from two instructors (total number of practical was four) once completed the total soil practical in year 2018. The information collected was based on the method adopted by them at three stages such as before commencing, while conducting and after completing the practical.
3. Guided sheets used for carrying out practical were considered for identifying stated teacher's learning objectives. It contained name and objective of the experiments, list of apparatus, steps of procedure, observation sheet, brief description of theory including formulas for calculating results and few questions for guiding students to write discussion in satisfactory level.
4. There were 18 practical groups (total 78 students) who followed the practical during 2018 from which 22 students were selected by considering their previous performances to make the purposefully selected sample for this study. Qualitative research often focuses on a limited number of respondents who have been purposefully selected to participate because they have in-depth knowledge of an issue which are going to be studied. The purpose of purposeful sampling is to select information-rich cases whose study will illuminate the questions under study. They are rich in information because they are unusual or special in some way [19].
5. Once total practical classes were over, data was collected from purposefully selected sample by interviewing and recording information on structured questionnaire with regards to two selected experiments. Students' learning was evaluated by considering these 44 sets of information collected under five learning areas i.e. identifying apparatus, following standard testing procedure, applying theory and calculations and use of selected tests in civil engineering field in order to determine to what extent students have learned by conducting experimental practical.
6. Recall time was obtained using practical records from the register and date of conducting the interview to investigate the effect of remembering learning against the time duration.

5. Analysis and Discussion

5.1 Development of Framework for Students' Learning

Practical work, as several authors have pointed out, is a broad category that encompasses activities of a wide range of types and with widely differing aims and objectives [20], [21]. Following elements has been proposed the framework for evaluating the practical [20].

1. Teacher's learning objectives.

2. Design or select the particular task to achieve the desired learning objectives.
3. What the students actually do as they undertake the task.
4. What the student learn as consequence of undertaking task.

Designing a laboratory experiment without clear instructional objectives is like designing a product without a clear set of design specifications [15]. Therefore, the requirements of teacher's learning objectives and respective tasks (elements 1 and 2 above) were considered and derived by studying two guided experiment sheets of sieve analysis and proctor compaction tests. By observing the process of conducting practical it was found that structure of both guided sheets were same and instructors followed the given guide line while carrying out practical.

Table 1. Teacher's learning objectives

Teacher's learning objectives		Tasks undertaken
Doing practical work (Laboratory class)	Identify objects and observable and become familiar	1. Identify apparatus 2. Carry out practical 3. Record observations
	Learn theory and calculation	1. Apply theory and calculations
	Learn team work	1. Organize work as a team 2. Complete the practical 3. Clean the area
Reporting results (Coursework)	Learn writing report	1. Use of correct format 2. Sketch apparatus 3. Write procedure
	Learn concept and relationship	1. Calculate results 2. Compare results 3. Interpretation evidence 4. Discuss the experiment

Frame work presented in Table was considered for analyzing students' learning considering the way of carrying out the practical by the instructor using guided sheet.

5.2 Students' Learning

Practical work is generally effective in getting student s to do what is intended with physical objects, but much less effective in getting them to use the intended scientific ideas to guide their actions and reflect upon the data they collect [3]. Data collected from respective two instructors (sieve analysis and proctor compaction tests) is summarized as step by step under three stages i.e. before commencing practical, while doing practical and after completing practical.

Table 2. Before commencing practical

Sieve analysis	Proctor compaction
i. Allowed students to read and understand the given guidelines. ii. Collected their ideas by asking few questions. iii. Explained about soil and why this experiment is important. iv. Explained the objective and theory as per the guideline by showing information on the sheet. v. Explained the applications of the test in industry. vi. Allowed students to ask questions.	i. Explained the objective of the practical. ii. Discussed engineering applications in soil compaction. iii. Explained the theory by writing on the sheet. iv. Explained the purpose and importance of the test.

Table 3. While doing practical

Sieve analysis	Proctor compaction
i. Showed the apparatus ii. Explained the procedure again. iii. Observed the way of carrying out practical. iv. Allowed students to observe the soil particle distribution on each sieves. v. Observed how students recorded observations. vi. Allowed students to check the correctness of observations. vii. Allowed students to clean the place.	i. Introduced apparatus and showed them. ii. Explained how to do the practical for best performance. iii. Checked the students' performance. iv. Allowed students to clean the place.

Table 4. After completing practical

Sieve analysis	Proctor compaction
i. Allowed students to carry out calculations the way noted in observation sheet. ii. Certified observations. iii. Explained how to present the results. iv. Explained how to do calculations and writing coursework. v. Allowed them to search important information using internet for about 30 to 45 minutes.	i. Certified observation sheets. ii. Explained how to do the calculations. iii. Explained how to prepare the coursework. iv. Instructed to write discussion using the given questions.

Active learning is the process of having students engaged in some activity that forces them to reflect upon ideas and how they are using those ideas [7]. As qualitative study, following indicators are used to measure

the students' participation.

Activity carried by the students alone – Highly participated (H)

Activity carried out by both instructor and students – Partially participated (P)

Activity carried out by the instructor – Not participated (N)

Data was collected from the instructor' questionnaire was summarized in Table to show the students' participation on each task in the developed framework.

Table 5. Students' learning on doing practical

Learning areas	Tasks covered in laboratory as group work	Sieve analysis	Proctor compaction
Identify objects and observable and become familiar	Identify apparatus Carry out practical Record observations	H H H	H H H
Theory	Learn theory and calculation	P	P
Team work	Organize work as a team Complete the practical	H H	H H

In this process, it can be said that doing practical is successful by the instructor as students managed the work as a team and arrived with desired observations. Coverage of learning theory and calculation was totally described by the instructor and students learn by listening without much involvement. Extent of learning received by individual students is not assessed while doing the practical. Measuring individual learning of practical is time consuming task for large group of students and the practical is usually designed as team work of students allowing learning by sharing knowledge through discussions in laboratory and at home. Engineering experiments are generally team efforts and this necessarily implies that all participants do not carry out the same activities [14].

Table 6. Students' learning at home

Learning areas	Tasks covered at home individually	Sieve analysis	Proctor compaction
Learn writing report	Use of correct format. Sketch apparatus. Write procedure.	H H H	H H H
Learn concept and relationship	Calculate results. Compare results. Interpret evidence. Discuss results.	H H H H	H H H H

Though students highly covered all tasks at home, level of achievement cannot be assured in this process. Instructor may satisfy students' work by marking coursework or getting corrections through resubmission.

Interpreting evidence, calculating, comparison and discussion of results are the main key learning areas which need to be kept in mind after completing practical. Recalling of learning as suggested in several research studies were undertaken to investigate the level of achievement received by the individual student using data from purposeful sample of students. Team work and writing report was not taken into account in detail study.

5.3 Recalling students' learning

According to the literature review, it is found that recalling experiment work is necessary to get the feedback for learning of the students. Using the time duration from the date of practical (in the register) to recalling learning was recorded in order to find the effect of remembering against the duration of learning. Since the practical was conducted once a week as rotation basis this duration is not equal to all students. Excel sheets were arranged to enter the collected data and individual student responses were noted. Identification of apparatus, experimental procedure, theory and calculations and use of the experiment in civil engineering field are considered as the main areas, which students need to keep as learning from the experimental practical. Time duration between the date of practical and recalling learning are presented along with the other learning information of 22 good students by covering 44 total records of soil practical. English letter was assigned from A to V (2 x 22 numbers) to a student when recording respective learning information.

Forgetting is the process of losing this information in memory or not being able to retrieve it even though the information is still stored [22].

5.3.1 Identification of apparatus

When interviewing, students were asked to state the apparatus used for the said two experiments and their answers were noted. It was noted that they recall the apparatus correctly while explaining the procedure. Therefore analysis is based on the identification of apparatus by the students while discussing the method of particular practical. Data is categorized as apparatus was Satisfactorily Identified – SI and
Not Identified – NI.

Table 7. Identification of Apparatus

Sieve Analysis			Proctor Compaction Test		
Recall Time Days	SI	NI	Recall Time Days	SI	NI
74	I		66	R	J
80	K, V	L	74	E, T	U
87	N		87	P, Q	
			107		V
101	F, H, E, G, S, U		115	K, L	
117		M	136	N	

150	A, B		171	F, H, G, S	
185	O		192	D	C
206	T	J	206	I	
220	P, Q, R		213	A, B	M
290	C, D		220	O	
Total	19	3		17	5

It is found that out of 22 students, 19 students and 17 students (average 82%) satisfactorily identified the apparatus used for these two experiments under the way of conducting practical. Though the recalling period varies from 66 days to 220 days, it does not affect for remembering learning. Practiced system using guided sheet and the instruction method have satisfactorily supported students for learning on identification of apparatus after performing the test. Effect of result of students J and M who did not perform well and students C and U who performed well in practical on sieve analysis may be due to the level of interest they paid.

5.3.2 Test procedure

Testing procedure mainly relates with the students activities carried out while performing the practical. When interviewing them, their explanations were clearly listened and noted step by step. The data collected was analyzed as Totally Explained (TE), Partly Explained (PE) and Not Explained (NE).

Table 8. Experiment procedure

Sieve Analysis				Proctor Compaction Test			
Recall Time Days	TE	PE	NE	Recall Time Days	TE	PE	NE
74	I			66	J		R
80	K, L	V		74	E		T, U
87	N			87	P, Q		
107				107			V
101	H, E, G, S, U		F	115	K, L		
117	M			136	N		
150	B	A		171	H, S		F, G
185	O			192	C, D		
206	J, T			206		I	
220	P, Q, R			213	B, M	A	
290	C, D			220		O	
Total	19	2	1		13	3	6

It is found that out of 22 students, 19 students and 13 students (average 73%) totally explained the test procedure of sieve analysis and proctor compaction respectively. Majority of students have learned the test procedure satisfactorily under this practical method. It is noted that students A, F and V did not perform well in both practical. According to the results, it can be said that hands on practice helps them to learn test procedure and keep them in mind without forgetting. Meaningful learning is possible in the laboratory if students are given opportunities to manipulate equipment and materials so that they are able to construct their knowledge of phenomena and related scientific concepts [6].

5.3.3 Theory and calculation

Aim of conducting soil practical is to investigate the properties of given soil samples by following the theory and calculation. Students get the actual work environment to conduct practical and learn how theory is applied and obtain the results by following the set of calculations. When collecting data from each student, time was given to explain the theory and calculation and record the explanations clearly. For the purpose of analysis the recorded explanations, they are categorized as; Satisfactorily Explained (SE), Partly Explained (PE) and Not Explained (NE).

Table 9. Theory and calculation

Sieve Analysis				Proctor Compaction Test			
Recall Time Days	TE	PE	NE	Recall Time Days	TE	PE	NE
74		I		66			J, R
80		K, L, V		74		E	T, U
87		N		87			P, Q
				107			V
101	S, U	F, H, E, G		115		K, L	
117			M	136		N	
150	A, B			171	S		F, H, G
185			O	192			C, D
206	T		J	206			I
220		Q	P, R	213	A, B	M	
290	C		D	220			O
Total	6	10	6		3	5	14

Student A, B and S learned well in both practical and students U and T learned sieve analysis test without relating to the recalling time. But majority of student (80%) did not learn well the theory and calculation in this process of conducting practical. This requires that teachers analyze more carefully the objectives of the practical tasks they undertake, and become more aware of the cognitive challenge of their students. It is thought that this phase allows the students to learn and experience science with greater understanding

and to practice their metacognitive abilities in order to provide them with the opportunity to construct their knowledge by actually doing scientific work [6]. The laboratory courses in engineering education, are typically engaged in a general way to support existing 'conventional' pedagogical practices which seem to be not so effective in developing the knowledge as well as skill of the learners [17].

5.3.4 Application in civil engineering field

Students, on the other hand, go to an instructional laboratory to learn something that practicing engineers are assumed to already know [15].

Table 10. Application in civil engineering field

Learning areas	Sieve analysis	Proctor compaction
Applications in civil engineering field		
Satisfactorily discussed	21 (95 %)	14 (64 %)
Not discussed	1 (5 %)	8 (36%)

More than 60% of student satisfactorily described the application of the test in civil engineering field and significant difference is noted in sieve analysis test. Additional experience received from civil engineering industry by the particular instructor may be supportive to gain high results in this area. Engineering graduates can benefit more when civil engineering courses are taught by instructors that have both academic and practical experience [18].

Data is analyzed basically by considering the students' active participation on practical and recalling the learning. When considering the both method of analysis, following results can be determined.

1. Students have engaged in practical actively in the areas of identifying apparatus and carrying out procedure at the laboratory which assisted them to learn well in these two areas.
2. Students have not actively engaged in the areas of theory and calculation and have not shown good results on learning under them.
3. Active participations on hands on practical in the areas of identifying apparatus and describe procedure have showed good results on learning and keeping them in mind without forgetting. There is no relation to recalling time. Students do remember observable aspects of practical tasks, often many months or even years later, particularly when the event is a striking one [23].

In addition, it is found that there is a significant difference in the results of learning received by the students with respect to sieve analysis test. Additional activities carried out by this particular instructor can be summarized as follows.

1. Time was given for student to learn the guideline and understand the practical well and their knowledge was verified by asking several questions before starting practical. Many practical tasks of this type might be made more effective by designing them to stimulate the students' thinking before they make any observations [23].
2. Main idea about these practical is to learn the properties of soil. Practical was started after explaining the types of soils and the importance of carrying out the practical.

3. Students were allowed to observe distribution of soil particles well after the experiment in order to think about idea of the experiment.
4. Student have completed observation sheet individually by performing part of the calculations in the laboratory.
5. Time was given for students to search relevant information through internet after the practical at the laboratory to understand the test further and collect information for the discussion.

It is found that instructor had taken few steps to carry out the practical with active participation of students at three stages such as;

1. Before starting - to obtain the knowledge of soil and the importance of the experiment.
2. While doing – to think critically about the observed soil distribution.
3. After completing – to search additional information relevant to soil and the particular experiment to make good discussion.

5.4 Effectiveness of practical

The effectiveness of any type of a laboratory practical depends upon the learning objectives that are associated with the laboratory [2]. In this study, it is analyzed using the framework developed for students' learning in Table 1 and recalling learning received from Table 7 to Table 10 in order to verify the coverage of learning from practical by fulfilling the requirement of valuable two elements 'what students actually do' and 'what student learn'. Team work and writing report was not taken into account under this analysis.

Table 11. Effectiveness of practical

Teacher's learning objectives	What students actually do	What student learn Coverage of students population %
Identify objects, observable and become familiar	1. Identify apparatus 2. Carry out practical	82 73
Learn theory and calculation	1. Apply theory and calculations	20
Learn concept and relationship	1. Use of results in the industry	60

When considering the results received from recalling learning under this study, it is found that majority of students learn by following the practical except the areas of learning theory and calculation. It can be said that the procedure presently applied is not totally effective as main area of learning is not covered. Therefore suitable improvement (as given under suggestions) on theory, calculation and the use of results is required to make the practical process is more effective.

6. Conclusions

1. Teacher's learning objectives have been presented in the form of guidelines and students are able to learn them before starting practical.

2. Students have learnt well in the areas of identifying apparatus and carrying out the procedure by actively engaging the work in the laboratory. These learnings are kept in their minds for long periods as it may be a striking one to them.
3. Instructor can design the tasks orienting students' active involvement at the beginning by allowing them to learn using guideline, while carrying out by observing physical outcomes and at the end of the practical by searching additional information through internet, the better results can be achieved as shown in sieve analysis practical.
4. Process of conducting practical is partially effective as students are unable to learn the specific theory and the set of calculation. An additional activity is required in order to reinforce this particular learning area.
5. Purposeful sample (good students in the batch) was selected to collect learning by recalling. Similar results have been arrived for both analysis based on actual practice and the recalling learning.

7. Suggestions

In order to make the practical effective, it is suggested to add an additional activity as a formative assessment based on theory and calculation which has to be conducted in the classroom once the practical is over, with students' active participation and facilitation of the instructor [Anonymous, 2018]. If it is necessary to memorize any information well, engage in deep level processing which would involve asking as many questions related to the information as possible, considering its meaning and examining its relationships to the facts you already know (Human memory, Chapter 7, Friedrich Nietzsche, Psychology).

8. References

[1] G. Roberts, SET for success. The supply of people with science, technology, engineering and mathematics skills, London: HM Treasury, Retreieved 27th February 2007, from http:// www.hm-treasury.gov.uk/documents/enterprise_and_productivity/research_and_enterprise/ ent_res_roberts.cfm.

[2] V. Romanas, V. Krivickas and J. Krivickas, Laboratory Instruction in Engineering Education, Global J. of Engng. Educ., Vol.11, No.2, 2007, pp 191-196.

[3] I. Abrahams and R. Millar, Does Practical Work Really Work? A study of the effectiveness of practical work as a teaching and learning method in school science, International Journal of Science Education Vol. 30, No. 14, November 2008, pp. 1945–1969.

[4] O.M. Olubu, Effects of laboratory learning environment on students' learning outcomes in secondary school chemistry, International Journal of Arts & Sciences, 08(02), 2015, pp 507–525.

[5] K. Tobin, W. Capie and A. Bettencourt, Active teaching for higher cognitive learning in science, International Journal of Science Education, 10 (1), 1988, pp 17-27. doi: 10.1080/0950069880100103.

[6] A. Hofstein, O. Navon, M. Kipnis and R. Mamlok-Naama, Developing Students' Ability to Ask More and Better Questions Resulting from Inquiry-Type Chemistry Laboratories, Journal of Reasearch in Science Teaching Vol. 42, NO. 7, 2005, PP. 791–806. doi: 10.1002/tea.20072.

[7] J. Michael, Where's the evidence that active learning works? Advances in Physiology Education Vol. 30, 2006, pp 159–167. doi:10.1152/advan.00053.2006.

[8] B. Maria, S.S. Parappilly, G. Marjan, J.S. Zadnik and L. Schmidt, An Inquiry-Based Approach to Laboratory Experiences: Investigating Students' Ways of Active Learning, International Journal of Innovation in Science and Mathematics Education, 21(5), 2013.

[9] J.A. David, 'Current Trends in Laboratory Class Teaching in University Bioscience Programmes', UK Centre for Bioscience, Higher Education Academy, and Faculty of Biological Sciences, University of Leeds, Leeds, LS2 9JT. Vol.13, 2009.

[10] D.S. Domin, A Review of Laboratory Instruction Styles, Journal of Chemical Education 76(4), 1999, pp 543.

[11] P. Tamer and V.N. Lunetta, Inquiry-related tasks in high school science laboratory handbooks, Science Education, 5, 1981, pp. 477–484.

[12] F. Darrell, H. Allan and D. Henderson, Laboratory Learning Environments and Practical Tasks in Senior Secondary Science Classes, Research in Science Education, 28(3), pp 353-363.

[13] P. Nuttgens, What Should We Teach and How Should We Teach It? Aims and Purpose of Higher Education (Wildwood House, Aldershot. 1988.

[14] N.S. Edward, The role of laboratory work in engineering education: student and staff perceptions, International Journal of Electrical Engineering Education, 39 (1), 2016, pp 11-19.

[15] L. Feisel and A. Rosa, The Role of the Laboratory in Undergraduate Engineering Education, Journal of Engineering Education, 2005, pp 121-130.

[16] C.V. Rahane, P.V. Mane and S.R. Bawane, The role of laboratories and its self-audit in engineering education, International Journal of Advance Research in Science and Engineering, Vol 6 (9), 2017, pp 806-821.

[17] J. Sujatha and R. Jobanputra, American Society for Engineering Education. 2012.

[18] K. Shaaban, Practical teaching and its importance in teaching civil engineering, Global Innovators Conference 2013 College of the North Atlanic-Qatar, 4-7th April 2013.

[19] M. Patton, Qualitative evaluation and research methods, Beverly Hills, CA: Sage. 1990, pp 169-186.

[20] R. Millar, J. F. Maréchal and A. Tiberghien, 'Mapping' the domain: Varieties of practical work. In J. Leach & A. Paulsen (Eds.), Practical work in science education, recent research studies, Roskilde/Dordrecht, The Netherlands: Roskilde University Press/Kluwer, 1999, pp 33–59.

[21] V. N. Lunetta and P. Tamir, Matching lab activities with teaching goals, The Science Teacher, 46(5), 1979, pp 22–24.

[22] H. Ebbinghaus, Memory: A Contribution to Experimental Psychology, Classics in the History of Psychology, An internet resource developed by Christopher D. Green York University, Toronto, Ontario. 1885.

[23] R. Millar, The role of practical work in teaching and learning of science, Department of Educational Studies, The University of York, High School Science Laboratories: Role and Vision, National Academy of Sciences, Washington. 2004.

PROMOTING IDENTIFICATION AND SUPPORT OF LEARNERS WITH VISUAL PROBLEMS IN PUBLIC PRIMARY SCHOOLS, CENTRAL KENYA

Sarah W. Mwangi (PhD), Japheth M. Makuna
Department of Educational Psychology and Special Needs, School of Education, Pwani University, Kilifi, Kenya.

Abstract

Visual impairment in childhood has implications in all aspects of the child's development. It possesses educational, occupational and social challenges, with affected children being at risk of behavioral, psychological difficulties, impaired self-esteem and poor social integration. Moreover, visual problems are an important contribution to poor school performance. Visual problems are known to deteriorate and become visual impairments if they are not identified and treated early. Despite this realization, high risk learners in primary schools remain unnoticed, undiagnosed and do not benefit from special education services and interventions. The purpose of this study was to document challenges that teachers in public primary schools experienced in identifying and assisting children with visual problems. Utilizing a descriptive survey design, a study involving 36 teachers was conducted in 12 public primary schools selected in Central Kenya. Questionnaires and observation schedules were used. The study established the major challenges faced by teachers in identifying learners with visual problems as: lack of knowledge and skills in special education and visual screening as well as lack of school visual screening programs. Strategies suggested to address the challenges included special education training and special education seminars for teachers and introduction of school visual screening programs for all the learners.

Key Words: Public Primary School, Visual Problems, County, identification, Visual impairment

Introduction

Visual impairment is a significant problem world-wide. Globally, about 285 million people have visual impairment although 80% of the visual impairment is preventable or treatable if identified early (WHO, 2012). According to WHO (2009), the number of people who have visual impairments globally will escalate to 360 million by 2020 unless elaborate interventions are undertaken. In Africa, there are 35 million people with visual impairments (WHO, 2009) and every year, an estimated 2000 children develop visual impairments (WHO, 2005). In Kenya, the census statistics of 2009 indicated that the population of people with disabilities in the country was about 1.3 million, with 25% having visual impairments (Government of Kenya, 2010).

Lack of early identification of visual problems and inappropriate intervention strategies have been attributed to the unnecessary multiplication of visual impairments globally (WHO, 2006). Visual problems

are experienced as mild visual losses or visual deviations which if not checked can progress to visual impairments. Signs of visual problems among school children include holding book close when reading, omission of letters and words when reading, frequent blinking of eyes, following line with finger when reading, unwillingness to engage in reading tasks, tendency to move near or away from light, difficulty in reading from the chalkboard, screwing up face or frown when trying to see, moving the head when reading instead of the eyes, complaining of blurred or double vision and complaining of eye strain or headache when reading. Visual screening programmes have been recommended as a prerequisite towards prevention of visual loss in children [ICEVI (2010), American Academy of Ophthalmology (2007), Sight Savers International (2005)]. Since visual cues are key to how children learn and function, visual problems can have a negative effect on learning, and thus affect all other aspects of a child' s development by potentially limiting the range and types of information and experiences the child processes (Kingo & Ndawi, 2009). Studies have documented that early identification of visual problems decreases the risk of developing visual impairment (Marshal, Meetz & Harmon, 2007; Roch-Levecq, Brody & Thomas, 2008).

The major challenges in preventing visual impairment in Africa is mainly delayed detection, lack of awareness about early signs of visual impairment and their potential effects at personal, family, school as well as community level; non-availability of services for visual testing, and misconceptions about visual problems (Barbara, 2010 and Ira, 2008). According to International Council for Education of People with Visual Impairments (ICEVI, 2005), millions of school children remain at risk of visual loss due to under-identification. Delayed identification and management of visual problems may impede the child's ability to adapt in school, family and community (Schaumburg, 1996 and Foster and Gilbert, 2001, PAVE, 2000).

Through the Kenya Special Needs Education Policy, the government has committed itself towards re-examining the existing physical facilities, curriculum, instructional materials and teacher preparation to ensure that all learners with visual impairments are supported (Ministry of Education, 2009). Every child with visual problems is entitled to receive required school support and interventions so that they may learn (Hoffman, 2006, Heward, 2005 and Crissy, 2009). Modification of the classroom environment, the curriculum and the teacher's instructional behaviours are important measures to be considered. This may involve the use of modified instructional techniques, more flexible administrative practices, modified academic requirements, or provide modified or alternative educational processes (Baraga & Erin, 1992).
Kenya has a population of 9.4 million children in primary schools (GoK, 2010). As a result, teachers need to be well equipped with the relevant knowledge and skills of dealing with learners with all kinds of disabilities. Currently special education teachers are being trained for degree courses in some universities and for diploma courses at Kenya Institute of Special Education (KISE). Despite this, there is insufficient number of trained special education teachers to meet the capacity in public primary schools (Republic of Kenya, 2003). Teachers require special education training to acquire the necessary knowledge and skills to successfully identify children with visual problems (Hoffman, 2006). Most school districts in developed countries conduct some form of developmental screening before children enter school (American Optometric Association, 2006). Thorough eye and visual examinations during the preschool years, and

consistently through the school years is the most effective approach to early detection of visual problems in children (Groffman, 2006).

Learners with visual impairment have unique educational needs and require specialized instructions from teachers who have expertise in addressing visual disabilities and specific needs (Heward 2006). According to Kluwin (1996), a great deal of informal assessment of visual problems should be completed by the school personnel. Teachers and other school personnel should note behaviours that might indicate a vision loss or any change in the vision of the child. However, for the teachers to be able to perform this kind of assessment, they need to be made aware of the behaviours to look out for (Flax, 2006 & Borsting, 2006). Children with visual problems form a heterogeneous group. The visual problems impact the level and type of special education support they need in order to function to their full capabilities. Teachers should be made aware of the classroom and environmental adaptations to cater for the learners' visual needs. This can be done through seminars and special education programs. In Kenya, the Kenya Institute of Curriculum Development (KICD) is mandated to develop relevant curriculum and support materials for use by learners with special needs. Providing the right kind of support, along with good interventions, can ensure success in the life of a child with visual problems (Alberta, 2006).

Parents are often the first to suspect that their child may have visual problem (American Optometric Association, 2006). There should be no delay in seeking for appropriate assessment, correction and interventions (Elbaum, 2005). Communication with education professionals about the diagnosis, proposed management plan, and expected outcomes should be initiated. Other education and health care professionals should be informed about the presence and nature of the vision problems and their relationship to extant learning difficulties (Cotter, 2006). Interdisciplinary communication, consultation, and referral are vital for the most effective management of the individual with vision problems (Scheer, 2003 and Groffman, 2006).

Objectives of the Study

- To determine the teachers' level of training in special education.
- To find out the challenges teachers faced in identifying learners with visual problems.
- To make recommendations for identification and support of children with visual problems.

Methodology

The study was conducted in twelve sampled schools in Kiambu, Murangá and Kirinyaga counties of Central Kenya. Questionnaires consisting open ended and closed ended questions and observation schedules were used. The sample of the study comprised thirty six (36) teachers. Data analyses were mainly descriptive, using statistical tables.

Findings and Discussion

Teachers' level of training in Special education

Teachers were asked to indicate their level of training in special education in the area of Visual Impairment (VI). The results are presented in Table 1.

Table 1: Teachers' level of training in Special education (n=36)

Special Education Qualification	Frequency	%
Masters in Visual Impairments	0	0
Degree in Visual Impairments	1	2.8
Diploma in Visual Impairments	0	0
Certificate in Visual Impairments	0	0
Other special Ed. Training	7	19.4
No special Ed. Training	28	77.8

Table 1 show that only one teacher (3%) had trained up to the degree level in the area of Visual Impairments. A very significant number of teachers (78%) had not undertaken any special education training. Training in special education is necessary for effective identification and teaching of learners with special needs. For this study, training in visual impairments was crucial for the teacher to be able to meet the needs of learners with visual problems effectively.

The results of this study showed that majority of the teachers had not trained in special education. To make it worse, the only one who had trained in visual impairments was not very confident about his training and expressed inadequacy in identifying and addressing visual problems in learners. Most respondents felt that low level of professional preparedness hindered them from appropriately identifying and supporting learners with visual problems. Teachers who have adequate knowledge and skills about visual impairments stand a better chance of identifying and supporting children with visual problems as opposed to those without (Hunt & Marshall, 2002). This study exposed a dire need for special education teachers in public primary schools. Special education training equips teachers with the relevant knowledge and skills to meet the unique needs of learners with specific disabilities (Bailey, 2006 & Marge, 2010). Information required by the teachers should include curriculum, environmental and classroom adaptations, referrals and placement. The benefits of training teachers in special needs education has been emphasized by several authors (Groffman, 2006 & Flax, 2006, Criss, 2009 & Zindi, 1997).

Challenges faced by teachers in identifying learners with Visual Problems

The teachers were asked whether they were able to identify visual problems in learners easily. They hesitatingly mentioned some of the eye related problems they noticed among children as: tearing eyes, red eyes, painful eyes, close reading, not seeing chalkboard clearly, itchy eyes and squinted eyes. According to them, these problems were just allergies and nothing of special concern. Nine teachers (25%) said that it was very difficult to identify learners with visual problems; twenty-four teachers (67%) thought it was moderately difficult while three teachers (8%) thought that it was easy. The findings indicated the need for teacher sensitization about visual problems and the necessity for early identification and interventions. When the teachers were asked to give their opinions why they found it difficult or moderately difficult to identify visual problems, twenty-eight teachers (78%) cited lack of knowledge and skills about visual problems as the major reason. Four teachers (11%) said that most visual problems were subtle and not easily identifiable while four teachers (11%) argued that the visual cues presented with other ailments making it difficult to distinguish them as unique. Foster and Gilbert (2001) posited that teachers are usually unaware of children's visual problems because they mistake them for other similar ailments.

Teachers' lack of knowledge and skills about visual problems was greatly attributed to lack of training in the area of visual impairments. In all the twelve schools involved in the study, none had organized special education training for their teachers. In- training courses in special education are necessary in equipping teachers with the necessary knowledge and skills of identifying and supporting learners with visual problems and other special needs. However, most schools do not give priority to special needs and other times, the trainings are hampered by prohibitive costs (KIE, 2010). In this study, only one teacher (3%) said that he had attended a seminar on teaching learners with visual impairment while 35(97%) said they had not attended workshops on teaching of learners with visual impairment. Attendance of special education seminars equips teachers with necessary knowledge and skills for identifying and supporting learners with visual problems and visual impairments. Lerner (2006) postulated that teachers who lack special education knowledge held unhelpful preconceptions about people with disabilities and discriminated them. In this study, fourteen teachers (38%) reported a stigmatizing trend of labeling children using the visual signs they observed in them which had a negative effect on the self-esteem of the affected children.

Another challenge identified was uninvolved parents of children with visual problems. Regretfully, no parent had reported any visual problem experienced by their child to the teachers. Three teachers (8%) had made effort to reach out to the parents regarding their children visual concern but the parents never responded. Teachers who focus only on classroom practices fails to harness parents' potential to contribute in supporting children with visual problems (Swamson, 2006). Parents sometimes deny or do not inform the school about their child's disability/ problem. This creates problems of a sensitive nature for teachers and schools. Parent participation is needed in the child's identification, support arrangements and interventions. The family of a child probably knows more about the child's abilities, deficits, style of learning and personal qualities than anyone else (Thomson, 2005). Teachers need to encourage parent

participation energetically and also listen positively to parents views for the benefit of the child with the visual problems.

Teachers suggested the need for visits to schools by collaborators like teachers trained in special education and other health professionals to help in screening children at high risk. However, trained special education teachers and ancillary support staff are insufficient to cater for all the special needs of children in schools (MoE, 2009).

Teachers complained of big class sizes which compromised individualized attention to learners needs. It is obvious that if a teacher is required to provide teaching to a large group of learners, it is going to create greater demands in the teacher's ability to notice any special problem the child could be experiencing. The respondents also cited lack of school visual screening services and programs. In this study, none of the participating schools had ever practiced school visual screening for learners. These findings were similar to those by Smeeth (2000) which related unidentified visual problems to lack of visual screening.

Conclusion

In this study, teachers experienced various challenges in identifying children with visual problems. It is evident that lack of the necessary special education knowledge and skills was the major impediment. Furthermore, none of the schools had embraced school visual screening for the learners and hence, screening for visual problems was inaccessible.

Recommendations

Based on the findings of this study, the following recommendations were made aimed at enhancing early identification and support of children with visual problems.

Every school child should have a routine eye examination through school visual screening programs which can be advanced by the Ministry of Education (MoE). Comprehensive eye and visual examinations should be made mandatory for all children entering school and, regularly throughout their school years. This will ensure healthy eyes, early identification of those with visual problems for appropriate interventions and consequently, prevention of visual impairments.

Collaboration and coordinated efforts between the teachers, parents and children with signs of visual problems should be enhanced. At the same time, parents and guardians ought to pay close attention to their children so as to notice any visual problems early enough. This way, teachers and parents will work together in addressing the visual problems. Simultaneously, teachers should make an effort to promote cooperation and openness between school children and their parents. This can be enhanced through school meetings and individual child clinics when teachers, parents and the children meet to discuss all issues revolving around the child.

There should be continuous in- servicing training for teachers in public primary schools. This can be done through special education seminars and workshops which can be organized by the schools or the Ministry of Education. In-servicing courses equip teachers with up- to- date knowledge and skills on early identification and support of children with special needs as well as motivate them to become more vigilant

to children's special needs. Conversely, the teachers should enroll themselves for special education programmes and desist from wholly relying on free and sponsored government initiatives which are sometimes delayed.

The teachers ought to be more observant and proactive in noticing unusual visual characteristics in children. When these children are identified, the teachers should come up with the relevant special education interventions, follow up to ensure that they receive the necessary visual assessments through Educational Assessment and Resource Centres (EARCs) and support them in accessing specialized medical check-ups, operations or treatment.

The Kenyan government through KICD (Kenya Institute of Curriculum Development) should ensure that all EARCs have all the resources, facilities and equipments needed for assessing children with all categories of special needs. Concurrently, the Teachers Service Commission (TSC) should post trained special education personnel to be in charge of EARCs for effective assessment, identification and placement of children with visual problems and other special needs.

References

Bailey, R., Indian R., Zhang X, Geiss L., Duenas M., & Saaddine J. (2006). Visual impairment and eye care among older adults—five states, *MMWR* ;55(49):1321–1325.

Barbara, Y. (2010). Barriers to seeking care following vision screening. *Journal of School Health*, 68, 319-324.

Barraga, C., & Erin, J. (1992). *Visual handicaps and learning.* Austin, X: PRO-ED.

Borsting, E. (2006). *Overview of vision efficiency and visual processing development.* St. Louis: Mosby-Elsevier.

Cotter, S. (2006). *Optometric assessment: case history*. St. Louis, MO: Mosby- Elsevier.

Crissy, D. (2009). *Children with undetected visual problems.* United Kingdom: Karen Sparrow.

Elbaum, B. (2005). *Self-concept and students with learning disabilities.* New York, NY: Guilford Press.

Flax, N. (2006). *The Relationship between Vision and Learning: General Issues.* St. Louis, MO: Mosby-Elsevier.

Foster, A. & Gilbert, C. (2001). Childhood blindness in the context of vision 2020: The right to sight. *Bulletin of the World Health Organisation.* 79, 227-32.

GoK, (2004). *Persons with Disabilities*. Government Printers: Nairobi, Kenya.

GoK, (2010). *Constitution of the Republic of Kenya.* Government Printers: Nairobi, Kenya.

Groffman, S. (2006). *The relationship between Visual Perception and Learning*. St Louis MO: Mosby-Elsevier.

Heward W.L (2006).Exceptional children: an introduction to special education. N. J.

Heward, W. (2005). *Exceptional Children (8th ed): An Introduction to Special Education*. Prentice Hall, New Jersey: Columbus.

Hoffman, L. G. (2006). *The role of optometrist in the management of learning related visual problems.* St. Louis: Mosby- Elsevier.

Hunt, N. & Marshal, K. (2002). *Exceptional children and youth.* Boston: Houghton Mifflin Company.

ICEVI, (2005). *Report of the 4th Workshop on training of teachers of visual impairments*. Budapest: Hungary.

ICEVI, (2005). *Report of the 4th Workshop on training of teachers of visual impairments*. Budapest: Hungary.

IDEA, (1998). *The Eric clearinghouse on disability and gifted children.* Htt://www.ericec.org/ digests/e560.html. Retrieved on 21st July 2010.

Ira, O. (2008). *Educating the Educators.* State university of New York, College of Optometry. New York: USA.

Ira, O. (2008). *Educating the Educators.* State university of New York, College of Optometry. New York: USA.

KIE, (2010). *United States International Development Project*. Nairobi: USAID.

Kingo, A. & Ndawi, B. (2009). Prevalence and causes of low vision among school children in Kibaha District, Tanzania. *Tanzania Journal of Health Research,* 11, 111-115.

Krumholtz, A. (2004). *Educating the educators: Increasing grade school teachers ability to detect vision problems.* State University of New York, College of Optometry. New York: USA.

Lerner, J. (2005). *Learning disabilities and related disorders: characteristics and teaching strategies*. Boston, MA: Houghton Mifflin.

Marge, C. (2010). A clear vision for equity and opportunity. *Journal of Optometry,* 85,48-58.

Marshal, E., Meetz. M. & Harmon, I. (2010). Through our children's eyes: Impact of Vision Screening requirements for Indiana School- Children. *Optometry,* 80, 71- 82.

MoE, (2009). *The National Special Needs Education Policy Framework.* Government Printers: Nairobi, Kenya. Mwangi S. W. (2016). Early detection of warning signs of Visual Impairment among children in Primary schools, Kenya. *British Journal of Education, Society and Behavioural science: 18(1): 1-7, 2016, Article No. BJESBS.28368. ISSN:2278-0998*

Mwangi S. W. (2011). *Moving Towards Braille Literacy: Braille Learning in Kenyan Schools.* Verlag: VDM Verlag Dr. Muller GmbH & Co. KG

P.A.V.E. (1996). *Vision checklist: Self Assessment List.* Santa Ana: Optometric Extension Program Foundation, Inc.

Republic of Kenya. (2003). Taskforce Report on implementation of Free Primary Education. Jomo Kenyatta foundation. Nairobi. Kenya.

Sight Savers International. (2005). *Children who are blind or have low vision.* http://www.sightsavers.org/in_depth/policy_and_rese; Retrieved 20/12/12

Smeeth, L. (2000). Effectiveness of screening for impaired vision in a community setting. *Brtitish Journal ophthalmol.* 28:660-663.

Smeeth, L. (2000). Effectiveness of screening for impaired vision in a community setting. *Brtitish Journal ophthalmol.* 28:660-663.

Thomson, J. (2005). *Vision influences on reading and writing disabilities.* New York: Guilford Press.

WHO. (2006). *Sight test and glasses improve life of people with poor vision.* Geneva: Switzerland.

WHO. (2009). *Action Plan for the Prevention of Avoidable Blindness and Visual Impairment, 2009-2013.* Geneva: WHO.

WHO. (2012). *World Report on Visual Impairments.* Geneva: WHO/World Bank.

Zindi, F. (1997). *Special education in Africa.* Botswana: Tasalls Publishing.

The advent of Islamic microfinance in Senegal

Massamba Souleymane SECK[8]
PhD student in Economics and Social Sciences
Doctoral School of Sustainable Development and Society (ED2DS) of the University of THIES / Senegal.

Abdoulaye BIAYE[9]
Economist, Specialist in Value Chains in the Program of Development of Islamic Microfinance in Senegal (PROMISE).
Ministry of Solidarity Economy and Microfinance / Senegal

Abstract

In Senegal, as elsewhere in the WAEMU zone, access to credit for vulnerable micro entrepreneurs is a major concern despite the important role of traditional microfinance institutions. To effectively solve this problem, Islamic microfinance has been identified as an alternative offer, alongside conventional finance in order to give access to bank accounts to those underprivileged people that have not been sufficiently served by financial institutions. Thus, this article aims to study the advent of Islamic microfinance in Senegal. To do this, our research focuses on the history and role of the State of Senegal in the promotion of Islamic microfinance to finally present the characteristics of this new funding model for vulnerable populations often excluded from the traditional financial system.

Key-words: Classical microfinance, Islamic microfinance, vulnerable micro entrepreneurs

J.E.L classification: G20, G21, G23

1. Introduction

The practice of microfinance intermediation has been largely explained by the inability of the banking industry to respond effectively to the financing needs of vulnerable groups (Hugon, 1996). In this sense, microfinance institutions are considered as a financial alternative (Lelart, 2002, Barboza and Barreto, 2006), if not an additional complement of banking institutions in the Senegalese financial system. The objective of microfinance institutions (MFIs) is to seek to take into account the needs of vulnerable micro entrepreneurs through access to credit while diversifying their offer (Labie, 2009).

In Senegal, the evolution of the microfinance sector has made it possible, through creditfocused initiatives to embrace a wide range of financial services in order to achieve a more inclusive financial intermediation system service of those excluded from the conventional banking system with a view to giving them a chance

[8] masseseck798@yahoo.fr or massambas.seck@univ-thies.sn

[9] biayeabdoulaye@gmail.com or abdoulaye.biaye@univ-thies.sn

to participate in the creation of wealth. In line with this principle, MFIs are committed to provide low-income segments of the population and micro entrepreneurs with opportunities to engage in productive activities and / or expand their business through regular access to microcredit. The latter is subject to purely conventional requirements (high interest rates, joint guarantee and guarantee ...).

According to recent data, the Senegalese microfinance sector has a total credit outstanding and a total volume of deposits respectively of 333 and 300 billion CFA francs for a clientele of 2,710,263 customers including 1,087,457 women, 1,418,949 men and 250,637 legal entities (DRS-SFD, 2017). These performances are considerable to make it clear that microfinance structures are real effective instruments for reducing poverty. However, although many poor people have seen their living conditions improved in recent decades thanks to the products and services of traditional MFIs, the high interest rates due to the cost structure associated with low credit amounts, guarantee were decried by the actors.

It is in this context that some authors have already begun to reflect on Islamic microfinance and its practicability within the Senegalese financial system. This new funding model for vulnerable populations abstains from any practices that do not conform to Sharia[10] law. In other words, Islamic microfinance offers a range of products whose object is to prevent against events that may constitute a threat or risk identified in advance and according to terms and conditions defined in advance.

Thus, its terms and conditions are more favorable and more accessible to vulnerable entrepreneurs and marginalized by the traditional financial system. On the other hand, Islamic microfinance presents a distinct model from that of traditional MFIs and an intermediation approach in which the lessor is also involved in sharing risks, losses and profits. It is also transparent in order to protect the social well-being of low-income clients.

The purpose of this article is to focus on the advent of Islamic microfinance and the main products and services it proposes for use by poor and resource-poor micro entrepreneurs. The article is divided into four parts. The first part is devoted to the history of microfinance in Senegal. The second part is to the promotion of Islamic microfinance: what role for the State of Senegal? The third part deals with the characteristics of Islamic microfinance and the fourth and final one will focus on the conclusion.

2. Historical background of microfinance in Senegal

Adapted to the needs of poor people in the margins of the traditional banking system, microfinance is a micro scale finance, which has considerably questioned the value judgment worn for ages, the insolvency of poor agents and low-income. For a long time, microfinance activities have been conducted by groups of people offering informally credit and accepting savings from vulnerable agents carrying out activities.

To this end, microfinance refers to a set of schemes that offer a range of financial services (microcredit, savings, micro insurance, transfer of funds, etc.) to poor families (Prescott, 1997), who are often excluded from the banking world for lack of tangible guarantees.

[10] Sharia is the Muslim canon law governing religious, political, social and individual life.

Microcredit was created in the 1970s with the creation of Grameen Bank in Bangladesh in 1976.This bank whose mission was to grant microcredit to poor women entrepreneurs is considered the starting point for microfinance modern. The idea of such a financial innovation, serving vulnerable people, was initiated by Professor Mohamed Yunus, the official founder of the Grameen Bank, which made microcredit popular with media impact.

Indeed, Professor Yunus has revealed to the world that it is possible and profitable to lend to vulnerable people because with the loan based on joint surety, problems related to asymmetric information and the likelihood of default are minimal.

In Senegal, microfinance was born in the mid-1980s in a context favorably linked to the achievement of the main social objectives through microfinance: poverty reduction, promotion to business creation, the diversification of enterprises and the social reinforcement of marginalized groups because of lack of wealth (Boye, Hajdenberg and Poursat, 2006).

It is clear from this observation that the arrival of microfinance in Senegal (1980-1984) coincided with the period of poor economic conditions characterized by a low economic growth rate of around 1.8%. In fact, the development models previously established by the State of Senegal, had not borne fruit on the population centered in their majority towards agriculture. Thus, on the initiative of such facts, the microfinance initiatives aimed at this population previously served by the traditional risky banks constituted a real hope for the financing of micro entrepreneurs' activities.

The first Microfinance Institutions (MFIs) created were created in the 1970s as microcredit experiments initiated by the National Council for the Promotion of Savings and Credit Unions (CONACAP) in the regions of Thies and Louga.

Other microcredit savings and loan credit union experiments were subsequently set up between 1985 and 1988 in Kaolack region with the help of technical and financial development partners. In addition, the emergence of the microfinance sector in Senegal also coincided with the withdrawal of the Senegalese state in some areas followed by the disappearance of the majority of the state bodies supporting and supervising the rural population whose level of precariousness was very high. This socio-economic situation, which is very unfavorable to the rural world, was certainly aggravated by the national banking crisis, which resulted in the closure of the public development banks (BNDS, BSK, SONA Banks, USB, etc.) whose mission was to increase the supply of finance to the economy in the hope of raising the productivity income and financial inclusion of marginalized small farmers.

Unfortunately, these development banks have failed for most of them and their closure in the period (1990-2000) was followed by the liberalization of the Senegalese banking sector and correlatively the extension of the microfinance sector (Nagarajan and Meyer, 2005).

Therefore it appears that in the early 1990s, the term microfinance began timidly to supplant that of microcredit to describe a wide range of financial services for the most vulnerable including savings, micro insurance money etc.

Despite the proven performance of traditional MFIs, the recurring problems of under-financing the economy remain. Thus, in 1993 on the initiative of the Association of Students and Muslim Students of Senegal (AMEES), the Mutual Savings and Islamic Credit of Senegal (MECIS) was created marking the

beginning of Islamic microfinance in Senegal. In this momentum, the Department of Islamic Finance (DEFI) was formally set up on 30 July 2011 by UM-PAMECAS to exploit this alternative financing offer. The beginnings of Islamic microfinance in Senegal coincided somewhat with the subprime crisis of 2007, which had adverse effects on the banking environment of sub-Saharan African countries such as Senegal. These constraints reduce the access of vulnerable groups to fund and explain among other things the choice of public authorities in relation with certain public and private partners notably the IDB to initiate several projects and programs (PALAM, FNPEF / PADEF- EJ, PDESOC, PADES, Bouchra SA) to promote the development of products and services of Islamic microfinance.

Since its first experiences, it is indisputable that Islamic microfinance has begun to interest the actors of conventional finance and the government of Senegal. Despite its potential for development, Islamic microfinance remains little explored and currently represents a market that most poor people do not understand. Currently, in Senegal only 6.3% of households are familiar with Islamic finance (ESRIF, 2017). It is in this particular context that has attracted increasing interest among decision-makers notably the Central Bank of West African States (CBWAS) and the WAMU states to create favorable conditions for the development of this new model financing and deepen the level of financial inclusion of the population.

3. Promoting Islamic Microfinance: What Role for the State of Senegal?

In its policy to support economic growth, fight effectively against household poverty and job creation, the State of Senegal is largely committed to widen the access of vulnerable groups to financial services through the deepening and diversification of the microfinance sector's offer. Despite the notorious performance of microfinance institutions, the exorbitant costs of their services, including interest rates, have often been decried by low-income populations and some policy makers.

Concerning the situation, a regular and legal system allowing actors to lead Islamic microfinance activities is also available in the Central African Bank of Western States (CABWS).

The system is based on instructions and community law and aims to define the different conditions for the exercise of Islamic microfinance activities within the West African Monetary Union (WAMU). For this purpose, Article 3 of Instruction N ° 002-03-2018, defines the scope of Islamic microfinance, which may be applied by all credit institutions, complying on a global or partial basis in their operations, the principles and rules of Islamic finance.

It is also important to note that the motivations of public and private actors in Islamic microfinance are also largely explained by the highest demand of the large number of Muslims seeking Sharia-compliant financial services. In addition, there is the competitive nature of Islamic products and services, which are increasingly attracting vulnerable investors more specifically SMEs, on the fringe of the traditional financial sector.

Indeed, Senegal has set up with the support of the Islamic Development Bank (IDB) a range of projects whose main mission is to promote Islamic finance in particular Islamic microfinance at the service of the poor population.

As an illustration, the State of Senegal has established through the Ministry of Women, Family and Gender, the Support Project for the Development of Female Entrepreneurship and Youth Employment (PADEF-

EJ). The main mission of this project is to enable women and young entrepreneurs to have the opportunity to access finance to develop income-generating activities, with a financing line of 4 billion supported by the IDB.

In addition to this project, there is the Literacy and Apprenticeship Program for Poverty Alleviation (PALAM / IDB / SEN). This program is based in fact on the promotion of endogenous know-how, through the equitable access of rural youth and women workers to qualifying training programs and to Islamic microfinance favoring self-development. The Livestock Development Project in Eastern Senegal and Upper Casamance (PDESOC). The project to create a public limited company for Islamic microfinance (Bouchra SA) supported by UM-PAMECAS, the State of Senegal and private partners such as the IDB, etc.

In addition, in order to consolidate its programs and to have a favorable framework for the development of Islamic microfinance, a framework agreement was signed between the State of Senegal and the IDB, creating the National Development Program of the Islamic Microfinance in Senegal (PROMISE).

Like other programs, it is in full compliance with certain orientations of the Emerging Senegal Plan (ESP)[11] particularly the promotion of Islamic finance, which has so far been underutilized, the widening of financial inclusion to the benefit of poor, support and financing of SMEs. To this end, the main objective of the program is to contribute to the socio-economic development of Senegal through the financial inclusion of SMEs. This financial inclusion for SMEs would result in more jobs and social advancement for vulnerable groups. According to the expected results, 50 000 microentrepreneurs could benefit from this financing. This would create 25,000 new jobs by 2022 (Promise, 2018).

This innovative mechanism is part of the principles of sharia law and is an attractive source of funding for people and businesses outside the traditional financial sector.

4. Characteristics of Islamic microfinance

MFIs have played a crucial role in engaging the financial inclusion of the poor while promoting the spirit of entrepreneurship especially in underdeveloped countries (Dupas and Robinson, 2013). It is in such context that we consider it necessary to study Islamic microfinance. Indeed, Islamic microfinance is defined as the provision of financial services in accordance with Islamic law for the moderately poor and excluded from the conventional financial system in order to promote the financial inclusion of the latter.

It aims to ensure the well-being of the disadvantaged population with the help of a new intermediation whose basic principle is to promote harmony and social solidarity.

[11] The Senegal Emergent Plan (PSE) is a program that was set up by the Government of Senegal whose horizon is set at 2035. The PSE in the perspective of boosting the Senegalese economy is based on a set of structural projects to high value-added content and job promotion. For that it is declined in three strategic axes of which:

✓ Structural transformation of the economy and growth; ✓ Human capital, social protection and sustainable development; ✓ Governance, institutions, peace and security.

This new funding model abstains from practices related to the negative principles [5]prohibited by sharia law and favors in its financing the adaptation to positive principles[6]. In this context, the returns and profits from the project are dictated by tangible assets or identifiable services as opposed to speculation and receivables as in conventional finance. For these reasons, the financing conditions of Islamic microfinance make it more accessible and more beneficial for vulnerable entrepreneurs. This explains the impressive growth of this new funding model. The specificity of Islamic microfinance allows us to distinguish two models characterizing the financing offer of Islamic microfinance institutions (IMFI):

4.1. Non-profit Islamic microfinance model

Charities are one of the pillars of Islam. Muslim law on all Muslims and business carrying out income-generating activities imposes them.

For example, Zakat or compulsory charity requires an obligation on every Muslim to pay an annual amount of 2.5% of all wealth held.

In addition, IMFIs can use non-compulsory forms of charity in their funding policies to help to eradicate poverty. ‘’Al Waqf’’’ is a "*Sadaqa Jarriya*" that can be defined as "*the possession of a property, converted from private property into social property, and the usufruct of the generated income is allocated to defined beneficiaries*".

---

5 The negative principles of sharia are:

• Prohibition of the use of Interest and Wear (Riba);

• Prohibition of uncertainty (Gharar) and speculation (Maysir);

• More general prohibition of all that illicit such as Alcohol, speculation, Gambling and so on.

6 Positive Principles:

• Sharing of risks, losses and profits;

• Backing of any financial transaction to a tangible asset.

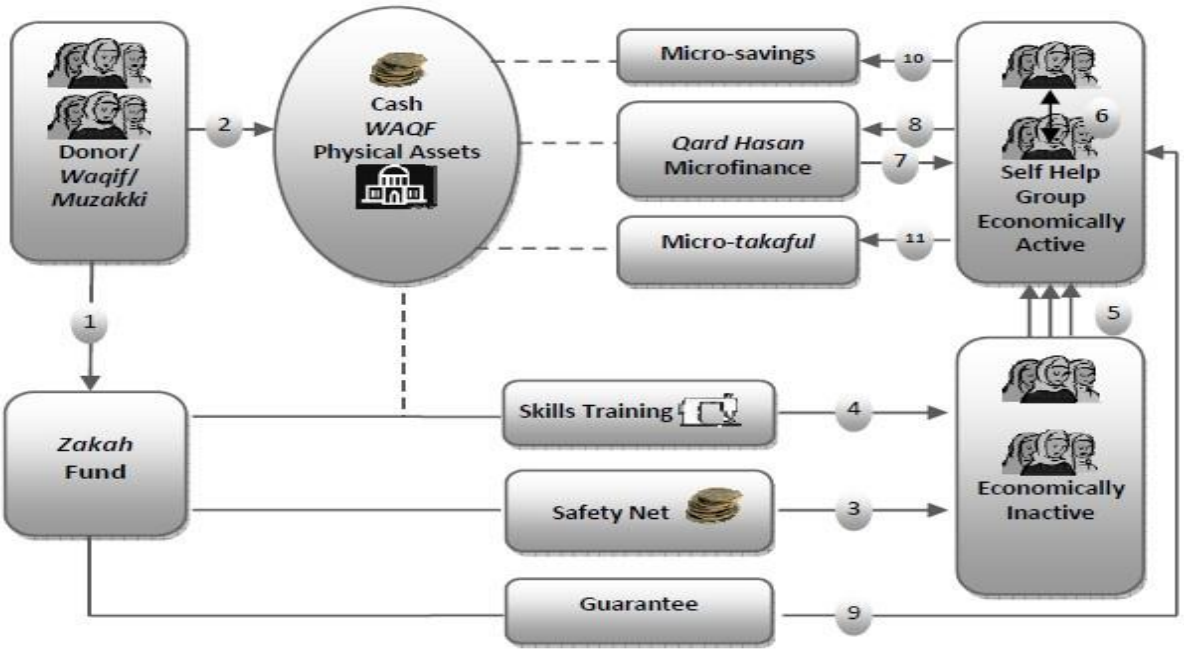
Thus, the “Waqf ‘’is the immobilization of a movable or immovable property an annuity or a service for the cause of God. This expression " for the cause of God " covers all charitable action aimed at improving the living conditions of the citizens as well as at meeting their needs in terms of infrastructure, health, education, education and training drinking water, roads, etc.

Added to this, there are other types of charity such as the Sadaqa Jaria, which is a continual charity, and the’’ Qard Hassan’’, which is the only product of Islamic finance which is to lend money to the poor entrepreneur without margin. The latter is a volunteer contract. Qard Hassan financing is a financing granted free of charge by the bank which receives no remuneration from the beneficiary. The only obligation of the customer is to repay at maturity, the amount of capital that has been lent to him.

When the lender asks for the amount he has lent to the borrowing client, he must immediately repay the amount without a profit margin. Qard Hassan was the base of Islamic microfinance during its early stages in Egypt.

Thus, in the context of Senegal, where poverty continues to plague the economy, these forms of charity offered by Islamic microfinance can play a key role in the fight against the financial exclusion of microentrepreneurs and participate in the promotion of poverty entrepreneurship of these.

Figure 1: Islamic Non-Profit Microfinance



Source: OBAIDULLA Mohammed, 2008, « Introduction to Islamic Microfinance », IBF Net, New Delhi, P.52.

This chart shows the different forms of charity that can be used in the practice of non-profit Islamic microfinance.

In view of this pattern we can emphasize that the interactions between different charities and active and inactive populations illustrate an Islamic microfinance model differ from the classical one. In explicit terms, donor Zakat funds are managed by Islamic microfinance institutions.

In addition, another body created by the Islamic microfinance structure deals with the endowment of other charities such as Waqf and Sadaka in the form of tangible assets (for example the training of poor microentrepreneurs selected by the Islamic microfinance structure). or monetary assets (for use of the Islamic product such as Qard Hassan). In addition, some capacity-building programs may be offered to poor inactive people seeking employment or income-generating business activities but lacking tools or investment funds. To facilitate and provide these training courses, IMFI can implement the Waqf.

4.2. For-profit Islamic microfinance model

The Quran is the first reference book of Islam in solving all problems. He explicitly and categorically forbids ‘’Riba’’; payment and receipt of interest represent a form of ‘’Riba’’. Because of this ban, many long-term poor Muslims are excluded from the formal financial system.

This means that those who have a surplus of funds will not put their savings surplus in these conventional banks that operate on the basis of the interest rate.

Similarly, those among them who have economically viable projects approved by Islamic law (Shari'a) will also not approach these traditional banks to find financing. The adverse effects of such attitudes on national income and productive activities are considerable.

The presence of Islamic microfinance institutions that offer alternative and Shariah compliant products would help address this problem. It is clear that the regulatory reform in France that allowed the introduction of sharia-compliant financial products was motivated by the opportunity that Islamic finance represents in increasing the wealth of their economy. In addition to the positive effect that Islamic microfinance has on the promotion of a seine economy, the diversification of the financing products it offers to the poor is a good method of managing the risks faced by lenders (asymmetry of information, credit risks, operational risks, legal risks ...).

Another source of stability for Islamic microfinance lies in the sharia provisions that make speculative activities difficult to conduct. In fact, IMFI's products are characterized by their performance linked to the connectivity between the financial sector and the real sector of the economy.

It is in this wake that Islamic microfinance institutions can develop a win-win partnership relationship with clients. Thus, it is almost impossible to imagine with such products that Islamic microfinance uses that a bubble as we saw during the subprime crisis of 2007, cannot occur.

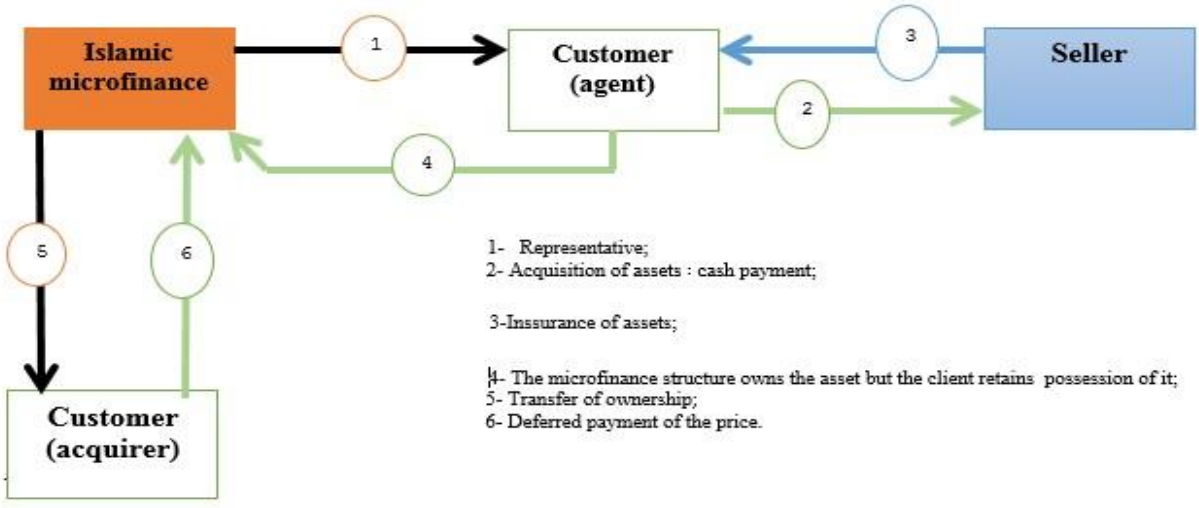
This is why recently and especially after the consequences of the latter, that some financial entities including the IDB and the State of Senegal have committed to expand the financial system by facilitating access to Islamic microfinance products. Briefly presented, here are some of the benefits that Islamic for-profit microfinance products could bring to Senegal's economy. Indeed, in line with Islamic law, all operations or financing products of Islamic microfinance must be backed by real asset or Asset Backing held by IMFI. This obligation strengthens the potential for stability and control of different types of risks.

This is why Islamic microfinance financing instruments have particular aspects compared to those of conventional microfinance. Thus, among the most well-known financing contracts we can note the contract of sale or purchase, order or partnership between IMFI and entrepreneur engaged in the realization of a common project. For example, we can list funding mechanisms such as:

- Murabaha, which are sales contract, which includes two parties a seller (IMFI) and a buyer (customer). The Islamic microfinance institution buys the goods required by a supplier and resells them to the customer with an increased selling price.

  When the Murabaha contract is signed between the two parties, the repayment period and the installments are specified at the time of signing the contract.

Figure 2: The working principle of Murabaha



Source: Author, based on Murabaha Principe Herbert Smith (2009), the guide to Islamic finance.

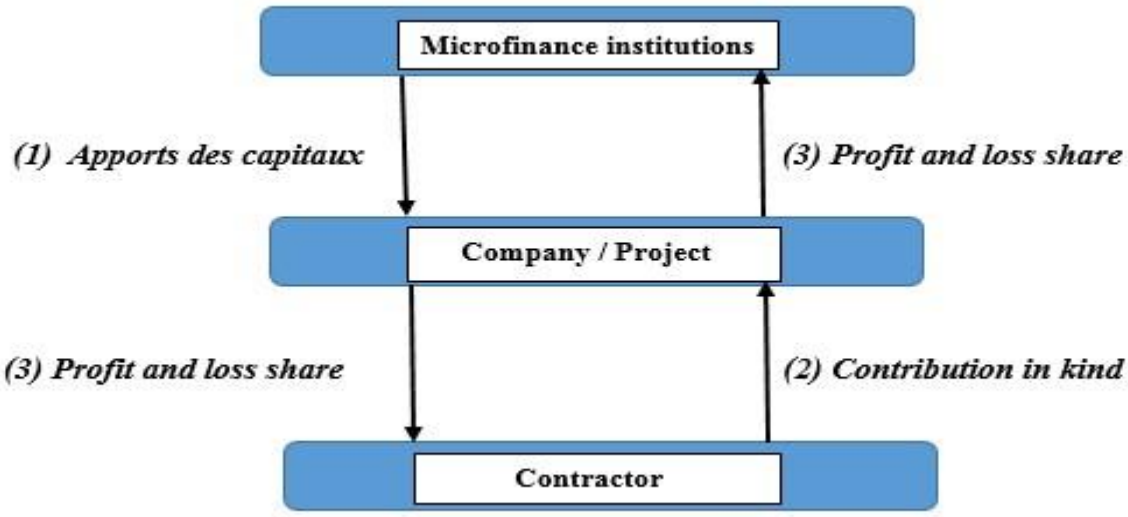
- ''Ijara and istina'': Regarding ijara, it is a means of financing that consists of buying materials or equipment and then transferring the usufruct to the customer, for a period of time according to which he retains and benefits from these equipments.

Unlike ijara, istina is a financing method based on a contract for manufacturing a property or building a real estate. The istina contract stipulates that the IMFI or vendor agrees to provide in a timely manner and at a price required in advance to the customer, the goods, once built. In this case, of contract the goods are specified at the signing of the contract.

There are also other financing mechanisms that Islamic microfinance uses to finance entrepreneurs, these are:

- The Moudharaba, which is a contract allowing the entrepreneur to carry out a project with the help of the investments coming from the Islamic microfinance structure. In this type of contract, any gains or losses incurred will be shared according to a criterion established at the time of signing the contract.
- Finally, we can also mention the contract of Mousharakah which is a contract that binds partners. The latter contribute together both to the capital and the management of the project and entrust to one of them the management for the success of the project.

Figure 3: The operating principle of Mousharakah



Source: Authors

Thus, for the effective use of these Islamic microfinance products, a number of challenges have recently been identified by the (CABWS), with the publication of the new instructions N ° 00203-2018 and N ° 003-03-2018 relating to specific provisions applicable to decentralized financial systems engaged in Islamic finance activity. Such a regulation facilitates the practice and expansion of Islamic finance particularly Islamic microfinance within the financial system of the countries of the West African Monetary Union (WAMU).

5. Conclusion

Islamic microfinance is an innovative financing model that combines the real and financial sphere based on Islamic law (sharia). In this context, we have tried in this article to address the advent of Islamic microfinance in Senegal and the different products that IMFI offers in order to meet the financing needs of poor populations and micro entrepreneurs in search of funding.

This is why the State of Senegal has undertaken initiatives with IDB and CABWS to allow this new financing model, which is aimed mainly at vulnerable entrepreneurs, to take off. Even though Senegal has not yet had a mature and dynamic Islamic microfinance model to address the growing financing needs of vulnerable entrepreneurs, the situation reveals that in-depth studies need to be done in this area.

It emerges from this analysis that, like the Islamic bank, Islamic microfinance structures are necessary complements to conventional ones in order to increase the financial inclusion of the poor since the conventional microfinance credit supply cannot satisfy all demands for credit from vulnerable micro entrepreneurs.

Thus, this additional weight of IMFI in the traditional microfinance sector can also be justified by the opportunities offered by Islamic microfinance products for agents on the margins of the banking sector who do not have the same needs. With a view to developing this sector, which is poorly known by the poor, CABWS has addressed this issue by proposing new instructions to facilitate the practice of microfinance-by-microfinance institutions.

Despite the efforts made, certain difficulties such as the lack of qualified human resources and the heterogeneity of the Islamic financial practices, the inadequacies of the principles and rules of Islamic finance linked to the divergent ideas of the "Shariah Central Board" are constantly gangrene the good practice of this new funding model.

6. Bibliographical references

Barboza, G. AND H. Barreto., 2006 “Learning by Association, Microcredit in Chiapas, Mexico.” Contemporary Economic Policy 24 (2): 316-331.

Department of Regulation and Supervision of Decentralized Financial Systems (DRS-SFD) annual report 2017.

Dupas, P., & Robinson, J. (2013), Savings constraints and microenterprise development: Evidence from a field experiment in Kenya. American Economic Journal: Applied Economics, 5(1), 163–192. https://doi.org/10.1257/app.5.1.163.

Survey of the Financial Inclusion Reference Situation in Senegal (ESRIF), 2017.

Hugon PH., "Uncertainty, precariousness and local financing, the case of African economies", Third World, 1996, No. 145, pp 13-40.

Hugon PH., (1996b), "Innovations in Informal and Semi-Formal Financial Spheres in SubSaharan Africa" Worlds in Development, Volume 24: 94-17.

Labie M. (2009), "Microfinance: Evolution of the Sector, Product Diversification and Governance", Reflections and Perspectives, Vol. 48, No. 3, p. 5-6, August.

Lelart M. (2002) "The evolution of informal finance and its consequences on the evolution of financial systems", Worlds in Development, Volume 30, 119.

Nagarajan G., Meyer R. L. (2005) Rural Finance: Recent Advances and Emerging Lessons, Debates, and Opportunities, Working Paper nº AEDE-WP-0041- 05, Department of Agricultural, Environmental, and Development Economics, The Ohio State University.

Obaidulla M., 2008, « Introduction to Islamic Microfinance », IBF Net, New Delhi, P.40.

Prescott E. S., 1997, « Group Lending and Financial Intermediation: An example », Federal Reserve Bank of Richmond Economic Quarterly, vol. 83.

Smith. H. (2009), "The Guide to Islamic Finance", Financial Markets Collection.

A reflection on Human Rights in the Amazon and the anthropological Other: Looking at *ourselves* through the mirror

Estevão Rafael Fernandes[12]

Abstract

How to realize universal rights in local realities? In order to answer this question, oneself make use of reflections on the anthropological "Other" as a way to deconstruct both speaking and ontological places, as well as the political and epistemological consequences of working human rights in different sociocultural contexts. One conclusion is that the very notion of humanism must be deconstructed. It reflects a system of values that is intended to be universal, taking local cultures as mere contingencies; as well as it takes its place as static, not as process, normalizing practices and domesticating specificities. It also shifts the deviants to the accepted matrix, imposing its own forms of construction of the subject; functions as a historical power device, relegating the alterities to "others," functioning as an instrument of social regulation; is based on the center / periphery dichotomy, reifying it.

Keywords: Human Rights, Amazon, Anthropology, Otherness, Post-Colonialism

Antes de começarmos, um esclarecimento importante. Não necessariamente minha exposição reflete meus posicionamentos, ou dos antropólogos, ou da Antropologia (no singular, se é que isso realmente existe). Meu desafio ao escrever estas linhas será buscar deslocar meu próprio lugar de fala, desconstruindo algumas das categorias aqui expostas. Deixo claro que meus conceitos, como aqueles que buscaremos analisar neste breve ensaio – porque todo texto deve ser considerado um ensaio, enquanto "experimento", mesmo - não devem ser vistos como prontos e acabados, mas enquanto processos, devires, relações. O ponto aqui é suscitar perguntas.

Buscarei traçar algumas provocações sobre o tema dos Direitos Humanos, a partir do olhar da Antropologia, ou dos olhares da Antropologia, do dos olhares das antropologias,... sejamos pois, subjetivos.

Eduardo Viveiros de Castro situa da seguinte forma a Antropologia em entrevista publicada na revista *Sexta-Feira* em 1999 (VIVEIROS DE CASTRO, 2017):

> A antropologia é o estudo das relações sociais de um ponto de vista que não se acha deliberadamente dominado pela experiência e a doutrina ocidentais das relações sociais. Ela tenta pensar a vida social sem se apoiar exclusivamente nessa herança cultural. Se vocês quiserem, a antropologia se distingue na medida em que ela presta atenção ao que as outras sociedades têm a dizer sobre as relações sociais, e não, simplesmente, parte do que a nossa tem a dizer e tenta ver como é que isso que dizemos aqui funciona lá. Trata-se de tentar dialogar para valer, tratar as outras culturas não como objetos de nossa teoria das

[12] Antropólogo, Doutor em Ciências Sociais (Universidade de Brasília, 2015). Professor adjunto do Departamento de Ciências Sociais da Universidade Federal de Rondônia. estevaofernandes@gmail.com

> relações sociais. Para mim, se há alguma diferença entre antropologia e sociologia, seria essa: o objeto do discurso antropológico tende a estar no mesmo plano epistemológico que o sujeito desse discurso.

Na verdade – e aqui sou eu dizendo, não mais Viveiros de Castro – buscar se despir das perspectivas eurocentradas no estudo das relações sociais, entendendo ser o discurso produzido pelo olhar antropológico no mesmo plano epistemológico dos sujeitos pesquisados possui implicações claras sobre a viabilidade de direitos humanos para todos os povos. O dilema é como, afinal, efetivar direitos universais em realidades locais?

A resposta é dada por Humpty Dumpty, personagem de Alice através do espelho, de Lewis Carroll... No capítulo 06 desse livro, Alice encontra Humpty Dumpty que lá pelas tantas tenta convencer Alice de que melhor que ganhar presentes de aniversário (que ocorrem em um só dia do ano), é ganhar presentes de "desaniversário", nos 364 dias restantes... Segue parte do diálogo:

> e isso mostra que há trezentos e sessenta e quatro dias em que você poderia ganhar presentes de desaniversário…"
> "Sem dúvida", disse Alice.
> "E só um para ganhar presentes de aniversário, vê? É a glória para você!"
> "Não sei o que quer dizer com 'glória'", disse Alice.
> Humpty Dumpty sorriu, desdenhoso.
> "Claro que não sabe… até que eu lhe diga. Quero dizer 'é um belo e demolidor argumento para você!'"
> "Mas 'glória' não significa 'um belo e demolidor argumento'", Alice objetou.
> "Quando eu uso uma palavra", disse Humpty Dumpty num tom bastante desdenhoso, "ela significa exatamente o que quero que signifique: nem mais nem menos."
> "A questão é", disse Alice, "se pode fazer as palavras significarem tantas coisas diferentes."
> "A questão", disse Humpty Dumpty, "é saber quem manda — só isto.

De fato, a história nos mostra que a noção de Direitos e mesmo a de Humanidade não podem ser vistos como politicamente neutros. A questão é, justamente, saber quem manda... Exemplos disso são a pesquisa com 400 negros portadores de sífilis no Alabama em 1972; ou os casos de negligência em experiências com Aids em 1997 em 15 países pobres, como Uganda e África, onde mulheres receberam placebo em vez de medicamento, o que fez com que transmitissem o vírus para seus bebês... No Brasil há alguns anos causou horror o caso de comunidades ribeirinhas no Amapá que serviam de cobaias humanas em pesquisas de malária... diariamente eles recebiam entre 12 e 20 reais para receber picadas de 100 mosquitos presos em um copo, colocavam o copo na perna e deixavam o anofelino se servir a vontade de seu sangue... segundo relatos, os insetos ficavam tão saciados de sangue que caíam... O mesmo pode se dizer das pesquisas envolvendo povos indígenas no Brasil nas décadas de 1960 e 70 no Brasil, e da batalha judicial que se seguiu nos últimos anos para que povos indígenas possam, finalmente, reaver o sangue de seus ancestrais, levado sem seu consentimento para instituições de Pesquisa na América do Norte e Europa, em nome da Ciência.

A questão é saber quem manda...

Como sintetiza bem Spock (sim, o orelhudo de *Star Trek*), "a necessidade de muitos supera a necessidade de poucos". Essa frase é de um personagem de ficção mas embasou, por exemplo, uma decisão judicial na Suprema Corte do Texas e parece ainda nortear as políticas de intervenção internacional em conflitos locais e práticas científicas nas quais pobres são quase sempre cobaias humanas e esboça bem a contradição inerente ao liberalismo – e ato continuo, a declaração de direitos humanos enquanto algo universalista: o da tensão entre indivíduo e coletividade, intermediada por relações de poder.

Enquanto os Direitos Humanos não colidem com outros direitos, parece não haver problema, mesmo porque a própria noção de Direitos Humanos parece estar assentada numa perspectiva eurocentrada cuja matriz ideológica encontra-se no liberalismo do século XIX e sobre a noção de indivíduo que apenas faz sentido a partir de valores "democráticos" os quais, afinal, não são – nem devem ser – universais.

Se Direitos Humanos é, como sintetiza Hannah Arendt, o Direito a ter direitos, a questão deve ser devidamente desconstruída. Quem reconhece esse direito e baseado em que pressupostos? Quem reconhece quem reconhece Direitos? Há, afinal, um valor humanista a priori universal que une todos os povos? Se sim, como explicar a tendência de grupos minoritários a buscarem não mais o reconhecimento da diversidade, mas da diferença?

Como escreve o sociólogo Richard Miskolci (2012):

> as demandas sociais são de reconhecimento da diferença, mas o filtro político as traduz na linguagem da tolerância da diversidade. Tolerar é muito diferente de reconhecer o Outro, de valorizá-lo em sua especificidade, e conviver com a diversidade não quer dizer aceitá-la. Em termos teóricos, diversidade é uma noção derivada de uma concepção muito problemática, estática, de cultura. É uma concepção de cultura muito fraca, na qual se pensa: há pessoas que destoam da média e devemos tolerá-las, mas cada um se mantém no se quadrado e a cultura dominante permanece intocada por esse Outro

A questão é saber quem manda

A própria noção de humanismo deve ser desconstruída, por uma série de fatores: reflete um sistema de valores que se pretende universal, tomando as culturas locais como meras contingências; toma o local como estático, não como processo, normalizando práticas e domesticando especificidades; desloca os desviantes para a matriz aceita, impondo suas próprias formas de construção do sujeito; funciona como dispositivo histórico de poder, relegando as alteridades a "outros", funcionando como instrumento de regulação social; assenta-se na dicotomia centro/periferia, a reificando...

Um exemplo claro disso são os casos de "infanticídio indígena"... Há algumas coisas que devem ser ditas, a despeito do sensacionalismo que a mídia gosta de fazer sobre o assunto.

Em primeiro lugar, não são todas as sociedades indígenas que tem por prática a morte de crianças. A questão aqui especificamente é: num contexto de direitos humanos universalistas, ainda há espaço para esse tipo de práticas? Isso é uma violação aos direitos humanos? É uma prática relativizável?

A fim de se compreender práticas como a de infanticídio há de se compreender que tais modos de proceder não apenas fazem sentido dentro daquelas lógicas culturais nas quais se inserem mas são elas, também, parte dessas lógicas. O ponto aqui é: o que nos faz querer impor nossas lógicas às deles? Um

universalismo que se baseia numa noção de humanidade e de fraternidade que não é – e nem deve ser – compartilhada pelos diferentes coletivos?

Aliás, no tocante ao tema do infanticídio (a quem se interessar pelo tema, sugiro a excelente dissertação de Marianna Holanda, 2008) um ponto interessantíssimo é percebermos quem evoca as práticas de infanticídio e em que contextos de enunciação. Quase sempre são os doutores em Antropologia via *digital influencers*, com especialização em religião pelo "grupo da família", como forma de afirmar, da forma mais peremptória possível, serem os índios completos primitivos e, sua colonização – e consequente usurpação de seus territórios – quase um favor que lhes é prestado.

O mesmo se pode dizer, *mutatis mutandis*, de minhas próprias experiências como alguém que investiga – ou tenta! – o universo *queer* indígena como chave interpretativa para os processos de colonização em nosso continente. Já ouvi de tudo, desde que pesquisas sobre o tema são completamente inúteis, até chacotas diversas, passando por "você não sabe que as pessoas riem por trás de você?". Fico pensando: se eu, como pesquisador, sofro preconceitos, imaginem xs inúmerxs LGBT indígenas que se matam, são mortxs ou expulsxs de suas aldeias devido a homofobia? Minhas pesquisas tem percebido ser a homofobia, e não o *queer*, uma "contribuição" do colonialismo, sendo obsessão do colonizador controlar as subjetividades, os afetos e as corporalidades indígenas. Evidentemente que a faculdade memística das redes sociais discorda, sendo eu um esquerdopata empurrando ideologia de gênero para os indígenas, salvos – uma vez mais! – de si mesmos pela religião e pela cultura liberal, ocidental e moderna. Urra! A esses entendidos, se um indígena é gay, lésbica ou trans, é porque está perdendo sua cultura – e, não sendo mais indígena, deixa de ser sujeito de direitos.

Aliás, essa é uma das minhas críticas à Antropologia (ou às antropologias, ou a alguns setores da antropologia...): em nossa ânsia pela exotização do outro, o universo LGBT indígena deixou de ser um tema de investigação, justamente por havermos incorporado – inconscientemente, talvez? – a pecha de que indígenas *queer* não são, afinal, "tão indígenas assim"... Mesmo a academia é um lugar de silenciamentos e subalternizações, ao contrário do que alardeia o protofascismo crescente em setores cada vez mais visíveis de nossa sociedade.

Em tempo, essa profusão de vozes não nos tem deixado perceber que, ao menos ao meu ver, talvez *o* grande problema para as ciências humanas para este século é compreender como, cada vez mais, como o lugar de enunciação, sua legitimidade e alcance são instrumentos políticos. O mundo hoje é decido por *hashtags* e *bots*, sendo nosso desafio compreender seus impactos para a legitimação, ou não, da retirada de direitos para sujeitos outros – os quais, nem sempre, possuem acesso a capital social, cultural ou tecnológico capazes de equilibrar essa balança. Tempos estranhos esses de pós-verdade, auto-verdade e *fake news* (sim, porque soa mais ~~colonizado~~[13] chique que as "notícias falsas" de nossa flor do Lácio)... Assim como a velha questão filosófica ("se uma árvore cai na floresta sem ninguém para ouvi-la, ela caiu?"), talvez tenhamos que compreender que a luta por direitos humanos, nesses 70 anos de Declaração Universal dos Direitos Humanos deva responder à questão: se um direito é violado, e ninguém compartilha, ele é violado?

[13] O tachado aqui é proposital...

Novamente: o fato de certos sujeitos – justamente os que mais sofrem violações de Direitos – terem acesso desigual a tecnologias faz com que eles sejam, mais uma vez, invisibilizados, subalternizados e silenciados.

Como diz Foucault em seu primeiro volume da *História da Sexualidade*

> O próprio mutismo, aquilo que se recusa dizer ou que se proíbe mencionar, a discrição exigida entre certos locutores não constitui propriamente o limite absoluto do discurso, ou seja, a outra face de que estaria além de uma fronteira rigorosa mas, sobretudo, os elementos que funcionam ao lado de (*com* e em *relação a*) coisas ditas nas estratégias de conjunto. Não se deve fazer divisão binária entre o que se diz e o que não se diz; é preciso tentar determinar as diferentes maneiras de não dizer, como são distribuídos os que podem e não podem falar, que tipo de discurso é autorizado ou que forma de discrição é exigida a uns e outros. Não existe um só, mas muitos silêncios e são parte integrante das estratégias que apoiam e atravessam os discursos (FOUCAULT, 1988).

Trata-se, novamente, de saber quem manda...

Direitos somente fazem sentido numa lógica discursiva simétrica de distribuição e legitimação de poder que toma o lugar das diferenças – que são, afinal, aquilo que nos caracteriza como sujeitos. O grande desafio é, neste contexto, não deixar essas vozes se diluírem a tal ponto de se perderem. Nestes tempos difíceis e complicados, tudo leva a crer ser o apagamento dessas vozes o primeiro passo para a legitimação de sua existência física: a desumanização do Outro ontológico já foi vista em momentos recentes da história como forma de apagá-lo (infelizmente, não apenas metaforicamente). Existir como diferente e ter direito a voz parecem ser os maiores desafios para os próximos 70 anos.

Referências

CARROLL, Lewis. **Alice através do Espelho.** Rio de Janeiro: Salamandra, 2012.

FOUCAULT, Michel. **História da Sexualidade I: a vontade de saber.** Rio de Janeiro: Edições Graal, 1988.

HOLANDA, Marianna Assunção Figueiredo. **Quem são os humanos dos direitos?: sobre a criminalização do infanticídio indígena.** Dissertação (Mestrado em Antropologia). Universidade de Brasília, Brasília, 2008.

MISKOLCI, Richard. **Teoria Queer: Um aprendizado pelas diferenças** (Série Cadernos da Diversidade, Vol. 6). Belo Horizonte: Autêntica, 2012.

VIVEIROS DE CASTRO, Eduardo. "O chocalho do xamã é um acelerador de partículas". In: SZTUTMAN, Renato (Org.) **Encontros: entrevistas com Eduardo Viveiros de Castro**. Rio de Janeiro: Azougue Editorial, 2007.

Literacy Tradition of Sundanese Society - Indonesia: An annotation of the 16th Century Ancient Manuscript

Agus Suherman
Universitas Pendidikan Indonesia

Abstract

The literacy tradition of Sundanese society appeared around the 16th century AD. This was attested by the discovery of the ancient Sundanese Sanghyang Siksakandang Karesian (SSK) manuscript written in 1518 AD. The discovery of the manuscript was not only illustrated Sundanese literacy tradition at that time, but also the ability to explore and understand ideas both delivered in writing and in audio- visual. As a matter of fact, literacy activities at that time had achieved the level of understanding and solving social and statehood problems with referenced to behavior in forms of dogmas. Thus, literacy activities at that time had involved and devoted all potential and expertise to manage life or life skills. The manuscript of SSK also illustrates the realm of literacy that has been covered at that time, for example reading and writing literacy, numerical literacy, scientific literacy, financial literacy, and cultural and citizenship literacy. The description of the above facts will be explained descriptively.

Keywords: literacy, ancient manuscripts, Sundanese society

1. Introduction

Reading and writing tradition in Nusantara archipelago has been existed since the beginning of AD century. It is proven by the discovery of the 4th century AD Kutai inscription and the 8th century AD *Tjandra Karana* manuscript (Baried, 1994: 37). Likewise in West Java, the emergence of written traditions in that decade was indicated by the discovery of the inscriptions from the relics of Tarumanagara Kingdom, especially when it was ruled by Purnawarman in 395 - 434 AD (Danasasmita, 1984). In form of ancient manuscript, Sundanese literacy tradition is known to be from the 16th century AD i.e. through the discovery of Sanghyang Siksakandang Karesian (SSK) manuscript which was compiled in 1518 AD (Atja and Danasasmita, 1981). In addition, it was also strengthened by the discovery of three Sundanese manuscript originated from the Sundanese Kingdom of the 16th century AD i.e. *Carita Parahyangan*, *Pantun Ramayana*, and *Bujangga Manik* (Ekadjati, 1988: 25).

Compared to the inscriptions, the manuscript contains more information with a very diverse range of topics. The description is quite long because it could be consisted of tens or even hundreds of pages. Therefore, the community involvement in accessing literacy activities in the form of this manuscript is more open, because there are many ways to appreciate those writing works, for example for *wawacan* manuscript, the appreciation can be done not only by reading but also through *beluk* performances.

Therefore, in the old time, the manuscript was one of the most adequate tools of literacy, so that everything that was considered important and had to be perpetuated at that time, was written in the form of a manuscript, the contents of which could be thoughts, feelings or ideas. Therefore, the ancient manuscripts have become icons of progress from a literate society that has had a certain level of civilization and progress.

This review is more emphasized in the study of the SSK manuscript. This ancient manuscript originated in the 16th century AD based on information on the colophon (the end of the manuscript): *ini babar ing pustakanipun nora catur sagara wulan* (completed in: *nora* (0) *catur* (4) *sagara* (4) *wulan* (1) = 1440 Saka, which if converted to the year of AD becomes 1518. The contents of this ancient text are in the form of moral guidelines for social life that prevailed during Pajajaran Kingdom.

2. Method

This study was aimed at examining SSK manuscript which so far has been found two manuscripts i.e. kropak 630 which had been investigated by Atja and Danasasmita in 1981, followed by Danasasmita et al. In 1987, and kropak 624 studied by Nurwansah in 2012. The data and sources of the analysis in this paper were the results of research by Danasasmita et al. (1987), because the manuscript (kropak 630) is considered more complete and the research is an improvement from previous research. The results of this study are further described descriptively by library research on the intended manuscript.

3. Analysis and Discussion

3.1 The Materials, Scripts and Language

The writing material used on which Sundanese manuscripts were written consists of two kinds i.e. the materials made of leaves, for example *lontar*, palm, coconut, *gebang*, and *nipah*, and made of paper, both traditional paper (*saeh/daluang*) and modern paper (Rohaedi, 1995 : 1). It can be assumed that the manuscripts written on leaves originated from the older period (before the 18th century) while the manuscript written on paper came from modern time period (around the 19th century AD). The manuscripts that use leaf material were technically written by using a scraper called *peso pangot*, while the texts on paper materials were written by using a pen, ink, or pencil (Ekadjati, 1988: 10).

The letter used in writing the manuscript can be traced by referring to three important periods in the development of manuscript in Nusantara based on its surrounded cultural background i.e. the classical period, marked by the inclusion of Indian culture and Hindu-Buddhist influences; Islamic period, since the insertion of Arab influence into Nusantara archipelago; and the colonial period, since the Europeans came to Nusantara (Indonesia Indah, 9:28).

There are various characters used in Sundanese manuscript writing. Ekadjati (1988: 9) classifies them into: (1) Sundanese characters, (2) Javanese characters, (3) *Pegon*/Arabic characters, and (4) Latin characters. Ancient Sundanese characters were used for manuscripts made before the 17th century AD, Javanese characters were used for manuscripts made around the 17th century AD, *Pegon* (Arabic) characters for manuscripts made since around the 18th century AD, and Latin characters for the manuscripts made since the end of the 19th century AD.

Viewed from the language used, Ekadjati (1988: 11) suggests that Sundanese manuscripts are divided into three groups. First, Sundanese-language manuscripts consisting of ancient Sundanese language and modern Sundanese language. Old Sundanese manuscripts are generally written in the Sundanese Kingdom period, while modern Sundanese manuscripts were generally written in the 19th century AD and 20 AD. Second, Javanese language manuscript groups, which were generally written between the 17th century AD - 18 AD, and third, Malay-language manuscripts, which were generally written at the end of the 19th century AD.

3.2 Literacy Domain in SSK manuscript

The World Economic Forum (2015) recommends six types of basic literacy that must be adept by the citizens of the world i.e. reading and writing, numeracy literacy, scientific literacy, financial literacy, digital literacy, and cultural and citizenship literacy. Except for digital literacy, five other types of the literacy have actually been introduced and practiced in a simple and natural way in Indonesian society, including in Sundanese region, which is through the inheritance from one generation to further generation.

The discovery of a number of manuscripts, both collected by the institutions, individuals, or those which are still scattered in the community, including the SSK manuscript, is a strong indication of the ongoing literacy activities in Sundanese society. The manuscripts, in this case the written tradition products and as well as reading material, can be considered as the main pillars of the activity of reading and writing literacy at that time. Moreover, this activity is stated by Saryono et al (2017: 2) as the earliest literacy in the history of human civilization.

Besides reading was purposed to deepen its contents, the tradition of reading and writing the manuscript continues to repeat especially when the re-writing process occurs. This is common because manuscripts reproduction was done manually by handwriting, which according to Sedyawati (1997: 4) was carried out for several reasons, both on the basis of orders, fulfilling orders, and personal desire, including the SSK manuscript that Nurwansah believed (2017: 32) was not a single script since kropak 630 and kropak 624 have been found. Whatever the background was, the rewriting process was also enlivening and at the same time was the basic activity of reading and writing literacy. Even in SSK manuscript, the literacy activity was explicitly mentioned: /*Lamun urang němu siksaan rampes ti nu maca ya kangken guru panggung ngara(n)na.*/ "If we find a good lesson from reading it is called *guru tangtu*".

The subsequent literacy is related to numbers or quantity that are useful in understanding quantitative information i.e. numeracy literacy. In everyday life, useful numeracy skills range from shopping, designing family budgets, to managing public policies related to statistical data, tables, and graphics. With adequate numeracy skills, the direction of development policy in a broader sense, will be clearer and easier to measure. From these skills, it is expected that numerical sensitivity will arise in terms of the accuracy in managing resources of the nature and human being, so that the goals of intended development for human welfare will come true. Given the importance of this literacy, Unesco in 2006 began to establish numeracy skills as one of the determinants of a country's progress. This is understandable as Weili (2017: 2) states that skill has an impact on economic, social and welfare growth.

The form of numerical literacy activities in SSK scripts is used to describe or elaborate various

behavioral rules or societal rules, including: *catur yatna* (four alertness) *catur utama* (four virtues)), *catur buta* (four terrible things), *catur yogya* (four kindness), *panca tatagata* (five realities), *panca byapara* (five protectors), *panca putera* (lima sons), *panca kusika* (five Resi), *panca gati* (five diseases), *panca parisuda* (five antidotes), *sad guna* (six utilities), *dasa kreta* (ten welfare), *dasa sila* (ten prohibitions), *dasa kalesa* (ten sins), and *dasa pasanta* (ten heart releiver).

In addition, there is also an appellation of the number in certain sentences such as: /*sakĕti wong kĕna i rika*/ "a hundred thousand people are affected there.", /*Sariwu saratus tahun keuna ku sapa batara*/ "a thousand and a hundred years being subjected to Batara's curse.", And /*midwakeun, ngadar*/ "divided by two, flatten". The numeracy literacy activity was simple, but it has called number or quantification covered in numeracy comprehension or proficiency.

The skill of acquiring knowledge and describing scientific phenomena is part of science literacy. This literacy combines with technology to create a quality of life that has implications for the environment, health, and even natural disasters. Fananta et al. (2017: 3) explains that the literacy of this field relates to water availability, disease control, and climate change.

The literacy of science in the SSK manuscript can be seen from the way the knowledge acquired.

> *Němu agama ti anak, ya kangkĕn guru rare ngara(n)na. Němu darma ti aki ma ya kangkĕn guru kaki ngara(n)na. Něme darma ti lanceuk ma ya kangkĕn guru kakang ngara(n)na. Němu darma ti toa ma ya kangkĕn guru ua ngara(n)na.*
> *Němu darma ti geusan leumpang di lĕmbur di geusan ngawĕngi, di geusan eureun, di geusan majik ma ya kangkĕn guru hewan ngara(n)na. Němu darma ti indung ti bapa ya kangkĕn guru kamulan ngara(n)na. Maka nguni lamun hatur ka mahapandita ya kangkĕn guru utama, ya kangkĕn guru mulya, ya kangkĕn guru prĕmana, ya kangkĕn guru kaupedesaan.*

> Getting the knowledge from a child, called guru rare. Getting lessons from grandfather, called *guru kaki*. Getting lessons from older brother is called *guru akang*. Getting lessons from *toa* is called *guru ua*.
> Getting lessons on a place during a travel, in a village on a stay, on a stop, on a boarding place is called *guru binatang*. Obtaining lessons from parents is called *guru kamulan*. Likewise, when study from a pastor is called *guru utama*, *guru mulya*, *guru premana*, *guru kaupedesaan*.

In addition, other scientific literatures are illustrated from the clues on reliable sources of knowledge, as it comes from the experts. Therefore, choose the right person in making question or in learning. It is metaphorically described in the following quotation

> *Hayang nyaho di j(ĕ)ro ning laut ma, matsya tanya.*
> *Hayang nyaho di lwir ning leuweung ma gajah tanya.*
> *Hayang nyaho di ruum amis ning kĕmbang ma, bangbara tanya.*
> *Hayang nyaho di sekweh ning carita ma, ... memen tanya.*

Hayang nyaho di sekweh ning kawih, ... paraguna tanya.
Hayang nyaho di pamaceuh ma, ... hĕmpul tanya.
Hayang nyaho di pantun ma, ... prĕpantun tanya.
Sa(r)wa lwir[a] ning tulis ma, …… lukis tanya.
Sa(r)wa lwir[a] ning teuteupan ma, ... panday tanya.
Sa(r)wa lwir[a] ning ukir ma, ... marangguy tanya.
Sa(r)wa lwir[a] ning oolahan ma, ... hareup catra tanya.
Sa(r)wa lwir[a] ning boeh ma, ...pangeuyeuk tanya.
Lamun hayang nyaho di agama parigama ma, ... pratanda tanya.
Sugan hayang nyaho di tingkah prang ma, ... sang hulujurit tanya.
Hayang nyaho di sekweh ning aji mantra ma, ... sang brahmana tanya.
Hayang nyaho di puja di sanggar ma, ...ja(ng)gan tanya.
Hayang nyaho di dawuh nalika ma, ... bujangga tanya.
Hayang nyaho di darmasiksa, ... sang pandita tanya.
Hayang nyaho di patitis bumi ma, ... mangkbumi tanya.
Hayang nyaho di sekweh ning labuhan ma, ... puhawang tanya.
Hayang nyaho di sawatĕk arĕga ma, ... citrik byapari tanya.
Hayang nyaho di sandi, ... wiku paraloka Tanya.
Lamun dek nyaho di carek para nusa ma, ... sang jurubasa darmamurcaya tanya.

If you know the sea, ask the fish.
If you want to know the contents of the forest, ask the Elephants.
If you want to know the scent and the sweetness of flowers, ask the bees.
When wanting to know all the stories, ... please ask the Puppeteer.
If you want to know all kinds of songs, ...ask the Musician.
When wanting to know the game, ...ask *Empul*.
When curious about poems, ...ask a Poet.
All kinds of paintings, ...ask the painters.
All kinds of forgings, ...ask the blacksmith.
All kinds of engravings, ...ask the sculptor.
All sorts of dishes, ...ask the cook.
All kinds of fabrics, ...ask textile expert
If you want to know religion and its values, ... ask *Pratanda*
When curious about war of conduct, ... ask the Warlord.
If you want to know all mantra, ...ask the Brahmana.
When curious about puja and *sanggar*, ...ask *Janggan* (monk).
If you want to know about time calculations, ...ask Bujangga.
If you want to know *darmasiksa* ... ..ask the Pastor.
If you want to know how to measure the land, ... ask *Mangkubumi*.

When curious about all the ports, ...ask *Puhawang* (master).
If you want to know all the price read, ...ask *Citrik Byapati* (smart person).
If you want to know the code, ... ask *Wiku Paraloka*.
When we want to know the languages of other countries ... ..ask *Darmamurcaya*.

The above description demonstrates the scope of knowledge covered in this manuscript ranging from the flora (flower), the ecology (sea, forest), the art (song, painting, carving), the literature (mantra, story / poem), clothing (cloth) , food (cuisine), moral and societal (religion, glorification), time-counting, land surveying, ports, weapons, war acts, up to the appellation of the language of the nations. Even if it is against this and assume no need to know, then it will definitely be awaited by hell, because all of these are goddess provisions: / /*Aya ma nu majar mo nya(h)o, ... tan [n]awurung inanti dening kawah.... kena itu tangtu hyang tangtu dwata.*/

The discussions on livelihoods and descriptions of living welfare in SSK manuscript can be categorized as financial literacy. The success of this literacy will bring up skills in sorting among primary, secondary, and tertiary needs, and not exchanging them between one another. Furthermore Fianto (2017: 5) states that financial literacy provides skills in managing financial resources effectively to achieve prosperity, as well as skills in making the right decisions in the financial matters.

Mentioning variety of work related with welfare in this manuscript has been started since the second paragraph.

Ini sanghyang dasa kreta kundangeun urang reya. Asing nu dek na(n)jeurkeun saraa kreta pakeuneun heubeul hirup, heubeul nyewana, jadiyan kuras, jadiyan tahun, deugdeug ta(n)jeur jaya perang, nyewana na urang reya.

This is *Sanghyang Dasa Kreta* for peoples guidance. Anyone who wants to establish a means of well-being in order to live long, stay long (in the world), succeed in animal husbandry, succeed in agriculture, always excel in war, all of which lies in the mass of people.

The above quote implies a prerequisite for success in business, animal husbandry and agriculture i.e. the need for cooperation or collaboration with many parties to achieve prosperity. In the next section, it is explained about integrity in work.

Maka rasa puja nyanggraha ka hyang ka dewata. Anggeus majaga rang dipigunakeun ka gaga ka sawah ka serang ageung, ngikis, marigi, ngandang, ngaburang, marak, mu(n)day, ngadodoger, mangpayang, nyair bi(n)cang, sing sawatek guna tohaan, ulah sungut, ulah surah, ulah purik deung giringsing, pahi sukakeun sareyanana.

Take a prayer and be under the protection of hiyang and the gods. If we are told to work in the farm, in rice fields, in large rice fields, strengthening the river banks , digging the channel, take

the cattle to the cattle shed, putting the trap, dam up part of the river to catch fish, netting the fish, pulling the net, all of the works are for the king, do not get angry, do not be a hypocrite, do not fret and grumpy, work happily for all kinds of work.

There are also appellation of some enviable work or profession because of its good work ethic and always put respect and devotion to the king.

Deung maka ilik-ilik dina turutaneun; mantra gusti kaasa-asa, bayangkara nu marĕk, pangalasan, juru lukis, pande dang, pande mas, pande gĕlang, pande wĕsi, guru wida(ng), medu wayang, kumbang gĕding, tapukan, banyolan, pahuma, panyadap, panyawah, panyapu, bela mati, juru moha, barat katiga, pajurit, pamanah, pam(a)ring, pangurang dasa calagara, rare angon, pacelengan, pakotokan, palika, preteuleum, sing sawatĕk guna. Aya ma satya di guna di kahulunan. Eta kena turutaneun kena eta ngawakan tapa di nagara.

And bear in mind the following enviable profession: the lords, state guards, jungle man, painters, blacksmith, tanner, puppeteer, *gending*, performers, comedians, farmers, tappers, rice farmer, janitor, *bela mati*, *juru moha*, *barat katiga*, soldiers, archers, *pemarang* and fisherman, diver and all sorts of jobs. All loyal to their duties for the king. All of them are enviable because they do different duties for the country.

Other messages of work ethic associated with financial literacy is the suggestions to always be careful, orderly and meticulous in doing the job, always do double check: /*Nya mana kitu, lamun a(ng)geus di karma ning akarma, di twah ning atwah, a(ng)geus pahi kaiilikan nu gopel nu rampes, nu hala nu hayu./* "If you have finished to fulfill all obligations and work, check back which one is bad and which one is good."

The last kind of literacy is cultural literacy and citizenship, which is very closely related to the rights and obligations as a citizen which contains the spirit of nationalism, identity preservation, national solidarity, and brotherhood among the nations. This is in line with what was stated by Hadiansyah et al (2017: 3) that literacy is the ability of the individuals to behave towards their social environment as part of a culture and a nation. In other words literacy can be interpreted as the ability to understand culture as national identity accompanied by the social awareness upon their rights and obligations.

The above capability should be accompanied by a competence in appreciating and implementing knowledge for a better life. Obviously, it must be accompanied by a high level of understanding and adequate interpretation, which Evelyn (2017: 15) refers to as complex, critical, and creative thinking techniques in solving problems.

The understanding of culture or cultural literacy activities contained in the SSK manuscripts covers a very broad range of seven cultural elements mentioned by Koentjaraningrat (1992: 2) i.e. carvings, paintings, songs, games, weapons, cloth, cuisine, agriculture, trade, trust , and the language used by the nations. Also the understanding of individual behavior as a member of society which is included in

citizenship literacy, is widespread in this manuscript, including manners, both in words and manner.

> *Ini karma ning hulun, saka jalan urang hulun, karma ma ngarannya pibudieun, ti(ng)kah paripolah saka jalan ngarannya. Maka takut maka jarot, maka atong maka teuang di tingkah di pitwaheun, di ulah di pisabdaan.*
>
> This is karma of *hulun*, for the way we serve. The work is called mind sense, the behavior is called the way. Be afraid, be careful, be respectful and be polite both in words and manner.

Furthermore, it is also explained about good character as commonly developed in character education or in the formation of national character building i.e. carefulness, thoroughness, diligence, attentive, wisdom, patriotism, willing to sacrifice, and generousness.

> *Ini pangimbuh ning twah pakeun mo tiwas kala manghurip, pakeun wastu di imah di maneh. Emet, imeut, rajeun, leukeun, paka prědana, morogol-rogol, purusa ning sa, widagda, hapitan, kara waleya, cangcingan, langsita.*
>
> These are the equipment of manner, in order not to fail in life and our homes will be full of blessings i.e. meticulous, thorough, hardworking, diligent, adequate clothing, passionate, heroic, wise, courageous, generous, deft, skill full.

The essence of the message conveyed from citizenship literacy in the SSK manuscript is in order to arise citizens sensitivity, including having a strong personality and being able to control themselves in words and manners:/*Disuruh neguhkeun di sarira, matitiskeun bayu sabda hědap.*/

In addition to the description and illustration of the behavior, the messages of citizenship delivered have been also formulated in the form of a collection of moral guidance or dogmas, for example: *dasa kreta*, *dara prebakti*, *dasa pasanta*, *panca tatagata*, *panca gati*, *panca parisada*, *catur yatna*, *catur buta*, and *catur yogya*.

The cultural and citizenship literacy mentioned above, as stated by Suherman (2017: 559) is highly in line with national values preservation, which derived from the four national pillars i.e. Pancasila, the 1945 Constitution, NKRI and the motto of Unity in Diversity, also from the local wisdom spread in the community, both from spoken traditions and written documents in the form of ancient manuscripts. Thus, SSK manuscript has directly placed the inheritance tracks of the national values to the next generation through the tradition of literacy.

4. Conclusion

Five of the six types of basic literacy recommended by the World Economic Forum (2015) have been recorded in the SSK manuscript i.e. reading and writing literacy, numeracy literacy, scientific literacy, financial literacy, and cultural and citizenship literacy. The above facts show that they have long been

introduced and practiced in Sundanese community, although in simple form pursuant to age progress. The 1518 AD, the time the SSK manuscript was written, shows that the literacy rate of Sundanese people has been starting since the 16th century AD or maybe even before. As a matter of fact, since the manuscript of SSK is not a single manuscript, the copying process could have been occurred repeatedly. The situation was also supported by the discovery of Sundanese kingdom contemporary manuscript, including *Carita Parahyangan*, *Pantun Ramayana*, and *Bujangga Manik*. This fact confirmed that literacy tradition occurred at that decade. The content of the five areas of literacy contained in SSK manuscript shows Sundanese people life skills at that time. It contains the appellation of quantity or numbers (numeration), the appellation of various knowledge (science), the discussion of livelihoods and welfare (financial), the description of the rights and obligations of citizens (citizenship), and explicitly mentioning that obtaining lessons can be taken by reading (reading and writing).

5. References

[1] S.B. Baried dkk, *Pengantar Teori Filologi*, BPPF Fakultas Sastra UGM, Yogyakarta, 1994.

[2] S. Danasasmita dkk., *Sewaka Darma, Sanghyang Siksakandang Karesian, Amanat Galunggung,* : Proyek Penelitian dan Pengkajian Kebudayaan Sunda (Sundanologi), Bandung, 1987.

[3] Atja & S. Danasasmita, *Sanghyang Siksa Kanda Ng Karesian* (Naskah Sunda Kuno Tahun 1518 Masehi), Proyek Pengembangan Permuseuman, Jawa Barat, 1981.

[4] E.S. Ekadjati, *Naskah Sunda: Inventarisasi dan Pencatatan,* Universitas Padjadjaran, Bandung, 1988.

[5] Ayatrohaedi & S. Saadah, *Jatiniskala (Kehidupan Kerohanian Masyarakat Sunda Sebelum Islam),* Depdikbud, Jakarta, 1995.

[6] Tim, *Indonesia Indah "Aksara" 9,* Yayasan Harapan Kita, Jakarta, 1997.

[7] Dj. Saryono, *Materi Pendukung Literasi Baca Tulis,* Kementerian Pendidikan dan Kebudayaan, Jakarta, 2017.

[8] E. Sedyawati, "Naskah dan Pengkajiannya: Tipologi Pengguna", Dalam Karsono H. Saputra (Peny.) *Tradisi Tulis Nusantara*, Manassa, Jakarta, 1997 pp. 1-6.

[9] I. Nurwansah, "Hukum dalam Naskah Sunda Kuna *Sanghyang Siksa Kandang Karesian*", *Manuskripta*, Manassa, Jakarta, 2017 pp 31-61.

[10] H. Weilin, dkk, *Materi Pendukung Literasi Numerasi*, Kementerian Pendidikan dan Kebudayaan, Jakarta, 2017.

[11] M.R. Fananta, dkk, *Materi Pendukung Literasi Sains*, Kementerian Pendidikan dan Kebudayaan, Jakarta, 2017.

[12] F. Fianto, dkk, *Materi Pendukung Literasi Finansial,* Kementerian Pendidikan dan Kebudayaan, Jakarta, 2017.

[13] F. Hadiansyah, dkk, *Materi Pendukung Literasi Budaya dan Kewargaan,* Kementerian Pendidikan dan Kebudayaan, Jakarta, 2017.

[14] E.W. English, *Pendidikan Literasi* (terjemahan Fuad Ferdinan), Nuansa Cendekia, Bandung, 2017.

[15] Koentjaraningrat, *Kebudayaan, Mentalitas dan Pembangunan,* Gramedia, akarta, 1992.

[16] A. Suherman, "Nationality Values of Words and Proverbs", Dalam Fuad Abdul Hamid dkk. (Peny.) *Proceeding The Tenth Conference a Applied Linguistics and The Second English Language Teaching and Technology Conference in Collaboration with The First International Conference on Language, Literature, Culture, and Education*, Scitepress, Setubal, 2017 pp. 559-562.