



INTERNATIONAL JOURNAL FOR INNOVATION EDUCATION AND RESEARCH

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



**INTERNATIONAL EDUCATIVE RESEARCH FOUNDATION
AND PUBLISHER (IERFP)**

Volume- 5 Number- 10

October 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

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Edition: October 2017

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-5, ISSUE-10 of IJIER** which is scheduled to be published on **31st October 2017**.

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

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

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

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

Thanks,

Dr Eleni Griva

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Brain Tumor Boundary Segmentation of MR Imaging using Spatial Domain Image Processing

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Abstract

Extracting information for medical purposes from magnetic resonance imaging is critically important for diagnostic and treatment plans. In this paper, a simple algorithm for tumor segmentation of Magnetic resonance imaging (MRI) is introduced. The novelty incorporates, preserving fine details of the input image while detecting the boundary accurately. Tumor segmentation is carried out by set of pre processing steps followed by morphological operations. Rough contour of the tumor is localized to reduce the search space for the boundary. Line drawing algorithm in cooperated with pixel selection criteria is used to detect the accurate boundary. The algorithm is evaluated in terms of the performance and accuracy with radiologist labelled ground truth MRI scans. Simulation results show that the proposed algorithm provides better identification with above 95% of accuracy, for clearly distinguishable tumors in relation to conventional contour detection methods.

Keywords: brain tumor, morphological tools, segmentation, Magnetic resonance imaging (MRI)

INTRODUCTION

Image processing in special domain involves producing a set of parameters incorporating the image information using the pixel intensity levels. Magnetic resonance imaging (MRI) and computed tomography (CT) imaging technologies are most profound tools currently used in medical imaging due to their ability to produce vast volume of data with better clarity. Image intensity in MRI depends upon four parameters namely proton density (PD), T1, T2, and T2 relaxation [6]. Images produced by MRI are in high quality with outstanding resolution and contrast for different tissues in any tissue plane. Hence it plays a key role in identifying deformities in soft tissues due to the great contrast over CT imaging [2]. Both horizontal and vertical slices can be obtained through MRI image slices which could aid the abnormality detection in human body parts.

A mass of abnormal cells in the brain that grows inside the restricted space of the skull is diagnosed as a brain tumor [1]. Since these tumors arise in different sizes and shapes with varying positions it is vitally important to detect them using medical imaging technology. Segmentation is the process in which an image is divided into its constituent objects or parts aiming to simplify the image representation to analyze easily [6]. Yet manually detecting brain tumors by trained expertise like radiologist is a cumbersome, time consuming and requires constant human inspection. Further the final result biased to individuals [3]. Segmentation process is more complicated when normal tissues are overlapped with tumor tissues.

Therefore, automating or semi automating the segmentation process is important and accurately locating the boundary to retrieve valuable information is highly essential.

A boundary is a contour in the image plane that represents changes in pixels from one object to another [5]. Boundary reveals information regarding the outline and shape of the object precisely [4]. Conventional brain tumor segmentation methods include thresholding and region based approaches. Calculation of local threshold is based on prior knowledge or mean intensity value. Various segmentation techniques that utilize different thresholding techniques are present in literature[7]. For instance, G. Evelin Sujji, Y.V.S. Lakshmi, G. Wiselin Jiji[8] adopts global and adaptive iterative thresholding techniques to segment the tumor from the background. K. A. K. I. S. N. Alyaa and H. Ali suggested an enhanced thresholding method for the segmentation based on the region of interest specified by the user [10]. Further, partial volume calculation of each region is used to identify the thresholding value of each region [14]. Statistical based approach relying on Gaussian distribution to determine threshold value is addressed by A. Stadlbauer, E. Moser, S. Gruber, R. Buslei, C. Nimsy, R. Fahlbusch, and O. Ganslandt [15]. In the study of Automated segmentation of MR images of brain tumors involves template driven segmentation mechanism using statistical classification process aided by a anatomic atlas [16]. As a modified region growing method, Y. M. Salman [17] has introduced a technique to detect 3D volume accurately adopting hole filling after segmentation. Multi scale transformation and user defined hierarchical watershed segmentation methods have been discussed [18,19] as means to avoid over-segmentation.

Moreover, application of fuzzy c means clustering to segment tumors involves providing better results for overlapping regions in compared to k means clustering [20]. Atlas-based methods incorporate patient specific information from different MRI modalities to segment the brain tumor [21].

The proposed method focuses on precise boundary extraction in contrast to conventional tumor segmentation approaches. The novelty incorporates reliable edge detection, which eliminates possible distortions occur in extracting the tumor region. Further, the method is simple and reduction of search space to a promising region result in increased performance. Thus, the tumor boundary extracted from this system is considerably reliable as an automated system. The derived information can be used to estimate the area and the volume of the tumor accurately. The results presented justify the accuracy of the proposed algorithm. The paper structure flows as three main sections, namely, methodology, results, discussion and conclusion.

METHODOLOGY

Numerous strategies have been proposed in literature for extracting tumors from MRI images. Available segmentation methods such as thresholding, region growing, clustering, Markov random field (MRF) and artificial intelligence approach are discussed in paper presented on current methods in image segmentation [11].

In the approach presented in this paper, the intensity based technique is adopted. Fig. 1 shows the computational steps of the proposed algorithm. Slice of raw axial MRI is taken as input to the system. It is enhanced using Gaussian low pass filter with an adaptive size. Then the tumor is segmented using morphological operations. This segmented image is used to estimate the initial contour. In the next step feature extraction is performed for the developed algorithm with respect to the selected search area of the tumor. Finally, tumor boundary is identified by using the proposed algorithm. A tumor MRI set related to

a patient consists of set of cross sections of brain taken at different phases. Hence, all the above set of steps is applied to all the slices in a multi slice MRI to obtain a complete three-dimensional segmentation.

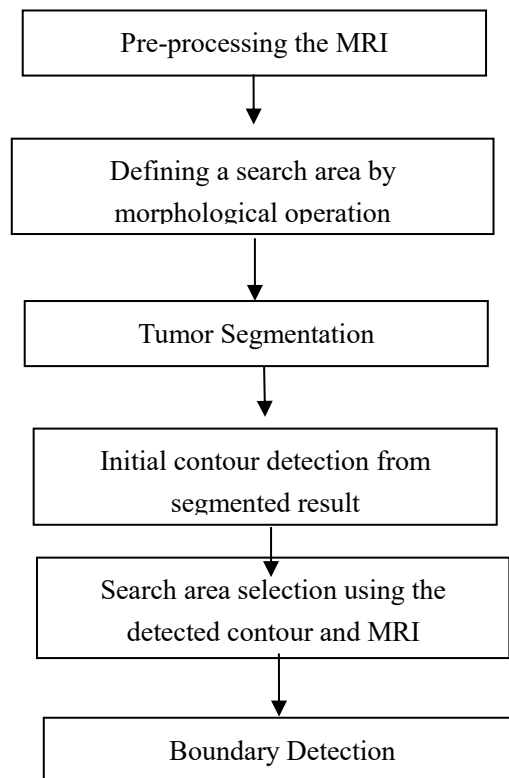


Fig 1 Block diagram for the proposed boundary detection system

Various types of tumor images comprising different shapes and sizes were collected to test and evaluate the algorithm. The performance of the proposed algorithm was evaluated by comparing the output image against ground truth labelled image. The accuracy of the system was further tested using the opinion of a radiologist.

Tumor segmentation

Segmentation constitutes isolation of cancer cells from non-cancer cells in the background. Tumor segmentation is inherently difficult, since normal cells are overlapped with cancer cells towards boundary. In the segmentation process the MRI is divided into distinct regions till the tumor is separated from the background. The segmentation phase comprised of two steps, preprocessing of the MRI and applying morphological process. This process is light weight, efficient, and results in a rough initial segmentation. The extracted rough boundary contains low details with considerable distortions resulted from the morphological operations. In the proposed method, in order to determine the exact tumor boundary a rough contour is sufficient. So the implemented system is not affected by the cell overlapping phenomenon.

Preprocessing

Once MRI data are acquired, preprocessing is done to enhance the fine details of the interested area by applying noise reduction algorithms. After the preprocessing, the resultant image can be handled more efficiently. Initial MRI is preprocessed to enhance the quality by removing the noise in the image. Gaussian filter is applied to remove the high frequencies and smooth the overall image. The ability of the Gaussian filter to remove the noise without deforming the edges is an added advantage for the task.

Global threshold method is applied after the preprocessing of initial gray scale MRIs. Then the gray scale MRI is converted to binary image using the intensity level obtained from global thresholding operation. In the binary image, black pixels denote the background while white pixels denote the foreground. Here, optimal global thresholding Otsu's method is used, since it is easy to implement and provides better results which roughly separate tumor parts from the rest.

Morphological process

Mathematical morphology is used to analyze a binary image by using simple mathematical concepts. In order to segment the tumor from the binary image dilation followed by erosion is applied.

By dilating the binary image foreground is expanded with respect to the binary mask. In this proposed system, several structuring elements were tested with respect to the output. Finally, disk structuring element was used as the most compatible shape with adaptive sizes.

Next by eroding the image the foreground was shrunk according to the shape and size of the disk structuring element. Finally hole filling algorithm was applied to remove unwanted small areas contained in the tumor binary image.

Boundary detection algorithm

After isolating the tumor region, a rough boundary of extracted tumor was used as the initial contour. The search space for the exact contour detection was optimized by limiting the search area to neighboring locations of the initial contour.

1) Pixel selection algorithm

Starting from two of the initial contour pixels a perpendicular line was drawn to pick the two ending points as shown in Fig 2 a. The width of the line is chosen by considering the area which is suspected to contain the edge point of the boundary. A line drawing algorithm Digital Differential Analyser (DDA)[13] was used to select the pixels for the gradient scale, employing the previously selected two end pixels. This set of pixels was treated as a promising area which contains the exact edge point corresponding to that region. Similarly, the entire feature points were selected in this manner for the proposed algorithm.

Boundary manipulation algorithm

Starting from the initial contour set of pixels from two adjacent locations was selected as a gradient scale as the input to the proposed algorithm. The correct edge location was calculated by considering the average value. First the average of pixel intensity value set was determined. Then each average value was selected as the boundary point of the tumor. The obtained resultant points were plotted over the MRI image as the exact tumor boundary. To evaluate the accuracy of the algorithm this was compared against labelled "ground truth" scans. Fig 2 b shows the search area selection for the input of the proposed algorithm. The initial contour is indicated in white color. Pixel points of the search area are indicated in blue color.

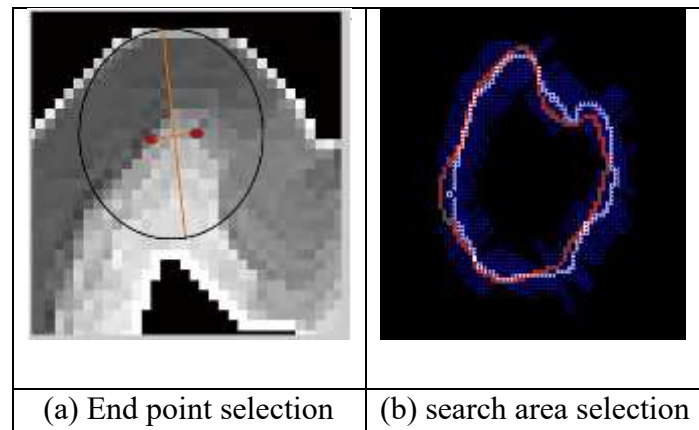


Fig 2 Search area selection & Search area of intensity pixel scale generated from initial contour of MRI image

Fig 3 indicates the segmented tumor by applying preprocessing and morphological operations. The localized tumor is used to extract the initial contour as the input to the proposed algorithm. Canny edge detection method is applied as it improves the signal to noise ratio of the output and provides a better detection of edges even in noisy environment.

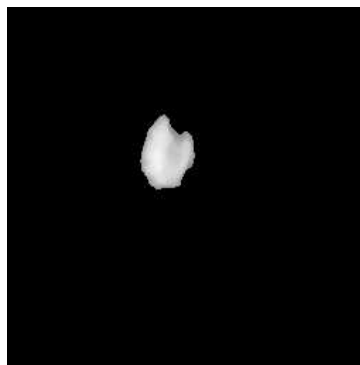


Fig 3 Tumor segmentation result of a MRI

After extracting the rough boundary, the segmented tumor search area is selected as explained in the step B in methodology. The algorithm is optimized by restricting the search area around the initial contour without manipulating the whole MRI scan.

The initial rough boundary was used as a starting point and the gradient level of the search area is checked and evaluated to adjust the boundary accurately. The adjustments were made by considering the gradient level variation in the search space with respect to the considered boundary point.

RESULTS AND DISCUSSION

The main aim of the proposed system is to detect the tumor boundary precisely and efficiently. The MATLAB R2015 was used to implement the system.

The proposed system was tested with sample MRI images given in Fig 4. In order to evaluate the performance, standard indicators of specificity, sensitivity, accuracy and elapsed time are used [12].

Tumor isolation followed by contour detection for sample dataset is presented in Fig 4-6.

Fig. 4 showcase the sample MRI data used to test the developed algorithm. It can be seen that tumors of various shapes and sizes were selected to evaluate the proposed algorithm. Fig. 5 indicates the extracted initial contour for the three sample MRIs. The images were preprocessed and mathematical morphological operations were applied to localize the rough boundary as explained in step A in the methodology. Fig. 6 illustrates the result of boundary extraction by applying the proposed algorithm. The detected boundary is outlined in the original MRI image in red color. The final boundary was evaluated for the accuracy of the output by comparing the results with the expected tumor boundary obtained by an expert through visual inspection.

The results tabulated in table 1 shows the values of the performance indicators of the developed system. To obtain these results the segmented image is compared with a reference image. The accuracy of boundary pixel selection is evaluated by adopting pixel wise criteria. The segmentation results in true positives (TP) which are correctly segmented as foreground compared to the actual tumour mask as well as false positives (FP) where the pixels of the output is falsely segmented as foreground. True negatives (TN) include pixels correctly segmented as background. False negative (FN) pixels comprised of segmentation areas falsely recognised as background.

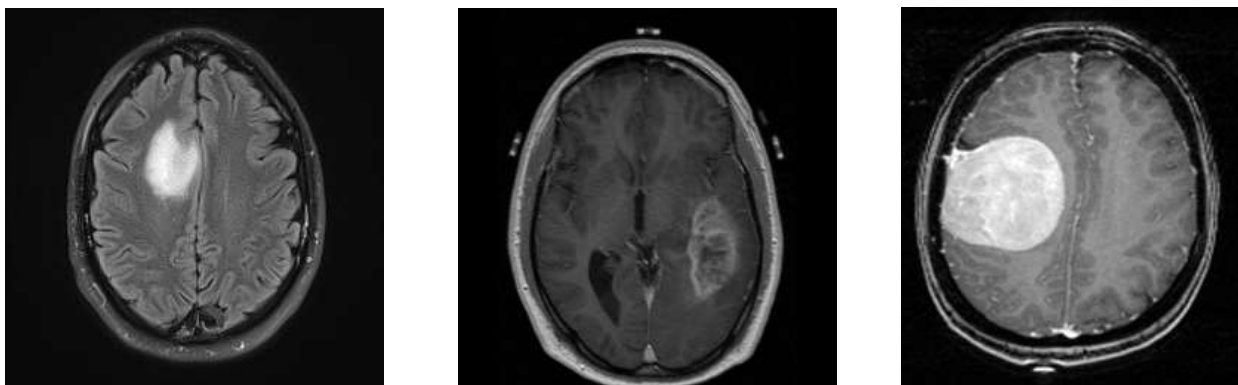
Sensitivity is an indicator representing how well the system performs the identification process and is determined as a proportion of actual positives to the total[9].

$$\text{Sensitivity} = \frac{TP}{(TP + FN)} \quad (1)$$

Accuracy is determined as the proportion of correctly segments areas with reference to the original tumor mask. The percentage value indicates the correctness of the segmentations process, and precise segmentation is indicated by the accuracy values is 100%.

$$\text{Accuracy} = \frac{(TP + TN)}{(TP + FP + TN + FN)} \quad (2)$$

Time taken for the whole segmentation process is determined by the elapsed time in seconds. The time is measured as the using the system clock run in MATLAB environment to produce the final results in 1.7 GHz Core i3 processor.



(b) (c)

Fig 4 : Sample tumor images Tumor A, Tumor B and Tumor C



Fig 5 : Initial contour extraction

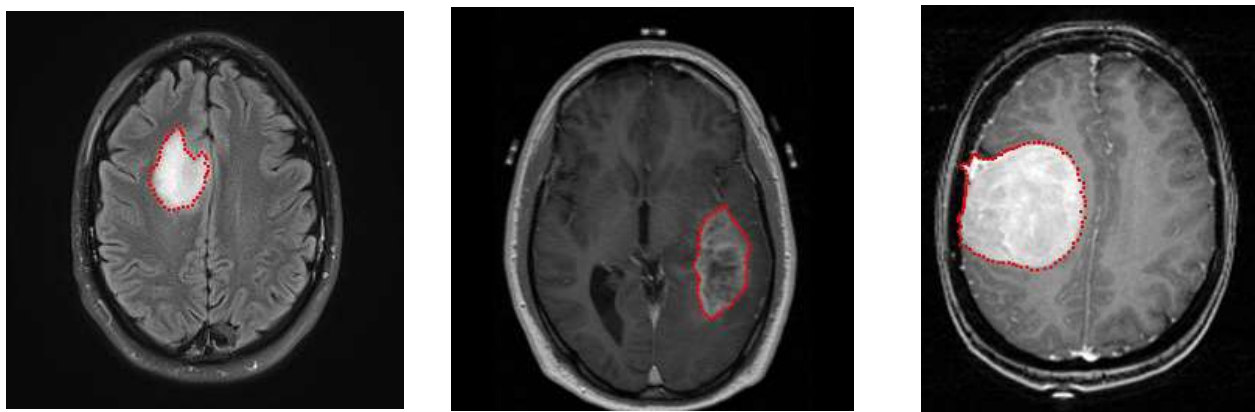


Fig 6 : Final result of detected tumor edge

TABLE I

PERFORMANCE INDICATORS OF THE PROPOSED SYSTEM

image	accuracy	sensitivity	Elapsed time (s)
a	0.9891	0.9601	3.86
b	0.9623	0.8862	2.77
c	0.9905	0.9833	3.03

According to the obtained results the more prominent the tumor is the higher the values of accuracy, sensitivity and elapsed time. Tumors such as MRI (a), (c) which display clear distinction from the background could be recognized easily and accurately. In the MRI image (b) the indicated tumor comprised of more fuzzy edges thus the performance indicated low values compared to others. The elapsed time is higher for the segmentation process becomes higher with the low image quality. From the results it is evident that the proposed system provides clear boundary detection and it can be used as an aid for further treatments.

However, the proposed system performs poorly when the noise level of the MRI is high as it directly affect to the morphological operations while extracting the fuzzy edges of the tumor. Moreover using Otsu's method provides ambiguous results when the image quality is considerably low. Hence, thresholding in a

more adaptive manner might enhance the accuracy. Multi-level image threshold mechanism provided by Matlab performs well with the Otsu's method and helped to overcome with the adaptive threshold selection.

CONCLUSION AND FUTURE WORK

In this paper, a novel algorithm is introduced to detect the tumor boundary more accurately as a guiding aid for medical practitioners. The system identifies the tumor boundary with higher accuracy level for the tumors with clear distinction from the background. Thus, the tumor boundary extracted from this system is considerably reliable than conventional edge detection methods as an automated system. The system can be further modified for the tumors which are having more fuzzier edges. By far deep neural networks, in particular convolution networks are rarely used in boundary detection problems. Hence, in future such neural networks can be proposed for this state of art application. Further this system can be extended for 3D boundary detection of brain tumors.

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Engaging students of Engineering & Technology in positive Group Dynamics using randomly generated Instant Virtual Group (IVG) quizzes

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Abstract

A quiz template is developed keeping in mind the group dynamics to engage and encourage group work activities among E&T undergraduates. The Microsoft® Excel VBA programming was used to create random instant virtual groups (IVGs) and to select random questions. Although the IVG quiz selects group members randomly, yet the programming enables “controlled” reoccurrence keeping the entire class in alert state (i.e. allowing previous members from other groups to reappear and regroup). During the quiz, a small group cooperatively engaged working towards solution and at the end of each quiz question each group member is peer assessed by entire class following pre-set rules of engagement. At the end of quiz, the analyses are auto-plotted showing individual and group contributions flagging out, the best, good and the poor performers. The developed quiz workbook can be easily adopted for the reuse in any group assessment activity by simply changing the attendance list and question bank. The quiz template was used in piloting an epistemological study of various taught modules at different programme levels in various pathways of MEng-BEng and MSc Engineering programmes. The results of a survey analysing the effectiveness of such IVG quizzes using Chi-square test predicted an overall 71% net positive student’s responses with an average above 59% for various programme levels. Furthermore, the data analysis suggested that Level 4 and MSc cohorts comparatively need more tutor support in their group work as they have limited exposure to group dynamics. The significance of eye-contact and positioning of peers in-classroom randomised IVGs were also studied, which revealed that increasing separation between peers and their obscured locations obstructing their eye-contacts show adverse effects on group homotopy recommending maximum five members in an IVG creating effective cooperative communication. The random IVG quiz is tutor centred activity and mainly designed engaging students in-class active learning, and is suitable for small to medium class size of 30-35, nonetheless, large cohort size can be supported by splitting in batches.

Keywords: group dynamics; random group quiz template; virtual groups, electronic voting system; eye-contacts; group homotopy; group homology, Excel VBA,

1. Introduction

Many Engineering & Technology (E&T) graduates having received better grades might face difficulties in real life demonstrating group or team related aspects mainly because they do not get enough opportunities in E&T institutes to engage with people acquiring experience of negotiation; arbitration; conflict

management and leadership qualities necessary for group work or teamwork. In addition, most employers in several job descriptions keep teamwork and/or group work on their top of the agenda and therefore E&T professional and accreditation bodies demand universities to equip graduates with these desirable skills. The Engineering Council UK, engineering professional bodies (i.e., IET, IMechE, RAE, InstRE, RAeS, etc) and leading industry employers insist upon promoting group work activities among E&T students. Recent government's initiatives on university education and sustainable employment can be seen as steps forward in bridging the skill's gap. These initiatives include, introduction of mandatory Degree Apprenticeship Programmes (DAP) levy; and voluntary teaching excellence framework (TEF). In both, DAPs and TEFs, the higher education institutions (HEIs) heavily support student's cause (Crawford-Lee, M. S., & Crawford-Lee, M. S., 2016). Despite some criticism, the TEF will evolve and emerge as a qualitative measure covering various parameters that students care about, including, enhanced quality engaged teaching, promoting collaborative and cooperative learning. In various E&T disciplines, group work activities are designed encouraging students to learn from and with each other in groups where both, students and staff involve in interactive stimulating learning environment. These can be resource intense activities but students truly explore various *group dynamics* enhancing their problem solving capabilities and developing team building characteristics. Group dynamics describe the way members interact with one another. It is a set of behavioural and psychological processes that occur (eventually and/or accidentally) within a group or between groups, include various parameters depending on the nature of groups, learning environment, cultural background, development factors, interrelations with individuals and other groups etc. The positive group dynamics promote team ethos and the poor or negative group dynamics thwart the groupwork performance. Although groupwork and teamwork can be seen as two different entities from 'business' point of view¹ but since both these essentially have same impact on the industry, therefore, in most E&T academic exercises various group and team fundamentals are mixed and their learning outcomes (LO's) are assessed accordingly. Therefore, in this study the phrases group, team, group work and group-work, teamwork have been used interchangeably. Unfortunately, many E&T students do not comprehend the importance of group work and their dynamics in their programme of study but acquire such interdisciplinary knowledge from various group activities, assignment submissions besides achieving subject-specific intended LO's. Consequently, they suffer more when they get trapped individually, encountering confusion; isolation; demotivation; incoherence and learn more about group dynamics from their costly mistakes in

¹ A group may comprise three or more individuals becoming a distinct unit or department working independently of each other to achieve their organisational goals. The members have a shared knowledge of the group's objectives, but specific tasks or responsibilities are assigned to different individuals. In contrast, team members (may be of same size as group) collaborate together on a set schedule achieving the project aims. Teams are often formed for temporary assignments with one specific desired goal. Teams can avoid potential problems early on in a project because team members are actually experts from various departments. For instance, a team of only engineers may create a new product with basic feasibility study, but may not cover more sustainable business analysis (i.e. return on investment, ROI). Therefore, having a finance expert within the team will help the engineers to create an affordable sustainable product in the first place, saving time and resources. Teams can be very productive and rewarding as it involves people with different talents and ideas converting problems into opportunities for innovation. Adapted from Web article by: Robin Fritz, "[Differences between group work & team work](#)".

group work assignments.

This study presents the design and development of randomised ‘Instant Virtual Group’ (IVG) quiz template helping to engage E&T undergraduates in classroom activities to participate and practice various group dynamics without these being mentioned. The quiz generates real-time small random group(s), required number of questions from the given list and the group members cooperatively workout solutions. There is a common consensus on optimal ‘small’ size of a group such that under five will compromise on diversity and interpersonal interaction, whereas with more than eight members in a group, the contribution from some individuals may start declining (Taylor, A., 2011, & Dennick, R, 2004). In cooperative learning, a small group is provided a platform where learners actively participate, respecting each individuals, valuing each other’s contributions and celebrating diversity. The members draw upon their past experience and knowledge, and expected to invest in their own learning. They work together rather than competing with each other. In such interactive environment, sometimes tutor becomes learner and learners sometimes teach. Nevertheless, it is crucial that aim and objectives should be clearly identified and used as a guide. The questions must be relevant, interesting and level appropriate to challenge students’ learning targeting desired skills-set for resolving conflicts as these arise. The IVG quiz template uses a group of five but can be adjusted to any number². The tutor invites selected IVG groups on their turns to discuss their subject specific knowledge and also demonstrating group co-ordination, communication and critical thinking skills. The peer assessment is conducted for each group member at the end of an IVG question session. Finally, towards the end of IVG quiz, the tutor concludes the IVG quiz giving the analysis of each individual’s contributions towards their group achievements, highlighting importance of various factors affecting the group cohesion.

Although there are several offline/online virtual learning environment (VLE) software (i.e. Blackboard®, Moodle®, Canvas®, StudyNet® etc) and third party automated quiz assessment tools (i.e. QMP: TodaysMeet; Padlet; Mentimeter; Kahoot; Quizizz; ThatQuiz; GoConqr; ClassMarker; Edmodo; Scorative, Google-Flubaroo; etc) capable of developing customised professional random quizzes offering instant personalised assessment and feedback but these may not generate instantaneous random groups. The main strength of aforementioned type quizzes is based on pre-set groups and online/offline or in-classroom real-time individual marking and feedback analysis based on electronic voting system (EVS). These are very useful in individual assessments and feedback or statistical analysis of the surveys or comparative analysis of depth of knowledge of an individual. Some of aforementioned quiz tools can be used in simultaneous assessment of multiple groups within a class but it requires use of personal mobile phone devices, generation of several codes, and above all the class-management requires more time, causing disengagement and class disruption. Furthermore, it is not possible to modify or adapt these commercially viable quiz tools for groupwork, engaging a small random group (i.e. five members) in an activity and simultaneously keep remaining (i.e. not participating) groups in state of readiness. Similarly, most of VLEs incorporated quiz

² There is no limitations with generation of the large numbers but the implementation in real class environment puts the bar (*for more details, see Appendix B3*).

tools can be very useful in collaborative learning activities, however, these cannot be used to encourage vulnerable students engaging them in 'face-to-face' in-class group activities.

Equally important is for staff to be more involved in developing and managing students in 'real-time' rather than just relying on resources, staff should get *interactively* engaged in cooperative learning with students since with the advent of live Internet messengers, automation technology, distance learning, on-campus/off-campus, management information systems (MIS) and VLEs are more likely to be integrated as 'all-in-one' product and therefore more courses and their groupwork assessments will be pushed into online 'cloud-based' environment creating fewer opportunities for physical meetings. This is evident from Google for Education, the College Level Examination Program (CLEP) and Massively Open Online Courses (MOOCs) type educational systems predicting a major shift in future E&T disciplines where students may not require to attend the traditional institutions on full-time basis but might physically attend only selected modules for onsite premises few contact hours per week. Many non-E&T institutions have started this migration and E&T institutes will follow sooner, rather than later.

Research suggests that both cooperative and collaborative learnings can be practiced in classroom environment for deep learning using multiple approaches (i.e. individual, group or combination of both). These bring positive results for individuals getting good grades, improved self-esteem and higher motivation. At the same time, cooperative learning helps students becoming actively and constructively involved in deeper understanding of content and take ownership of their own learning, resolving group conflicts, besides improving teamwork skills. Recent HEA survey on student academic experience³, identified that the students value their *collaborative* and *educational relationship* with the university, and students want this relationship to be *personal* (Goold, A., Craig, A., & Coldwell, J., 2008). Therefore, it is crucial for E&T staff to engage students in real time 'face-to-face' small group activities preparing them for professional skills that are more difficult to learn remotely or collaborating online.

The randomised IVG quiz template is user friendly, easy to implement and does not require any complicated software for the operation or restructuring for any taught module. The tutor's input is the key to the delivery mechanism where students benefit from tutor's knowledge, skills and abilities. During the quiz sessions, tutor helps students to understand the importance of cooperativeness and collaboration within the groupwork, team's efforts and consequences of not contributing to the group. Such IVG quizzes were used by the author in an epistemological pilot study encouraging good practice of groupwork in various cohorts and pathways of different programme levels (i.e. Level 4 to 7) in Electronics and Communication systems Engineering (ECE) division. The quiz template was used in different teaching and learning sessions, including, induction week; introduction to module; tutorials on lectures and final revision tutorial for examination preparation, etc. A feedback survey and analysis are also presented in this study supporting the possible use of such quizzes in various taught modules promoting positive group dynamics in E&T students, whilst achieving intended learning outcomes.

³ <http://www.universitiesuk.ac.uk/blog/Pages/What-do-students-want-from-their-university.aspx>

1.1 Literature Review: Group work Design, Assessment and Edutainment system

Several aspects of groupwork can be divided into two main areas. The first thing that any group would consider is 'the product' (i.e., what is the job to be done?). The second one is 'the process' defining how the group should work together. It is important that the group must act as one unit accomplishing all tasks to achieve desired learning outcomes (LOs). In E&T groupwork depending on the objectives of an assignment, both 'process' and 'product/service' related skills must be assessed, and finally the group performance can be translated into grades, -individual; -group; or -combination of both, respectively. For example, in a project or laboratory based groupwork, an assessment comprises of several components for fair and transparent distribution of marks (i.e., literature review, experimental design & planning, analysis/interpretation of results, technical discussions, besides considering personal individual performance, motivation, and communication factors, etc). It is important that the assessment criteria must synchronise all the parameters of three inter-dependent vertices of 'assessment triangle', e.g., cognition, observations and interpretation. Therefore, for any cooperative and/or collaborative type of groupwork, it is necessary to make assessment as a method of reasoning from evidence.

Besides designing the programme specific and level appropriate group activities, the academics have responsibilities to ensure stimulating environment for effective learning. The 'system theory' describes the behaviour of individual(s) within a system putting each individual under spotlight. However, it may not be possible to achieve all the positive group dynamics by just summing up the individual characteristics of each group member but one must address the potential issues associated with the methods of 'engagement' and 'learning', respectively. Furthermore, the sustainable learning involves cycles of 'action' and 'reflections', during which learners should feel accountable and must question their actions, reflecting on their assumptions, and committing to new actions (Wankel & DeFillippi, 2005). Designing *effective* group activities and composing a group with defined roles and responsibilities are crucial to successful product & service delivery (Edward et al., 2006; Palmer & Hall, 2016; Springer, Stanne, & Donovan, 1999). It is more challenging in E&T disciplines to design various interesting, stimulating, value added groupwork activities covering diverse range of applied E&T subjects. In most universities, the tutors, module leaders (MLs) and programme leaders (PLs) jointly develop various strategies and design group work activities and reuse the same developed resources next time around after internal/external moderation process (i.e. ensuing Quality Assurance procedures). It is possible that some tutors may exploit group work to reduce the overall 'labour' required in assessment and feedback, and such abuse can be discouraged if the group work is designed with appropriate assessment strategy, making overall process simple, fun and engaging.

It is widely accepted that the random selection of students in making groups inspires diversity where different cultural backgrounds, gender, expertise, skills, etc are *forced* to work together. Such random selection may comparatively benefit everyone achieving the desired set of specific LOs, besides developing strong bond with entire class, mastering communication skills (Colbeck, Campbell, & Bjorklund, 2000; Rienties, Alcott, & Jindal-Snape, 2014). However, some criticises randomised grouping concluding that few groups may function effectively whilst many may become dysfunctional due to poor group dynamics (Bussman, 2014; Mills, P, 2003; Lencioni, P, 2006). In worst-cases, the student's group leader and/or team members could easily cause potential poor group dynamics (i.e., jokes, bad attitude, distraction, irrelevant

talks, drift or diversion from agenda, monotonous activities, boredom, isolation, low self-esteem, etc). The poor group dynamics and their root causes are well known to educationists who develop strategies making a team functional and cohesive, however, the required level of efforts varies from one discipline to other. The author in Reference (Lencioni, P, 2006) and the *online team assessment product developer*⁴ have worked on a model identifying five dysfunctions of a team, given in Figure 1. The authors concluded that because most group leaders (and managers) are not schooled in the *art of building teams*, therefore if small problems are left untreated then with the passage of time, these misconceptions further lead to conflicts, resulting in massive financial losses and business scandals.

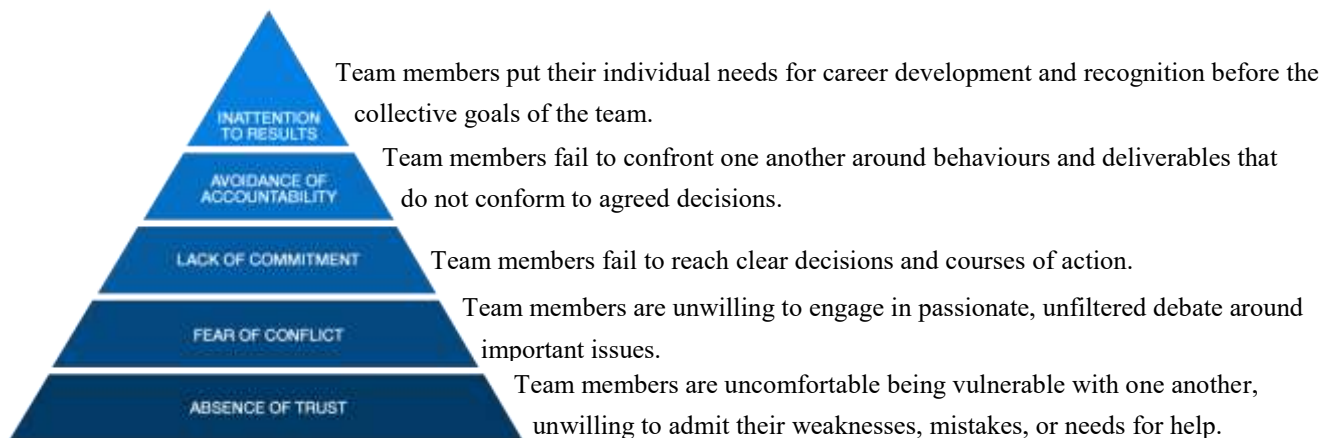


Figure 1. Conceptual model describing five dysfunctions of a team (Lencioni, P, 2006).

The full potential of randomised groups' activities can only be realised if the criteria of marking and assessment are made absolutely clear to both learners and assessor, as well (Council, N. R, 2001). Furthermore, the instructions and guidelines should be 'friendly', level appropriate and moreover the wordings used in the instructions must be andragogic and free from pedagogic jargon.

It is important for students to explore and evaluate their team's characteristics, such as: Strength; Weaknesses; Opportunities and Threats (SWOT). Such analysis helps undergraduates to recognise and convert their weaknesses into strengths by using available resources and opportunities whilst troubleshooting problems (Kashan, 2011; Fine, 2009). The SWOT analysis can best fit with various well-known group strategies enhancing the groupwork. The SWOT analysis can be broken down relating to the most commonly used team building strategy, given in the Reference of (Manktelow et al., 2015).

- i. Know your team (SW)
- ii. Tackle problems quickly with good feedback (OT)
- iii. Define roles and responsibilities (SW)
- iv. Break down barriers (OT)
- v. Focus on communication (S)
- vi. Pay attention (T)

There are several other useful analyses that may be used to define, planning; development and concluding

⁴ <https://www.tablegroup.com/teamwork>

stages of a work (i.e., feasibility study, Gantt chart, etc) or to evaluate team's contributions, such as; 'Pareto's Principle' also known as 80/20 rule suggesting that for many events, roughly 80% of the activities yield 20% of profit. This is widely used in the analyses of contributions and decision making process where it is thought that the ideas within the group are always imposed by one or two individuals. The 80/20 rule may accept some deviation in favour of random partitioning variables such that the sum of two variable remains 100, for example; 90/10 or 70/30, etc (Lipovetsky, 2009). If these two variables are further extended to ratios 60/40 or 50/50 etc, then most of fundamentals will favour the SWOT analysis. These analyses, however are more useful in the final stages of a group work but students must be enlighten about such analyses in their group work in particular for their peer assessments.

Peer assessment involves students taking responsibility for assessing the work of their peers against set assessment criteria. This is more important in group work reflecting on individual's contribution affecting the overall team's achievement. In the proposed IVG quiz, a *formative* peer assessment is introduced encouraging students to explore 'assessment for learning (AfL)' skills, and drilling for their future summative peer assessments. There is enough evidence that such practices benefit most students when AfL principles are implemented in classroom environment (Panadero, E., 2017). With large group size in a classroom environment, the quiet students tend to get less airtime. The same could be true with the small groups if members are widely dispersed in the large cohort size, easily cause poor group dynamics. In such cases tutor should create suitable environment ensuring that every member gets equal opportunities for talking and being listened to. The tutor can easily achieve this during lecture or tutorial sessions by talking and walking through the partitioning space (i.e. gaps) in the classroom whilst uses wireless remote control pointer executing the slides show. Such responsibility is shifted onto 'group leader' for establishing effective communication within the group whilst focusing on the question. However, a group leader has limited freedom in classroom groupwork or meetings (i.e. cannot move away from the desk but can only twist and turn body or neck around) to establish contact with peers. This could adversely affect the group dynamics, in particular the group cohesiveness. The cohesion is an important factor in group work that is multi-faceted process helping to achieve bond between group members, mainly linked to social relations, unity and emotions. In addition, eye contacts and positioning of peers play pivotal role harmonising positive group dynamics. It is a universal truth that eye contact and interpretation of facial expression between two people establish a social link and a conduit for non-verbal interpersonal communication including salient and emotional information. This has been verified in a neuro-scientific study that these two features help synchronising thought process during a live eye-to-eye contact (Hirsch, J. 2017).

During the various trials on randomised IVG quizzes, factors affecting group cohesion were studied and some of these were linked to eye contacts, positioning and physical location of group members. Therefore, terms '*Homotopy*' and '*Homology*' were introduced in the group work analyses to further study their impact on individuals within and across random groups. Their fundamentals are subsets of 'combinational' algebraic topology, which deals with formation of space, shapes and their constructs due to interaction of members. Simply, homotopy can be defined as a *continuous transformation from one function to another*⁵. Two mathematical objects are said to be *homotopic* if one can be continuously *deformed* into the other. For

⁵ Weisstein, Eric W. "Homotopy", <http://www.mathworld.wolfram.com/Homotopy.html>

example, the real line is homotopic to a single point. In IVG *group theory*, homotopy can be extended to characterise the individual efforts (i.e. contributions) to transform into overall group's performance. The term homology (or co-homology) in relation to homotopy can be defined as the '*degree of similarity*' or '*having similar relation*'. In IVG analysis, this term was used considering that all members have had same '*homologous*' status and therefore each member in random selection is interchangeable, and therefore anyone can be randomly picked as group leader. Furthermore, leader has no supremacy but will still be assessed on the same marking criteria. This is further discussed in Section 2.4.1.

Engaging people in groupwork is challenging but at the same time it can be more rewarding and interesting if the learning activities are based on *edutainment system*⁶, creating a system where learners are engaged in learning process without boredom and would still like to continue the process feeling like they were playing their favourite game. Making a teaching session like playing games, motivates students providing stimulating environment and furthermore it enhances their learning if they are offered immediate '*feed-forward*' type helping feedback. Such edutainment type groupwork helps those individuals who may not respond accordingly to pure pedagogical approach or instructions that they do not perceive as engaging. Some approaches given in the references (Neo, M. 2009; Bodnar, C. A., 2016; Takyar, D. K. 2015) encouraged author to develop IVG quizzes employing constructivist learning environment, turning students into 'active learners' and experiencing various group dynamics. Most of the IVG quizzes can be delivered in classroom environment using multimedia screen projector, Microsoft Excel spreadsheets, electronic voting system (EVS) clickers and PowerPoint slides designed with TurningTechnologies®. The tutor and students are engaged as a team exploring domain of the given subject, offering students chance to use their knowledge, presentation skills, testing their abilities, and assessing their peers anonymously. Tutor effectively uses the break time (i.e. gaps) highlighting the importance of group dynamics affecting the team and individual performance.

2. Development and Structure of the IVG Quiz Template

Keeping in mind edutainment system covering most of the aforementioned factors involved in groupwork design and developing assessment strategies of E&T multidisciplinary groupwork activities, a simple IVG quiz template has been developed using Microsoft® Excel Visual Basic for Application (VBA). With little efforts, anyone new to VBA but with basic knowledge of Excel can develop, edit or at least easily run such IVG Quiz show by following the simple YouTube Tutorial videos and guidelines given in the reference (Takyar, 2015; Alexander 2016).

The VBA code for this IVG quiz (*see Appendix-A*) mainly uses random integer number generation command developing a simple algorithm selecting '*m*' members for each instant group from a pool containing a list of attendance with number, '*n*', such that the chosen members may not appear again in the same or even in the remaining groups. The '*N*', total number of groups without repetition is given by $\frac{n}{m}$.

⁶ The Walt Disney corporation created the term "*edutainment*" in 1948 in a documentary "True Life Adventure" combining both "*education*" and "*entertainment*", *Taken from*: Van Riper, A. B. (2010). Learning from Mickey, Donald and Walt: Essays on Disney's Edutainment Films: McFarland, Inc.

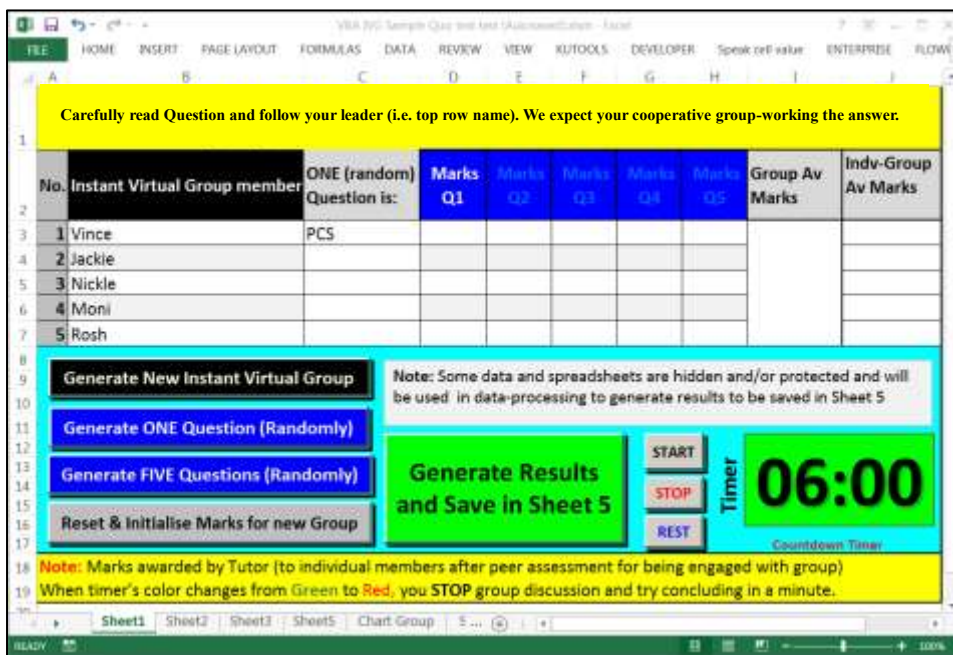
For example, a cohort size of $n=30$ students with $m=5$ members in each group results in $N=6$ independent groups. The same randomised algorithm can be applied to select/display the question(s). It should be noted that VBA code can be constructed with conditional format, for example; when a member of group or questions reach a set saturation level (or a set criterion) then any name(s) or question(s) can reappear randomly but in a controlled manner. In our case, any name or question may reappear randomly (i.e. not more than twice or maximum three times) in the entire quiz session but no duplicates within the same batch or group (see *Appendix B1*). The possible random reappearance of any previous group member into upcoming IVGs keeps the entire class active and in state of readiness. In IVGs, some randomly selected names will reappear in different group setup and capacity (i.e., may be as group leader or member). This helps students to explore their communication skills, abilities, personalities and leadership qualities within and across the group. It is interesting to see that in most cases, sections of the same group that frequently worked together in the same environment may produce radically different group dynamics (Anderson, D. L., 2017). Therefore, this ‘break and make another’ group system truly helps self-evaluation process. The number of members within a group and/or batch of questions in an IVG quiz can be adjusted depending upon the nature of the test (i.e. tutorial, revision practice, etc), type of the teaching module, programme level, cohort size and question bank. Furthermore, for an induction tutorial session, an active dynamic hyperlink can be included in VBA code to link the displayed topic (or question) pointing to the corresponding answer in the spreadsheet by just clicking the question with hypertext link the answer will pop-up in a window (i.e. functioning like an online electronic dictionary).

2.1 Operation of the IVG quiz

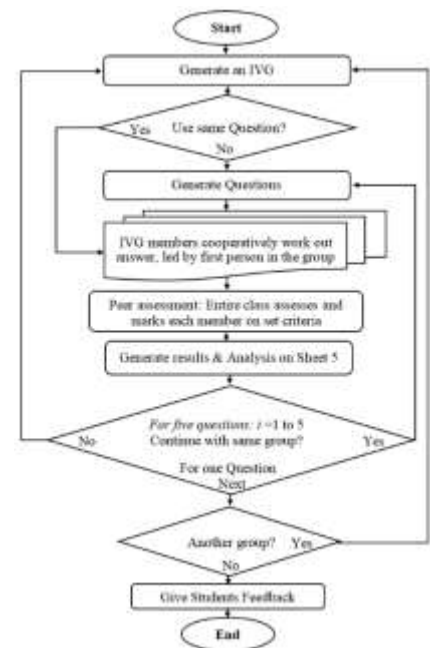
The IVG quiz template can be used in a traditional classroom environment (i.e. tutor centred with student’s desks facing to tutor’s desk and projector display) with a number of students in between 20 to 40 for different cohorts of programmes levels 4 to 7, respectively. The Figure 2(a) shows screenshot of a live quiz where Figure 2(b) gives a flowchart describing operational procedure to run that IVG quiz. There are clickable buttons on the spreadsheet ‘Sheet1’ to generate one group and options for picking question(s), reset, and save results, respectively. A randomised IVG group is generated instantly from the *Attendance list*⁷ at a single click on the button named as “Generate New Instant Virtual Group”. Similarly, random question(s) can be picked and displayed to the group instantly via a single click on corresponding button with a caution that another click will generate a new session (i.e. this caution is applicable to both group and questions as well). In addition to generation of a batch of random questions, another button (not shown in the Figure 2) can be used to generate a tailored sequence of questions from a smaller question bank in ascending sequential order (i.e. 5 to 10 questions, displaying one at a time in ascending order, instead of generating random questions). Such sequential quizzes are useful in assessment of a Tutorial session, where each group may already has worked the solutions. In such a sequential quiz students know the next upcoming task or question and the tutor can invite any member of the group to present the suitable solution. Appropriate Microsoft® Excel settings can be used to enhance the visibility attracting the audience (i.e.,

⁷ For this study, all names and details of students are anonymised and the names appearing here in the ‘Sample’ quiz are the fictitious.

hiding gridlines; rows; columns; headings or formula bar, setting colour-scheme; font's size; adding eye-catching effects such as, colour-contrast; pictures; images; audio/video; animations, countdown timer, etc).



(a)



(b)

Figure 2. The layout and operation of an IVG Quiz: (a) screenshot showing buttons and question's setup, (b) Flowchart describing the working procedure of the quiz.

Due to preset formulas encoded in the respective spreadsheet cells, the individual marked entries in 'Marks' column instantly produce statistics (i.e. group average marks and individual-group marks etc). The single click on large green button saves the generated data of the group in the destination sheet (i.e. in our case it is Sheet 5). Within the group, the name of the person appearing next to the question (i.e. in the same row) leads the group, initiating the discussion and finally concluding the session within allocated time as illustrated in Figure 3 (a) to (d). Only identified IVG members engage in working out the best model solution for the given question. The tutor awards the marks considering peer-to-peer assessment, not for just assessment of the technical knowledge but also considering the leadership, communications and engagement qualities of individuals. The criteria and the protocols are covered in more details in Sections 2.1 and 2.2, respectively, but for simplicity let's assume that the tutor manually enters these marks in the Excel sheet as reflected in peer assessment. It should be noted that 'structure', 'size' and 'display cell location' of the question can be set as desired. For example, question can be displayed in a popup window using message-box option in Excel, or the question can be displayed in the first top row of the Excel sheet as shown in Figure 2(a). In this sample 'Revision Tutorial' quiz, well-known short terms and single phrases from the subject review were randomly picked/ displayed as a 'flash-card' question to the group. Furthermore, these sessions can easily be saved after displaying individual group statistics and producing datasheet or showing comparison of group's performances. Some of these screenshots of similar quizzes are given in *Appendix-B1*. Such displays help providing instant feedback, making activity more stimulating

and turning into healthy competition.

The VBA script uses different *independent* ‘sub’ procedures and ‘for-next’ loops refreshing every time a button is hit, therefore all the buttons function independently, hence the same spread sheet can be used ‘instantly’ in variety of ways. For example, the same instant group can be asked a series of questions being generated instantly, one after the other. Single or multiple questions can be generated and displayed to individuals or to the group as whole, or new group can be generated asking same set of questions that was offered to previous group as illustrated in flowchart of Figure 2(b). The Figure 3 presents a session generating five members for each IVG quiz group and one question, respectively. It shows four selected ‘cropped’ screenshots from an IVG quiz session during a ‘Revision Tutorial’ used for a Level-6 module. It can be observed that some names reappear ‘randomly’ in ten different groups, such as: Jackie, John, Norez and Vince (*for more details, see Appendix-B1*).

No.	Instant Virtual Group members	ONE (random) Question is:	Marks Q1	Group Av Marks	Indv-Group Av Marks
1	Vince	PCS	3	3.6	2.16
2	Jackie		4		2.88
3	Nickie		5		3.6
4	Moni		3		2.16
5	Rosh		3		2.16

(a)

No.	Instant Virtual Group memb	ONE (random) Question is:	Marks Q1	Group Av Marks	Indv-Group Av Marks
1	Jackie	TDM	5	4.6	4.6
2	Casper		4		3.68
3	Goldsmith		4		3.68
4	Norez		5		4.6
5	Ulux		5		4.6

(b)

No.	Instant Virtual Group memb	ONE (random) Question is:	Marks Q1	Group Av Marks	Indv-Group Av Marks
1	Olu	Burst Mode	4	3.6	2.88
2	John		3		2.16
3	Vince		3		2.16
4	Green		3		2.16
5	Tariq		5		3.6

(c)

No.	Instant Virtual Group member	ONE (random) Question is:	Marks Q1	Group Av Marks	Indv-Group Av Marks
1	Elmas	Bluetooth	4	4	3.2
2	Xio		4		3.2
3	Norez		4		3.2
4	John		4		3.2
5	Dolly		4		3.2

(d)

Figure 3. Four selected screenshots showing displayed IVG quiz session in the classroom environment: (a) Vince is leading the group discussion; (b) Jackie is leading the group discussion; (c) Olu is leading the group discussion; (d) Elmas is leading the group discussion.

This random selection with about a minimum 10% repeat option, keeps everyone attentive and prepared for more chances to review their technical skills (i.e., demonstration, presentation and communication etc). It is important not to let vulnerable ‘shy and/or weak’ students demoralised (*see for more details in Section 3.3 Student’s comments*). Therefore, the IVG quiz displays statistics, plots and charts from the generated data encouraging their technical and group engagement activities. For example, bar chart statistics are auto produced displaying the analyses showing individual efforts invested in obtaining the group average marks. This is further explained with illustrative examples in *Appendices B1 to B3*.

This quiz template is specially designed for the tutors to share their groupwork, teamwork knowledge and experience encouraging positive group dynamics in students besides doing regular quizzes. The developed customised template can be reused for any other module by simply copy-pasting ‘Attendance list’ and ‘Question bank’ in corresponding spreadsheets (i.e. ‘Sheet 2’ and Sheet 3’). It should be noted that the attendance list should contain only the names of available participants taking part in the quiz test (i.e. by quickly taking class attendance and excluding absentees from the original cohort attendance list). Any late

arriving student can also be added to the Sheet at any time. The 'Instructions' and 'ground rules' can be included and displayed on the top row of the spreadsheet.

2.2 Rules of Engagement for IVG quizzes

In order to achieve all the positive group dynamics and programme specific learning outcomes, simultaneously, the students would be instructed to consider some useful guidelines while answering any question during the IVG quiz sharing their contributions with the team, For example;

- i. Introduce yourself (communication, presentation)
- ii. Define the Topic (subjective knowledge, self-expression)
- iii. Explain the basic principle behind it, e.g., explain how does this work (fundamental/operation, storyboarding)
- iv. Give practical uses (subject awareness/applications)
- v. Historical background of topic and future aspects (evolution, trend analysis)
- vi. If you do not know the answer then politely decline or ask for more clarity if you are not sure (critical appreciation, self-evaluation)

Individually, students would be expected demonstrating at least any two of the above six points to get pass marks. Other members of the IVG must carefully observe and listen to the speaking member and wait for their timeslot to interact (i.e. none should try dominating the conversation). The members waiting can raise their hands and group leader will invite them to speak in the next available slot. Once all the members have had their turns then the group leader may ask the group to conclude main findings, one-by-one. Each IVG member could give a very brief valid conclusion, about one line or short sentence. The overall time allocated per each IVG could be set as required, depending upon the total duration of quiz session and number of groups. A minimum 5 minutes for discussion/talk plus 60 seconds for concluding remarks was allocated to each IVG for this 'sample' quiz as indicated by the countdown timer (i.e. 6 minutes) in Figure 2(a). The next stage will be to mark each individuals after completing their peer assessment.

2.3 In-class Peer Assessment

The tutor vigilantly observes the entire quiz process where group leader and other members were expected to be engaged cooperatively working out conclusive answer. The tutor also ensures that the rest of the class maintains the set ground rules. At the end of each IVG question, the tutor invites the entire class to assess each group member by casting their 'multiple responses' votes using EVS clickers. In this peer assessment students consider two broad marking criteria, for example; has the member: a) contributed meaningfully to group discussions and following the rules of engagement demonstrated a cooperative and supportive attitude? b) used clear communication and time keeping? and how likely s/he will be welcome to my next group work.

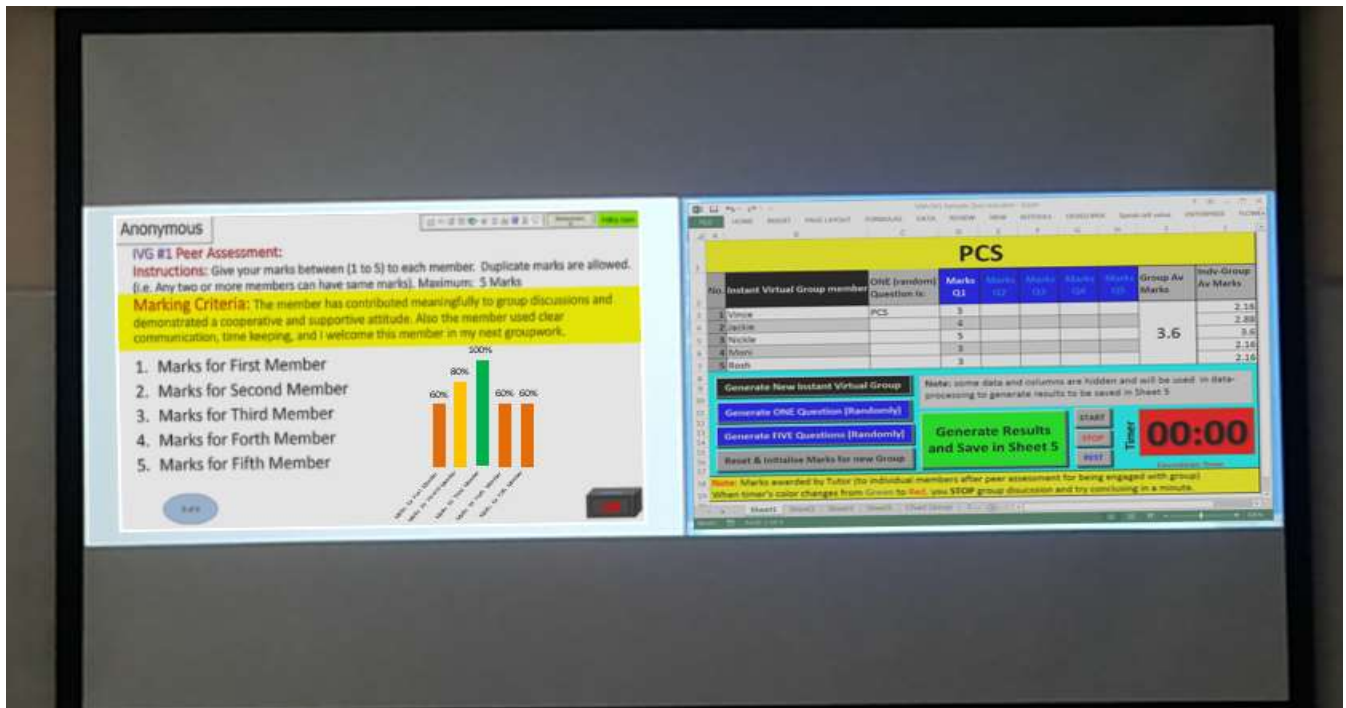
Briefly, the peer assessment includes appreciation of group's efforts related to the communication skills, ability to manage the given task within allocated timeslot. It is noteworthy to mention that instead of particular group members, the entire class participates in the peer assessment process. This *collective* peer assessment was thought useful considering the famous political statement "problems cannot be solved with

the same mind-set that created them”. Therefore, those members who completely failed to achieve the desired LO’s of the group work cannot self-assess themselves immediately after going through a disaster. The group needs to break up, step back, and individually self-evaluate themselves. In collective peer assessment, the entire class acts as a ‘critical friend’ and consistent peer assessment increases metacognition among students where vulnerable are advised to accept peer assessment results appreciating the majority’s criticism.

The peer assessment involving entire classroom using EVS clickers took less than 2 minute² per each group marking each member of the IVG group that were instantaneously and randomly selected using Excel VBA quiz. The tutor inputs these peer assessed marks in the Marks column onto the Excel Sheet 1. The tutor should not involve in arguments as there could be some situations causing nuisance or disturbance (i.e., jokes, laughs, irrelevant/funny remarks/talks, disability, discriminating factors etc). In these circumstances tutor takes control avoiding further confrontation and uses these opportunities converting the poor or negative group dynamics into healthy useful discussion spreading the awareness, highlighting the school/university’s policy about widening participation, equal opportunities, gender discrimination, disability, diversity and the available support in the university. In addition, tutor records individual marks with simple handwritten comments in tutor’s notebook, not showing to students. For example, tutor may not agree with the peer assessed score, hence it is important to avoid the arguments, saving time and maintaining quiz tempo. At the end of quiz session, tutor talks about these differences during feedback session explaining how an impartial assessment can make a clear, tangible difference to the progress of the student receiving genuine feedback.

Figure 4 shows the in-class peer assessment of a group using dual-windows wall-screen projector, each showing the IVG quiz and the EVS peer assessment. The screen projector control unit has several options to select from. After an IVG quiz, the tutor choose ‘two windows’ option, each showing desktop PC for MS Excel IVG Quiz and a laptop EVS peer assessment, respectively. The EVS peer assessment slides were set using priority ranking (i.e. multiple responses)⁸ with duplication enabled, one slide per each IVG group number. It should be noted that the EVS collective score is displayed in percentages whereas the peer assessed marks were in between 0 to 5. Hence a quick conversion table is provided showing appropriate marks in the IVG spreadsheet vs EVS peer assessed scores.

⁸ TurningPoint User guide https://www.albright.edu/itservices/media/pdf/Turning_Point_Clickers.pdf



Quick Conversion Table					
EVS %	= Marks	EVS %	= Marks	EVS %	= Marks
100%	= 5.0	70%	= 3.5	40%	= 2.0
90%	= 4.5	60%	= 3.0	30%	= 1.5
80%	= 4.0	50%	= 2.5	20%	= 1.0

Figure 4. Dual window management displaying two screens on the wall display: Excel VBA-IVG quiz and the EVS peer assessment (also showing a quick conversion table for transferring EVS peer assessed results showing in percentages to IVG marks).

2.4 Implications for Teaching and Managing Students

There are numerous case-studies suggesting group work as essential skills for the graduates, however; the workload on students and staff can be over burden if group work is not monitored or scheduled appropriately according to landscape of the assessment (MY Jamro, 2015). As a matter of fact, a group work requires more time than individual work where a group must develop qualities of a team and finally the staff should assess each component of work accordingly. In group work, the role of staff changes from a tutor to facilitator and hence staff should be more accessible to students than normal. Additionally, the groupwork assessor (i.e. the tutor) should be trained 'psychologically' to handle 'stress' answering the diverse queries effectively during dialogues with various groups as any two groups of students might inquire different aspects and hence expected to respond differently to set pieces of work (Emmer E. T, 2001).

The randomised IVG quizzes were implemented in classroom environment with all participants being present, therefore the IVG groups cannot be compared with any online virtual groups or quizzes where there is no face-to-face interaction between students and the tutor. The IVG quizzes were offered as formative assessment tool exposing group dynamics to individuals (both students and staff) developing

good practice for the future summative group work activities in the laboratory and/or online environment (MY Jamro, 2017). In most cases dealing with collaborative or online coursework submissions, the issues of *lurkers* (i.e. the individuals not actively participating) and *shirkers* (i.e. the individuals who may dodge work, duty, responsibility, etc) are more serious and should be taken care accordingly, otherwise they jeopardise all the group work efforts. It is important not only to identify these abstracted individuals but also to find ways bringing them back into the community as many of these would have been working on their individual 'brainy' ideas, and if inducted appropriately then these could contribute more and become useful part of the E&T business. The IVG quizzes can potentially identify these vulnerable students and pastoral care tutor can counsel them confidentially.

2.4.1 Managing random IVGs In-classroom Cooperative Learning environment

In a standard classroom environment, the size of a virtual group and their seating arrangement (i.e. floor plan) can play significant role in determining the impact on group performance. Most of these may be obvious and self-evident expecting to display known trends, however, since, the IVG quizzes focus on group dynamics, therefore it is important to study various parameters affecting students to share their subject specific knowledge, and pose challenges to judge and practice their communication skills and appreciate peers as 'critical friends'. Some useful information and predictable trends were observed confirming the positive group dynamics for effective communication within the group based on classroom management, and will be presented in this section.

The IVG quizzes were conducted within standard classroom arrangement with teacher-centred layout as shown in Figure 5(a) where tutor had freedom to walk through the partition (i.e. between two batches as identified by dashed line) approaching near to any student within 1-3 meters distance.

Figure 5(b) shows 15 different IVG layouts where group members were interacting in the classroom environment. The coloured borders show the effectiveness of group communication with green and red representing good and poor communication, respectively. The purple colour box represents the group leader where the shaded boxes show the members of that group. Figure 5(c) shows the possible line-of-sight (LOS) constructs of a group where each member can clearly 'see' each other (i.e. establishing effective eye contacts with everyone within the group), while physically located within a closed loop formation. This type of homology can be considered to follow the fundamentals of '*simplicial*' or '*simplicial complexes*' (see more details in Appendix-B3).

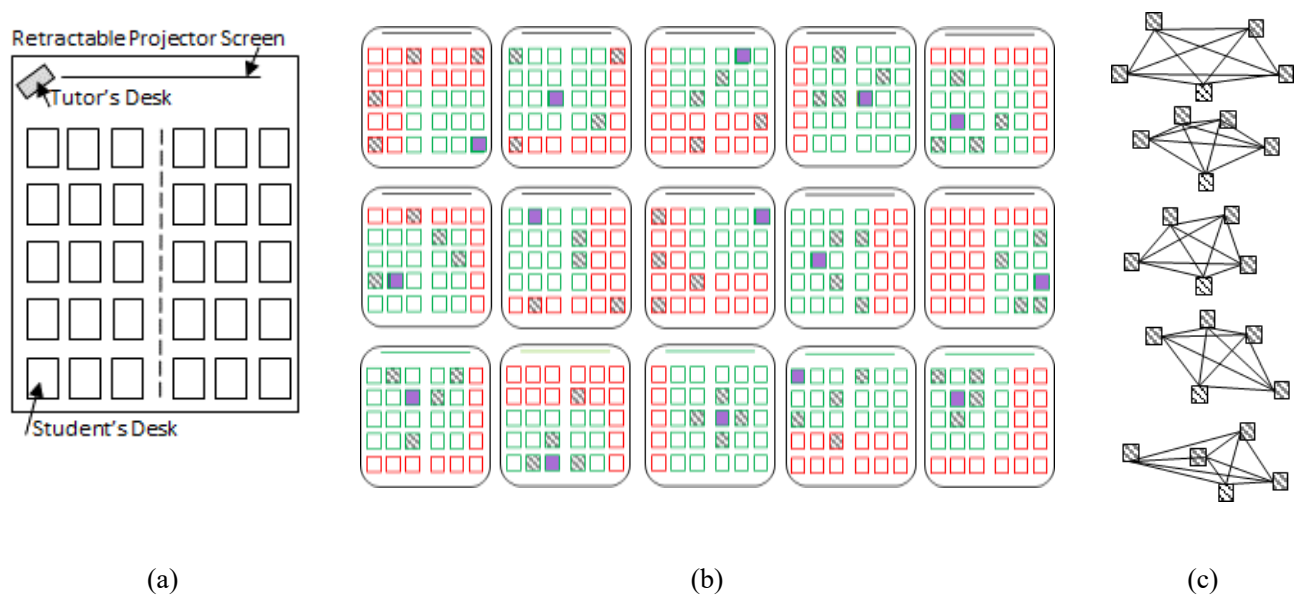


Figure 5. Classroom Floorplan: (a) Standard floorplan for 30 students, (b) 15 different classroom IVG patterns each showing formation of a 5-member IVG, (c) Possible group LOS-homology patterns.

During the operation of IVG quizzes, it was observed that the group members at shorter distances without obstructions and closed to their leader with clear LOS homology exhibited better homotopy as compared to ones at longer distances (or nearby, but being obstructed) who faced some challenges in establishing effective communication. Some of the poor group dynamics were expected in most cases being identified with red bordered cluster of boxes that include, blockade due to disruption and shouting; frustration and aggression in asking to repeat; social loafing due to isolation etc. These ills were ultimately attributed to weak leadership qualities. These patterns were shared with the students during their feedback and reflection session at the end of quiz. It was recommended to students to stay close to each other similar to a roundtable floorplan for any 'physical' group work activity as suggested in the Reference (Brown, M., 2006). This study dealing with homotopy and homology is still under investigation and some of the early results are shared with groupwork enthusiasts in *Appendix B3*.

3. Comparative analysis of the IVG quiz survey

The IVG Quizzes were delivered within the classroom environment for several modules covering Level 4 to 7 of various programmes of study, including, Integrated Masters⁹ (i.e. MEng and MSc) at Level 7 and BEng/BSc (Honours) Levels 4 to 6. It should be noted that UK universities intake direct entry students from national (or local), European and International at Level 5, 6 and 7, respectively. Most of Level 7 MSc cohorts are expected to be international students besides others progressing from previous levels. In fact, it takes time and efforts for the new entrants to adjust within the university system (exploring campus life, resources, learning new VLE and sorting accommodation etc). However, the progression to Level 7 MEng requires minimum upper 2nd class BEng (Honours) qualification to progress from Level 6, and also because

⁹ Integrated Masters are the undergraduate programmes as per IET accreditation.

most of these may have successfully completed their Semester-abroad, Mini-Project module and/or Industrial placement years, therefore they possess thorough understanding and knowledge of the assessment landscape and group work requirements (MY Jamro, 2015). Therefore, in IVG quiz survey for programme, the Level-7 is split into MSc and MEng, respectively to consider their diversity, awareness and limitations.

3.1 Feedback Questionnaire and Analysis

All quizzes used in this pilot study were 'formatively assessed' sessions. There were at least three IVG quiz sessions with same cohort of students for each programme Level 4 to 7 (i.e. induction week, before commencing an assessed group work activity and finally one IVG quiz for the module revision tutorial near to closed book examinations). At the end of the last IVG quiz test (i.e. module revision tutorial) a survey was conducted with students using EVS clickers to reflect their likes and dislikes of the IVG quiz on five level Likert Scale from 'Strongly agree: 1', 'Agree: 2' to 'Strongly disagree: 5' and 'Disagree: 4', respectively, with 'Neither' in the middle with '3' score. There may be two possible ways to interpret the 'Neither' option, firstly, a student has no clear opinion and secondly, if this was not applicable to any of other choices (*see the questionnaire in section 3.1.1 and Appendix-C*). It was observed that some students did not cast their votes as if they were still either undecided or could not find any suitable option to choose from and made notes in 'optional comments' in additional box on the paper copy of the questionnaire. Nonetheless, all participants in formative IVG quizzes were alerted via visible countdown timer included in IVG quizzes. In order to maintain anonymity of the EVS sessions, unregistered ResponseCard RF LCD EVS clickers were used in the survey quiz.

3.1.1 Open-ended Survey Questionnaire

Following eight questions were used in seeking anonymous student's feedback on the effectiveness of the IVG quizzes enhancing their programme specific intended learning outcomes (ILOs) whilst at the same time bringing awareness of group work and group dynamics.

- Q1: I know the difference among Group-work, Group-Individual-work and Individual-work
- Q2: Now I know my weaknesses/strengths and can decide my role within a group
- Q3: I can easily introduce myself to the new members (i.e. even in randomised groups)
- Q4: The IVG quiz helped me to gauge my communication skills
- Q5: I prefer making a group 'ourselves' rather than random selection
- Q6: The randomness of IVG quiz kept me active throughout the test session
- Q7: More IVG quizzes with small summative assessment including feedback will help me
- Q8: I understand 'group dynamics' more than last semester/year

3.2 Statistical Analysis of Survey results

The statistical analyses were carried on recent year's data. The statistical significance was calculated on five-point Likert Scale assuming that the students' responses were considered being positive (i.e. *Overall Agree* = Strongly agree + Agree) and negative (i.e. *Overall Disagree* = Strongly disagree + Disagree), excluding their neutral responses (i.e. Neither) after confirming the null-hypothesis by chi-square χ^2 test

given in the Reference (Comrey & Lee, 2006) using formula:

$$\chi^2 = \sum_{i=0}^{n_l} \frac{(O_i - E_i)^2}{E_i} \quad \text{Equation: 1}$$

Where the terms, χ^2 : chi square statistic, Σ : summation symbol, O : number of observed events, E : number of expected events, i : iteration, n_l : number of pathways or Levels.

The χ^2 test was performed on all 8 questions each for four different programme levels plus MSc cohort. The Table 1 shows contingency data for Survey Questionnaire, describing observed, expected and chi-square statistic for all programmes Level 4 to 7.

Table 1. Chi Square ' χ^2 ' sample data analysis for Questionnaire

Q. No:	EVS* Feedback	Observed					Expected					χ^2 value	χ^2 Test P-value
		Level 4	Level 5	Level 6	Level 7 MEng	Level 7 MSc	Level 4	Level 5	Level 6	Level 7 MEng	Level 7 MSc		
Q1	Neither	4	2	3	1	1	3.419	2.824	3.270	1.041	2.081	0.925	0.598
	O-Agree	20	17	20	6	11	23.000	19.000	22.000	7.000	14.000	1.569	
	O-Disagree	3	2	2	1	3	3.419	2.824	3.270	1.041	2.081	1.193	
	G-Total	27	21	25	8	15	-	-	-	-	-	-	
Q2	Neither	3	1	2	1	2	3.041	2.554	2.554	0.973	1.459	1.267	0.570
	O-Agree	21	19	20	7	10	25.000	21.000	21.000	8.000	12.000	1.336	
	O-Disagree	4	2	1	1	2	3.247	2.727	2.727	1.039	1.558	1.589	
	G-Total	28	22	23	9	14	-	-	-	-	-	-	
Q3	Neither	4	2	1	1	1	1.946	2.432	2.432	0.973	1.338	3.175	0.659
	O-Agree	13	18	18	7	9	16.000	20.000	20.000	8.000	11.000	1.451	
	O-Disagree	3	2	2	1	2	2.462	3.077	3.077	1.231	1.692	0.971	
	G-Total	20	22	21	9	12	-	-	-	-	-	-	
Q4	Neither	3	0	0	0	0	0.811	0.932	0.973	0.324	0.486	8.627	0.563
	O-Agree	17	20	23	7	10	20.000	23.000	24.000	8.000	12.000	1.341	
	O-Disagree	3	3	1	1	2	2.597	2.987	3.117	1.039	1.558	1.627	
	G-Total	23	23	24	8	12	-	-	-	-	-	-	
Q5	Neither	4	2	0	2	1	2.797	2.432	3.041	0.730	1.338	5.931	0.807
	O-Agree	21	18	24	6	10	23.000	20.000	25.000	6.000	11.000	0.505	
	O-Disagree	2	2	1	0	1	1.747	1.519	1.899	0.456	0.835	1.103	
	G-Total	27	22	25	8	12	-	-	-	-	-	-	
Q6	Neither	3	2	1	0	0	1.865	1.703	1.541	0.568	0.730	2.230	0.870
	O-Agree	21	22	18	6	8	23.000	21.000	19.000	7.000	9.000	0.528	
	O-Disagree	2	1	2	1	1	2.147	1.960	1.773	0.653	0.840	0.724	
	G-Total	26	25	21	7	9	-	-	-	-	-	-	
Q7	Neither	1	2	2	1	1	2.270	1.986	2.081	0.662	0.851	0.912	0.831
	O-Agree	22	20	21	7	8	24.000	21.000	22.000	7.000	9.000	0.371	

	O-Disagree	2	1	1	0	1	1.538	1.346	1.410	0.449	0.577	1.106	
	G-Total	25	23	24	8	10	-	-	-	-	-	-	
Q8	Neither	3	3	3	2	1	4.054	3.405	3.568	1.135	1.784	1.416	0.152
	O-Agree	19	20	20	6	8	25.000	21.000	22.000	7.000	11.000	2.630	
	O-Disagree	6	1	2	1	3	4.452	3.740	3.918	1.247	1.959	4.086	
	G-Total	28	24	25	9	12	-	-	-	-	-	-	
Total Attendees		28	25	25	9	15	-	-	-	-	-	-	

* Some respondents chose not to answer (i.e. remain abstain or were undecided and could not click any option and the polling was closed). Some students put their comments in 'optional section' given to them as a paper copy handout.

O-Agree: Overall Agree, O-Disagree: Overall Disagree, and G-Total: Grand Total includes all the favourable and unfavourable respondents.

Each level's decisions were independent and the decision making in rejecting the null hypotheses was based on p -values with standard χ^2 distribution. A standard 5% predetermined level of confidence (i.e. $p = 0.05$) with 4 degree of freedom (df) was used in the calculation, e.g., $df = (n_l - 1)$, where ' n_l ' represents 5 independent programme levels, e.g., Level 4 to 7 plus MSc as separate cohort. It can be observed that the calculated p -values for each question against all programme levels, were less than 1 (i.e. between 0.152 and 0.870) that is much lower than theoretical critical value (i.e. 9.49) for standard conditions, see Appendix-D for more details in Reference (Comrey & Lee, 2006).

The data in Table 1 looks quite cumbersome at first glance, therefore to present the main data in a meaningful manner the *normalised* values in percentages were extracted to plot the trends for the questionnaire. The normalised value as 'net positive responses' being converted into percentage using formula given as under:

$$\text{Net positive responses \%} = \frac{(\text{Overall Agree} - \text{Overall Disagree}) \times 100}{\text{Grand Total}} \quad \text{Equation: 2}$$

Table 2 provides the percentages of net positive responses of entire questionnaire (i.e. all 8 questions), which were derived as normalised values from their corresponding data using formula given by Equation 2.

Table 2. Net Positive Responses for all 8 questions

Q. No:	% Net positive responses					
	Level 4	Level 5	Level 6	Level 7 MEng	Level 7 MSc	Over-all
Q1	63%	71%	72%	63%	53%	64%
Q2	61%	77%	83%	67%	57%	69%
Q3	50%	73%	76%	67%	58%	65%
Q4	61%	74%	92%	75%	67%	74%
Q5	70%	73%	92%	75%	75%	77%
Q6	73%	84%	76%	71%	78%	76%
Q7	80%	83%	83%	88%	70%	81%
Q8	46%	79%	72%	56%	42%	59%
All Qs	63%	77%	81%	70%	62%	71%

Based on data validation using χ^2 test analysis, student's satisfactory trend for each programme level is plotted in Figure 6 showing overall positive responses for various programme levels. If a threshold level of 40% is assumed then it can be observed that all the questions scored 40% or above for all programme levels. However; Levels 5 and 6 were found more thoughtful appreciating overall quiz questionnaire attaining above 70% score for all questions. Students at both these levels know their modules, their expected learning outcomes very well and also familiar with the marking and assessment criteria of various components of their programme of study. Students are therefore keen to explore more, furthering their chances to achieve better grades in their degree programmes. It can be observed that Q1 to Q3 and Q8 show overall less confidence as compared to Q5 to Q7. Since Level 4 and most of MSc intakes are new to the university system and therefore showed overall low confidence in 'group work' activities mainly due to less acquaintance and awareness of available resources. Figure 6 also shows another analysis on the secondary y-axis showing programme of study level-wise average acceptance (i.e. taking the average of responses for same question number for various programme levels). Here Q1 to Q3 and Q8 attain average scores of 64%, 69%, 65% and 59%, respectively.

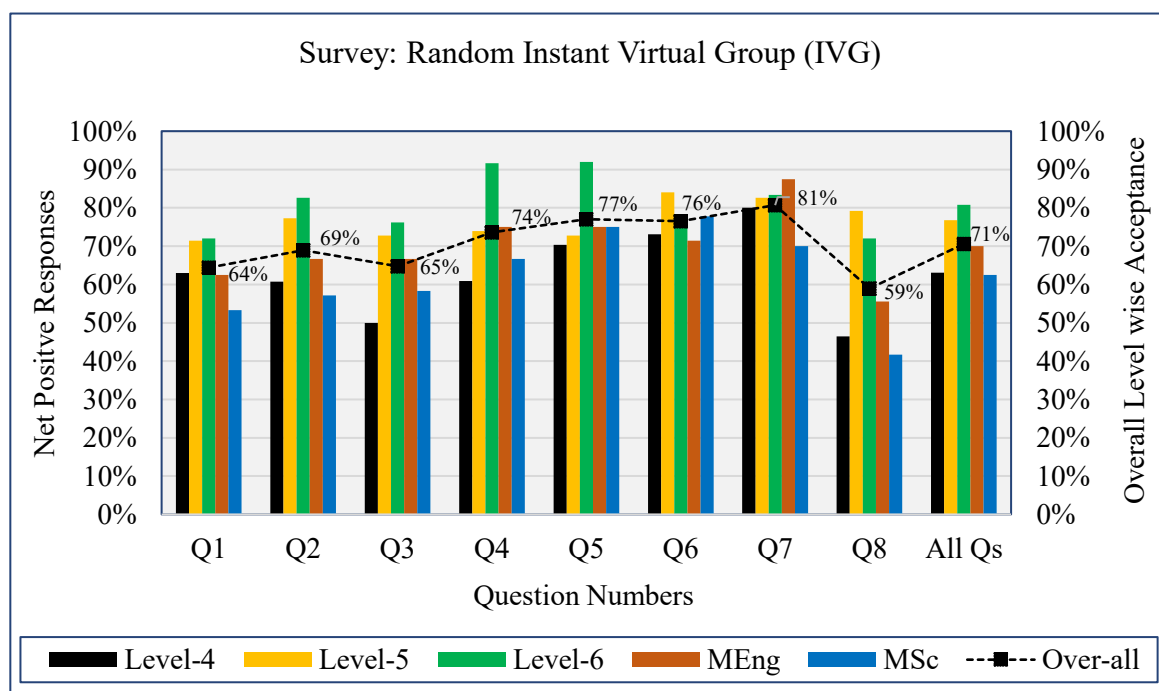


Figure 6. Feedback analysis on Instant Virtual Group (IVG) quiz for various Programme Levels showing Net Positive responses and level of acceptance.

The Q5 to Q7 attain higher average values of 77%, 76% and 81% respectively. The overall average level-wise acceptance for all eight questions remained 71% that showed positive attitude of E&T students towards such IVG quiz activity. The Q8 attained overall lowest average level acceptance score (i.e. 59%) that mainly resulted from Level 4 and MSc scoring 46% and 42%, respectively, who felt either over-assessed due to their more *demanding* weekly assessment landscape of all taught modules in the last teaching weeks of the semester (MY Jamro, 2015) or the scope of such IVG quizzes was not clearly understood. These two pathways (i.e., Level 4 and MSc) are more vulnerable and deserve some edutainment

to engage them in the group work activities. This analysis also does not include the number of absentees and their possible reason(s) to remain abstain in the quizzes assuming that they were not withdrawn from the course and attended their other regular modules. The main reason for being remaining absent may be related to the fact that some students do not give more importance to ‘formative assessed’ sessions or they could be occupied by other coursework due for submission within the same week. This was particularly true for some vulnerable MEng students who were doing their MEng Team project¹⁰ and were not progressing accordingly due to either incoherent group work or leaving things to the last minute and thus accumulated more work towards the end stages of their MEng Team Project.

3.3 Student's Comments

In the anonymous questionnaire, students were asked to provide their ‘optional’ comments to help the programme and modules teams developing more support for cooperative and/or collaborative groupwork related coursework and lab exercises. Although students provided clear score on the questionnaire but their received comments are valued and can be categorised in three main areas: comments about communication skills of individuals within group and their handling; comments about staff and school in delivering and managing the groups; and third category includes mixed responses covering various topics related to assessment and feedback. Some selected comments from each category are presented here. Only spelling errors were rectified and corrected whereas some terms and names were x^{ed} to maintain anonymity or student's natural prejudices.

Comments from Level 4:

“... I could explain things in my way but the time given was short and mostly taken by lead person”.

“... I am not happy with random selection in my group work assignment. Last semester, I could not find my group mates in one of group coursework, surprisingly two were withdrawn and one was transferred to other course. I raised my concerns and managed to submit as one person group ☺ and passed. What's point of such random groups with ghost peers?”.

“.... to be formative assessed and get zero marks is not helpful. Why would I waste my time in the classroom? Please set these as online quizzes and I could better use my contact hours in more productive way, I am a part time student and I want to use my time in most useful way”.

“... IVGs sound interesting idea but many were not ready for such quizzes as very short thinking time was given. The random questions were also challenging and one needs to be either Newton or Einstein to react that fast”.

“... it was nightmare to talk with X people as I could not understand a word. Complete waste of time...I still see that X getting more marks than me”.

Comments from Level 5:

“.... May I suggest to allocate random groups with different set of questions for each group, and come next week for assessment so that groups could workout best solutions”.

¹⁰ MEng Team Project is a 45 credit point's module covering both Semesters A and B.

“... plz make these quizzes summative assessed and let us feel bit rewarded, i.e. people should get paid for their work done”.

“... my opinion was heard and valued in the IVG group. I don't know if the same will work in practice because most of our online chat groups are without face-to-face communication”.

Comments from Level 6:

“... I felt like being named and shamed. May be it's my weakness or I was unlucky in random selection. Anyway, trust me, I am engineer and engineers love doing work. I see politicians talking and engineers working...so I keep calm and continue working!”.

“.... I prefer working with my selected group mates as it saves my time-efforts-energy, because I know what/when and how to reach them”.

Comments from Level 7:

“... I learnt a lot during my placement year. I think groupwork is a 'science' rather than 'art of talking'. We must be taught more about augmentation, negotiation, challenging etc also avoiding dominance of the lead person”. MEng

“... I am new to university and hardly know anyone in the class. This was my first ever opportunity to act as a lead person. I never did this before in my life. I enjoyed it”. MSc

Most of the students' comments were shared with programme committee team working for developing group work. These comments revealed that E&T students truly value their time and efforts and this awareness increases exponentially as they progress to their next level of their programme of study. At the same time, some vulnerable students were unhappy who might have learnt their lessons after getting reduced marks in their group work. Some comments suggested implementing IVGs as online group quizzes, which can be effective collaborative method, however the current IVG quizzes are not ready for VLE integration.

4. Summary and Conclusions

The template development and implementation of a random group quiz were presented. The quiz using Microsoft® Excel VBA, randomly picks a group from the attendance list and a desired number of questions from question bank, instantaneously. The bar charts showing performance of different IVGs awarding individual's efforts contributing to the group marks were auto-plotted displaying various statistics, in particular identifying vulnerable students. The IVG quiz template is designed for formative assessment incorporating peer assessment via EVS clickers engaging students and encouraging group co-ordination, cohesion and individual contributions to produce effective solution of a question. The rules of engagement to participate and peer assessment of the IVG quiz were kept simple and students were engaged in meaningful conversation exposing them to various paradigms of group dynamics. Based on the marks given by their peers the tutor input these in the MS Excel that generated automatically comparative charts. The marks awarded to individuals reflected individual's contributions to attain the achieved average group marks. Thus entire group's full contributions raised the group average marks whereas their poor performance damaged the group marks and consequently each individual received reduced marks. The main idea behind such marking scheme was to educate and engage students promoting positive group

dynamics.

At least three such IVG quizzes were given to various cohorts of MEng/BEng and MSc programme levels 4 to 7 at different times during a semester and at the end of the final IVG quiz, a survey was conducted to analyse the effectiveness of such quizzes. The results were analysed using Chi-square test that revealed that Level 4 and Level 7 (i.e., mostly MSc) are most vulnerable to group work activities and need more tutor support with clear instructions. The net positive responses of students from all programme levels surprisingly were high as 71% whereas the average acceptance level remained above 59% for all the questions appeared in the Questionnaire. These data show that the students liked such IVG quizzes as formatively assessed tests to help preparing for their summative coursework and final examinations, however, some suggested an appropriate portion of overall coursework marks should be associated with these IVG quizzes recognising the value of their efforts and time. Furthermore, some students mainly from Level 4 were critical to the idea since random grouping requires bit more time-efforts dedications to develop effective team and it is recommended that random group allocation should not be used for Level 4 students for their assessed group work, in particular online virtual groups. Nevertheless, variety of group-individual cooperative and collaborative work can be given to students in classroom environment using such IVGs quizzes. Some appropriate fraction of marks (i.e., 30% marks) should be set aside associated with the knowledge and application of E&T, management of group and resources, and remaining 70% marks for the subject specific learning outcomes.

It was also concluded that the poor group dynamics can cause potential issues even within smaller size randomised groups in classroom environment if the formed group is very scattered and members cannot make proper eye-contacts during their group discussion. Such situation may arise when cohort size is larger than 40 or the participants are seated in a wide-spaced classroom. In such of large cohort size, the entire class can be divided into multiple batches and IVGs could still be implemented on rota basis. The impact of cohort size, IVG groups and their obscured location due to random selection was studied using the concepts of homology and homotopy. Some fundamentals and early findings of these concepts were shared with readers, however; these still require further investigation to establish their correlation and variance within a noisy environment.

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Appendices

Appendix-A1 Sample VBA code for generating Random Instant Virtual Group (IVG) and Questions from a spreadsheet. (Note: full VBA code can be shared with the enthusiastic academics on request subject to the University IPRs)

'Copyright © 2017 by M.Jamro@herts.ac.uk All rights reserved. No part of this VBA code may be reproduced, distributed, or transmitted in any form or by any means, including photocopying, recording, or other electronic or mechanical methods, without the prior written permission of the author/publisher, except in the case of brief quotations embodied in critical reviews and certain other non-commercial and academic uses permitted by copyright law. For permission requests, write to the publisher or contact author via email.

```
Private Sub CommandButton1_Click()
'You can also name this button as Group. First we define two variables
Dim i, RowNum
'We clear all the content in column B
Sheets("Sheet1").Range("B3:B7").ClearContents
'We use the 'for next' loop to get our questions for this Sample IVG Quiz. If you want 5 Members use i= 1 to 5
For i = 1 To 5
generate:
'We generate random integers. If you have 100 students in the class then use 100 in the random function. In our test quiz we consider 30
RowNum = Application.RoundUp(Rnd() * 30, 0)
'We want no duplicates within the same IVG group therefore we check with countif
If Application.CountIf(Sheets("Sheet1").[B3:B7], Sheets("Sheet2").Cells(RowNum, "A")) = 0 Then
'If not duplicate we get the question from sheet2 to sheet1
Sheets("Sheet1").Range("B" & Rows.Count).End(xlUp).Offset(1).Value = Sheets("Sheet2").Cells(RowNum, "A").Value
Else
'If number generated is duplicate we generate another random number
GoTo generate
End If
Next i
'We do some formatting of the data in sheet1
Sheets("Sheet1").Select
Range("B2").Value = "Instant Virtual Group members"
Range("B2").Font.Bold = True
End Sub
Private Sub CommandButton2_Click()
'You can name this as Generate ONE question. First we define two variables, these should be different than the above variables used in sub
'commandButton1, otherwise these will generate incorrect values. However to keep the VBA code simple, we reuse the above code and simple
'change the names of variables and their locations in rows and columns
Dim j, RowNumQ
'We clear all the content in column C
Sheets("Sheet1").Range("C3:C7").ClearContents
'We use the 'for next' loop to get our questions for the Sample Quiz. If you want One Questions use 'j= 1 to 1
'as here we just display only ONE questions, hence we use:
For j = 1 To 1
generate:
'We generate random integers. If you 100 questions in your question bank use 100 in the random function
RowNumQ = Application.RoundUp(Rnd() * 100, 0)
'We want no duplicates so we check with countif
If Application.CountIf(Sheets("Sheet1").[C:C], Sheets("Sheet3").Cells(RowNumQ, "C")) = 0 Then
'If not duplicate we get the question from sheet3 to sheet1
Sheets("Sheet1").Range("C" & Rows.Count).End(xlUp).Offset(1).Value = Sheets("Sheet3").Cells(RowNumQ, "A").Value
Else
'If number generated is duplicate we generate another random number
GoTo generate
End If
Next j
'We do some formatting of the data in sheet1
Sheets("Sheet1").Select
Range("C2").Value = "ONE (random) Question is:"
Range("C2").Font.Bold = True
Range("C2").Columns.AutoFit
End Sub
Private Sub CommandButton3_Click()
'We can use earlier defines two variables
'We clear all the content in column C
Sheets("Sheet1").Range("C3:C7").ClearContents
'We use the 'for next' loop to get our questions for this Quiz. If you want 5 Questions use 'k= 1 to 5. But here we just display only 'two
questions, hence we use:
k = 0
For k = 1 To 2
generate:
'We generate random integers. If you 100 questions in your question bank use 100 in the random 'function.
RowNumQ = Application.RoundUp(Rnd() * 100, 0)
'This gets the number generated in column B. We want no duplicates so we check with countif
If Application.CountIf(Sheets("Sheet1").[C:C], Sheets("Sheet3").Cells(RowNumQ, "C")) = 0 Then
'If not duplicate we get the question from sheet3 to sheet1
Sheets("Sheet1").Range("C" & Rows.Count).End(xlUp).Offset(1).Value = Sheets("Sheet3").Cells(RowNumQ, "A").Value
Else
'If number generated is duplicate we generate another random number
GoTo generate
End If
Next k
'We do some formatting of the data in sheet1
Sheets("Sheet1").Select
Range("C2").Value = "TWO (random) Questions are:"
Range("C2").Font.Bold = True
Range("C2").Columns.AutoFit
End Sub
```

```

Private Sub CommandButton4_Click()
    'This will save the data copy-paste in sheet5. Find the first blank cell in the sheet. Copy and 'paste data below it.
    Dim rFirstBlank As Range
    ThisWorkbook.Activate
    '1. Find last used row in destination sheet
    Set rFirstBlank = Worksheets("Sheet5").Cells(Worksheets("Sheet1").Rows.Count, 1).End(xlUp).Offset(1)
    '2. Copy data
    Worksheets("Sheet1").Range("A3:J7").Copy
    '3. Paste data
    rFirstBlank.PasteSpecial
End Sub
Private Sub CommandButton5_Click()
    'We can use earlier defines Five variables. We clear all the content in column C
    Sheets("Sheet1").Range("C3:C7").ClearContents
    Dim m, RowNumR
    'We use the 'for next' loop to get our questions for the Quiz. If you want 5 Questions use m= 1 to 5 questions, hence we use
    m = 0
    For m = 1 To 5
        generate:
        'We generate random integers. If you 100 questions in your question bank use 100 in the random function
        RowNumR = Application.RoundUp(Rnd() * 100, 0)
        'This gets the number generated in column B. We want no duplicates so we check with countif
        If Application.CountIf(Sheets("Sheet1").[C:C], Sheets("Sheet3").Cells(RowNumR, "B")) = 0 Then
            'If not duplicate we get the question from sheet3 to sheet1
            Sheets("Sheet1").Range("C" & Rows.Count).End(xlUp).Offset(1).Value = Sheets("Sheet3").Cells(RowNumR, "A").Value
        Else
            'If number generated is duplicate we generate another random number
            GoTo generate
        End If
    Next m
    'We do some formatting of the data in sheet1
    Sheets("Sheet1").Select
    Range("C2").Value = "FIVE (random) Questions are:"
    Range("C2").Font.Bold = True
    Range("C2").Columns.AutoFit
End Sub
Private Sub CommandButton6_Click()
    'Button Reset & Initialise Marks for New group
    'We clear all the content in columns D3 to H7. All the marks given to each individuals
    Sheets("Sheet1").Range("D3:H7").ClearContents
End Sub
Private Sub CommandButton7_Click()
    'Start timer functionalities
    starttimer
End Sub
Private Sub CommandButton8_Click()
    'Stop (pause) timer
    stoptimer
End Sub
Private Sub CommandButton9_Click()
    'Reset timer
    Sheets("sheet1").Range("i12").Value = ("00:06:00")
End Sub
'Timer beep function
Sub starttimer()
    Application.OnTime Now + TimeValue("00:00:01"), "nexttick"
End Sub
Sub nexttick()
    Dim myValue As Double
    Dim myColor As Long
    myValue = Range("i12").Value
    If Sheet1.Range("i12") = 0 Then Exit Sub
    Sheet1.Range("i12").Value = Sheet1.Range("i12").Value - TimeValue("00:00:01")
    If Sheet1.Range("i12").Value <= TimeValue("00:01:00") Then
        Sheet1.Shapes("TextBox 1").Fill.ForeColor.RGB = RGB(255, 0, 0)
        'Red warning, your group conversation time ended and now got 1 minute to conclude
    Else
        Sheet1.Shapes("TextBox 1").Fill.ForeColor.RGB = RGB(0, 255, 0)
    End If
    starttimer
End Sub
Sub stoptimer()
    On Error Resume Next
    Application.OnTime Now + TimeValue("00:00:01"), "nexttick", , False
End Sub
Function Beepnow()
    Beep
End Function
'Declaration
Option Explicit
Sub createmychart()
    Dim Chart1 As Chart
    Set Chart1 = Charts.Add
    Chart1.SetSourceData Source:=Worksheets("sheet5").Range("I1").CurrentRegion, PlotBy:=xlColumns
    Chart1.ChartType = xlColumnClustered
End Sub
'Error message in reserved cells
Sub ErrorMessage()
    'ErrorMessage Macro
    'Shows an error
    MsgBox "You Must Entre value", vbCritical
    Range("E23").Select
End Sub

'Other VBA codes for full operational IVG quizzes may be available on request subject to University IPRs.

```

Appendix-B1 Example of ‘Sample IVG Quiz, illustrating developing and organising groups’

(a) Ready for marking after assessment (start countdown timer when group is ready)

(b) Finished with marking after peer assessment and ready to save data in Sheet 5

(c) Error message entering accidentally marks elsewhere on the datasheet (i.e. cells are protected)

(d) Error message: entering incorrect marks ‘7’ marks. Only valid numerical values between ‘0’ and ‘5’ are allowed.

(e) Accidental entry in reserved cells is not allowed (i.e. Group Av Marks)

(f) Accidental entry in reserved cells is not allowed (i.e. member 6 does not exit)

Figure B1. Various screenshots of sample IVG Quiz showing execution stages. Note that these screenshots show only ‘One question’ for each IVG group. The data produced after clicking green button will be for one component (i.e., one question) and one leader manages the entire group activity (see more operational details in Appendix B2).

Sheet #1: Assessment and Marking in classroom. Random groups are generated and peer assessed marks are input by tutor in Sheet1. All the data cells are protected, for example; in the ‘Marks’ column, the cells accept only numerical value between 0 and 5 (including decimal point values). To protect accidental or incorrect or forced entry in any in reserved cells will be rejected displaying appropriate warning messages (i.e. Question’s column, Group Av and Indv-Group Av etc).

Group formation and random selection to maximize participation: *Conditional group formation.*

Consider a cohort size, ‘ $n = 30$ ’ participants comprising ‘ $m = 5$ ’ in each group, constituting 6 random groups, ‘ $N = 6$ ’, without repeating, for example: groups, A; B; C; D; E and F, respectively, and let’s call this as the ‘Category-I’. For *surprised* random reappearance of members from all 30 participants, 4 or more mixed

groups can be formed. Ideally, selecting group members from combined two pseudo-random groups (i.e. A and B, etc), hence ' $k = 2$ ' expecting to form 15 possible mutual groups *combinations* of twos, e.g., AB, AC, AD..., EF or combinations of threes, or more, respectively, for $2 \leq k \leq 6$, can be achieved using formula: $\binom{N}{k} = \frac{N!}{k!(N-k)!}$, $k \leq N$. Let's call this the 'Category-II'. For an IVG quiz session, 10 random groups can be selected (i.e. 6 without repeat and 4 with members reappearing pseudo-randomly from mixed groups ensuring that selected random names have not appeared twice in previous IVGs confirmed from Sheet 5). These two Category -I and II are further arranged such that after every two IVG groups from Category-I, an IVG group from Category-II will appear. Therefore an expected order of the ten groups can be observed as under.

Order of IVGs	Category-I	Category-II	Comments
1	IVG#1	-	10 minutes per each group.
2	IVG#2	-	
3	-	IVG#7	The IVGs in Category-I are without repetition.
4	IVG#3	-	
5	IVG#4	-	Category-II contains IVGs with reappearing based on random selection of members from mixed groups using formula: $\binom{N}{k}$ for $N=6$, and $2 \leq k \leq 6$,
6	-	IVG#8	
7	IVG#5	-	
8	IVG#6	-	
9	-	IVG#9	
10	-	IVG#10	

Two hours (i.e. 120 minutes) per Quiz time distribution: 100 minutes for 10 groups (i.e. 10 min time allowance per each group covering, 6 min for co-operatively group working answer; plus 2 min for peer assessment; plus 2 min catch-up/break time) + 10 minutes for final results and analyses/discussion/feedback at the end of quiz session + 10 minutes welcome and switch off time (5 minutes each).

Appendix-B2 Sheet 5 Auto-populating and plotting the results with analysis

Sheet 5 is automatically populated with the data entry in the Sheet 1 by clicking on button 'Generate Results and Save in Sheet 5'. By default, the quiz is set to display up to 10 groups (6, + 4 expecting groups with repetition). More IVGs can be created with conditional repetition of names as explained earlier based on VBA code using combination or permutation. However, any number of groups can be added or set as default subject to availability of in-class contact time. It can be observed from the Figure B2 that few names are reappearing in different groups. If tutor would like to continue the quiz and generate new groups (i.e., IVG#11, IVG#12 and etc) then these will be added in the 'Group Comparison Chart' and also corresponding IVG# bar charts (i.e., these can be seen in the background, also given in more details in Appendix B3).

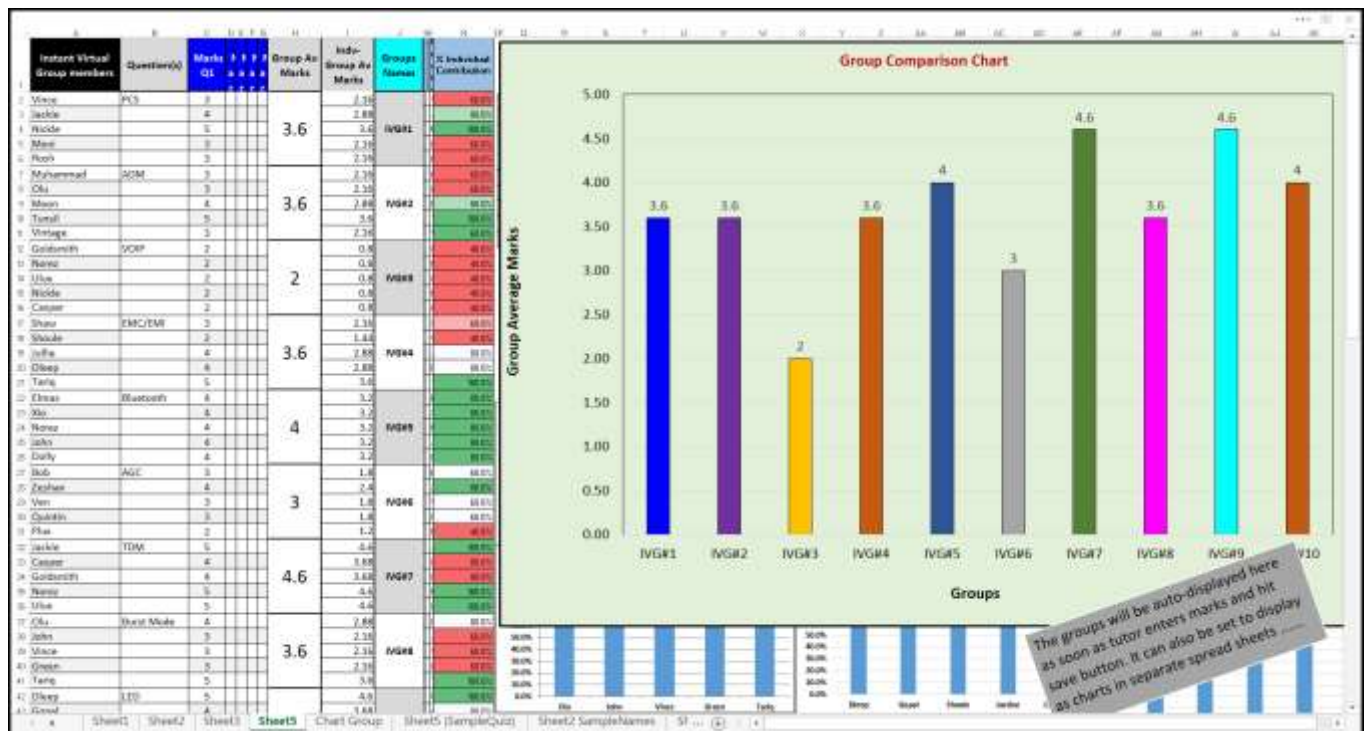


Figure B2. Structure of Sheet 5 to store data and auto-construct various statistics and plot the data to present to individuals and their IVGs.

Scenario #1: Generating only 'One question' for each IVG group on Sheet 1. On completion of allocated slot, tutor invites entire class for peer assessment and awarded marks are input for each individual in the marks column for Q1.

Scenario #2: Generating more than one question. This is suitable to test their leadership qualities. (i.e., challenging each member to lead a different single component of the quiz question). Here, maximum implementable question number can be set between 2 to 5 for each IVG group (i.e. in Excel, columns C, D, E, F and G, respectively, on spreadsheet Sheet1). The names appearing in the each question row-column-A, are the leaders responsible for managing group conversation and final answer to their given questions in column B. The entire IVG group cooperatively workout the answer for Q1 first and tutor invites entire class for peer assessment for Q1. Then moves onto Q2 and onwards. The rest of the process for remaining questions (i.e. Q2 to Q5) will be similar to Q1. This scenario is more time-constraint and challenging, and only suits the assessment with less number but well-articulated questions (i.e. between 5-to-10, instead of 100's short single term or phrase questions) randomly offered to IVG members who may already have attempted the whole assignment but will be assessed on just any one component.

Appendix-B3 Relating Homology and Homotopy with individual contribution and group performance

As given in Appendix-B2 (*Scenario #1*), similar statistical data and bar charts can be provided for each groups showing their individual contribution to build group marks. As shown in Figure B.3, each group is presented with a bar chart showing each member's effort as contribution in percentage making the group-average marks for that group. It also shows traffic light coloured analyses with green, white and red for best, average and poor contributions, respectively. For example, IVG#1 with 3.60 group-avg, Nickle and Jackie show investing 100% and 80% of their individual efforts, respectively, and were green flagged. Other group members, Vince, Moni and Rosh comparatively invested low efforts within the group and came under red flags with 60% each. The IVG#10 shows very promising group-avg marks of 4.00 identifying as all contributing much to group efforts with green flags. All the members in IVG#3 under performed and none showed enough efforts and all were flagged red.



Figure B3. Selected IVGs screenshots from 'Sample IVG Quiz' sessions showing comparison of their individual contributions and resultant group homotopic impact.

The coloured scale patterns are auto produced from chart analysis when a group of cells are selected in Excel for ‘quick analyses. This shows individual performances associated with their group homotopy. A group is said to be ‘homotopic’ such that individual efforts are completely transformed into group contributions. For example, all green (or combination of green and white) flags demonstrate full-homotopy that can be ranked as excellent, better and good, respectively, based on their percentages. However, the red flags in IVGs can be seen as significant threat making a group partial- or non-homotopic affecting the overall performance leading to dysfunctionality. This rank classification is given in the Table B3.1. The card colour on top of the deck represents the ‘group homotopy’ where the layers underneath show transformation based on individual efforts, green, white and red for full, partial and non- homotopy, respectively.

Table B3.1 Homotopy classification and ranks

Homotopy class	Traffic patterns	Ranks and their conditions				
		Excellent	Better	Good	Average	Poor
Full homotopy		all green	more green and some white	some green and more white	-	-
Partial homotopy		-	-	-	combination of all colours	-
Non-homotopy		-	-	-	-	all red

The effective communication among randomised IVG members within a classroom environment can be dependent on physical room area. As a rule of thumb, a regular teaching classroom of 30 students may require a floor space of 45 m² (i.e. length 7.5m × width 6.0m) giving an average of 1.5 m² desk space per single student (this excludes floor space for teaching desk, equipment, partitioning, etc). Therefore, it is expected that an average random group of five could spread onto a floor plan within 7.5 m² to 30 m². The random shape of ‘finite’ *physical space* occupied by a group can be visualised considering various possible combinations of vertices forming triangular shapes based on *simplicial complexes*¹¹.

¹¹ More analytical discussion can be found in the reference Jonsson, J. (2008). *Simplicial complexes of graphs*, (Vol. 3): Springer. <https://link.springer.com/content/pdf/10.1007/978-3-540-75859-4.pdf>, date accessed: 12/07/2017.

Table B3.2 Simplicial complexes and effective peer communication

x -Simplex	0-Simplex	1-Simplex	2-Simplex	3-Simplex	4-Simplex
Diagram (space shape)					
Effective transmission area					
Shape description	single point, vertex	line segment, edge or vertices	triangle	tetrahedron	cell with 5 vertices or pentachoron
Communication	An individual	The mutual understanding between/among peers shown by algebraic Venn diagrams showing intersectional area (i.e. two-way communication), several members require comparatively more synchronisation time for developing mutual consensus or agreement.			

The distance between two members (i.e. two points in space) determines the effective transmission area to establish suitable communication as environmental noise increases *exponentially* with increasing distance. There are various parameters associated with poor group dynamics within and across the groups building 'peer pressure' causing *inertia*. These phenomena are under investigation. Although it is commonly considered that 'two heads are better than one', but things may get complicated when multiple heads are put together. In such cases, various group dynamics must be carefully controlled (i.e. time keeping, conflict management, and convergent conversation, etc). All this requires increasing mental work and more synchronisation time and efforts among peers with increasing number of peers as function of covered space area as shown in Table B3.2. The space takes a regular shape for effective transmission with the shorter radius and if the LOS homology among all members is maintained then the effective communication will take place. The cooperativeness may decrease with increasing number of vertices and triangles, and hence can reduce overall group cohesiveness. For shorter distances, the orientation of triangulation does not affect the homology and therefore the 2-simplex is ideal for consistent homology requiring less sync time as compared to large x -simplex. With increasing number of ' x ', the optimal space spread due to diverse simplicial complexes can be difficult to maintain the *Barycentric* coordinate system, For example; with $x > 4$ most of the peers may be located away from the centre point and these members can easily find themselves blocked and disengaged. However, 4-simplex closely spaced triangles with clear LOS homology and with minimal obstructions still can produce positive results leading to effective group communication among the members. Keeping smaller value of ' x ', all individual efforts can easily be transformed into mutual group contribution resulting more homotopy. Hence, it is expected that an IVG with 4 or 5 members can yield better performance as compared lesser or larger group size.

Appendix-C Anonymous Quiz Survey Questionnaire handed in as paper copy (the similar Questionnaire was set as a PowerPoint presentation using TurningPoint Technologies® EVS quiz)

Please identify your Programme Level (i.e. 4, 5, 6 or, 7 MEng or MSc)		Level 4	Level 5	Level 6	Level 7 MEng	Level 7 MSc
		☐	☐	☐	☐	☐
Read following questions and choose ONE option as your best answer						
Q. No.	Question (Topic)	Strongly Agree 1	Agree 2	Neither 3	Disagree 4	Strongly Disagree 5
Q1	I know the difference among Group-work, Group-Individual-work and Individual-work	☐	☐	☐	☐	☐
Q2	Now I know my weaknesses/strengths and can decide my role within a group	☐	☐	☐	☐	☐
Q3	I can easily introduce myself to the new members (i.e. random grouping)	☐	☐	☐	☐	☐
Q4	The IVG quiz helped me to gauge my communication skills	☐	☐	☐	☐	☐
Q5	I prefer making a group 'ourselves' rather than random selection	☐	☐	☐	☐	☐
Q6	The randomness of IVG quiz kept me active throughout the test session	☐	☐	☐	☐	☐
Q7	More IVG quizzes with small summative assessment including feedback will help me	☐	☐	☐	☐	☐
Q8	I understand 'group dynamics' more than last semester/year	☐	☐	☐	☐	☐
Comments (Optional)	Please write your comments and suggestions to improve our system. Do not write your ID as this is anonymous survey.					

Figure C.1 Anonymous Quiz Survey Questionnaire.

Appendix-D Chi-Square Test (Degrees of Freedom)

Standard χ^2 distribution											
Degrees of Freedom (df)	Probability (p)										
	0.95	0.9	0.8	0.7	0.5	0.3	0.2	0.1	0.05	0.01	0.001
1	0	0.02	0.06	0.15	0.46	1.07	1.64	2.71	3.84	6.64	10.83
2	0.1	0.21	0.45	0.71	1.39	2.41	3.22	4.6	5.99	9.21	13.82
3	0.35	0.58	1.01	1.42	2.37	3.66	4.64	6.25	7.82	11.34	16.27
4	0.71	1.06	1.65	2.2	3.36	4.88	5.99	7.78	9.49	13.28	18.47
5	1.14	1.61	2.34	3	4.35	6.06	7.29	9.24	11.07	15.09	20.52
	Non-significant								Significant		

Figure D.1 Chi-Square Test (Degrees of Freedom).

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Online Education and Teaching Reform on Higher Education Development in China

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Abstract

Lifelong Education has changed the old view of the end of education, and promoted sustainable development of education, which is a strategic goal of social development. Lifelong education exhibit new features to further achieve educational equity with the technical support of MOOC/SPOC. In recent years, teaching reform of applied chemistry profession promoted by Department of higher education has gradually gone deeper, but there are still some problems and difficulties, such as contradictions among basic of specialized subject, teaching hours and teaching content, difficulties of lifting of the teaching content and improvement of teaching quality, which restrict teaching reform process. Teaching practice experience of SPOC in applied chemistry profession is simply introduced, proposing countermeasure for SPOC in college teaching applications designed to enhance the quality of teaching for reference.

Keywords: Teaching reform, Applied chemistry, MOOC; SPOC, Teaching methods

1. Introduction

In 1965, the beginning of the world of lifelong education, adult education French theorist and activist Paul Lengrand firstly proposed the concept of "lifelong education" in international conferences to promote adult education in UNESCO. Educational thought full of vitality in the history of education is in line with the needs of the times and gain a positive response from the international community. Lifelong education covers all kinds of learning activities of acquisition and improvement of knowledge, skills, abilities and qualities, and breaks through the limitations of traditional school education, so that education can be extended to the entire space of human social life to promote the socialization of teaching and learning (Klug et al., 2014).

In the current information age, education time, space and way change with the development of the times. The traditional education concept is overturned, and emergence and application of massive open online course (MOOC) and small private online courses (SPOC) provide lifelong education with a broader platform and opportunities (Duke & Hinzen, 2014). In recent years, some foreign researches on lifelong education mainly focus on sustainable development of lifelong learning, application of modern technology, the role of higher education institutions and foster of lifelong learning concept. As learning forms across time and space in the information age, online learning receives much attention from western scholars, and becomes a huge driving force to the development of lifelong learning. Online learning has a unique

advantage in meeting the diverse needs of all types of learners, in particular in: (i) low cost; (ii) repeated learn, re-watch to understand; (iii) great flexibility in learning time and space. The blended learning is a combination of internet-support virtual space and face to face, which gives important attention from lifelong education experts. Flipped classroom is used and makes innovation of education resources, learning method and changing role of teachers and students.

However, scholars also objectively and dispassionately think world Lifelong Education. In April 2000, World Education Forum in Dakar noted that many young people and adults still do not have the opportunity to learn the culture and the skills and knowledge of employment in necessary for social life. If universal education for all (EFA) does not progress rapidly, the goal of the international community to eradicate poverty will not be achieved. Therefore, inequality between countries will be further intensified. Even now, 15 years later, as one means of achieving international fair, out of poverty, the development of lifelong education has been greatly restricted, which give way to school in resources, ideas and so on. Neoliberal trend reduces social service properties of university, so the evaluation criteria has shifted, papers and student enrollment scores are the main criteria to judge university level. Thus, development of lifelong learning is greatly reduced.

As a new birth of curriculum model, MOOC has inevitably many imperfections. It just can inspire and attract bright minds around the world and their wisdom to solve this series of contemporary issues. As the trend of a kind of network of course, MOOC is ascendant. SPOC is critical and beyond MOOC, but more is supplement and perfect on MOOC (Lin et al., 2015). For nearly a century, the Chinese people are accustomed to follow the West. In education, we followed Westerners, who put forward the "flipped classroom", Chinese school classrooms from primary to universities also went to flip up. MOOC in China has just landed for one year, but many universities want to deny and substituted with the SPOC. This presentation and introduction of foreign cultural and educational way are more harmful to the development of Chinese universities education. SPOC and MOOC are inherently integrated, which not only is an effective strategy for online course development, but also is the only way.

2. MOOC/SPOC in higher education

2.1 MOOC/SPOC is technical support for the development of lifelong education

Universities are an important source of teachers for basic education (Davidson, 2014). The habits and attitudes of lifelong learning in the basic education stage rely heavily on modern teaching teachers' awareness and means. Therefore, the university has to be the cradle, in which educators have the concept and heritage awareness of lifelong learning. The development of MOOC/SPOC curriculum relies mainly on human and intellectual resources in colleges and universities. Rich MOOC provides an inexhaustible resource for lifelong learning. Meanwhile, as a blended learning model, SPOC development makes up disadvantage of MOOC to improve teaching quality and efficiency (Abdiraiymova et al., 2014).

2.2 Thinking of modern professional education

Why must establish MOOC / SPOC Course in the teaching reform process of applied chemistry profession? Applied chemistry profession includes many specialized courses, "Chemical Engineering

Thermodynamics", "Chemical Reaction Engineering", "instrumentation and automation", "Chemical Engineering Principle", etc., which are important courses benefiting for annual average six million of college students. Up to today, more and more teachers and students recognize that the important influence on students' future innovative thinking is not a topic for answer, and more than just a set of instruments will be used, but students' innovative thinking training (Ma et al., 2015). Construction of MOOC/SPOC course can just solve problems of teaching reform of applied chemistry profession. Although the content system of applied chemistry course is clear, but there was still contradictions among profession basic, teaching content, and teaching hours, which has caused a lot of problems, such as teaching purpose is unclear, the facts are more and thinking are less, explain content shallow, just simply explain the concepts, so that many teachers and students have wrong understanding in their minds, which they think this course has a low function, little effect on this specialty. Many reform-minded schools have no ability to reform, and still confused on how to land creative thinking education, and improve the quality of education level of teachers and so on. How to solve the above problems? I believe efforts to make in two aspects: First, to seek the minimum set of teaching content; the second is to take advantage of advanced teaching methods MOOC / SPOC to crack this contradiction (Lue, 2013).

2.3 MOOC/ SPOC is a means of promoting teaching

2.3.1 The support and promotion aspects

MOOC/SPOC is really a mean of promoting teaching. We not only do not exaggerate its role, but also do not belittle its impact. It just takes advantage of advanced information technology to generate learning platform to support teachers teaching. This support and promotion is reflected in the following aspects:

- (1) MOOC/SPOC is the collection and use platform of teaching resources. It can effectively aggregate a variety of teaching resources and teaching outcomes, including: a short video, course guidance document, courseware (PPT), simulation exercises and answers, the topic of discussion, exam and assessment, materials; assignment and completion. These resources can be gathered and effectively used by learner. Teaching effects may be many times greater than the traditional classroom.
- (2) MOOC/SPOC is teaching support platform. Teaching reform involves many aspects, such as individualized teaching, research teaching, teaching process and assessment diversification, etc. The specific implementation of MOOC/SPOC course will make a lot of efforts, which involves effectively automatic data collection, automatic evaluation, automatic results processing.
- (3) MOOC/SPOC is platform of accumulation and management data in SPOCs teaching process. Managers evaluate and improve teaching according to teaching process data, which is an important basis not only for teaching managers to analyze, but also for classroom teachers to improve the teaching process.

2.3.2 The difference of MOOC/SPOC

MOOC is a sharing mean, and SPOC is a student management mean. For the social community and students, there is a difference in teaching activities. From the perspective of openness, the former emphasizes on public and open, while the latter emphasizes private, open only for several classes; from the perspective of learning requirements, the former is interest-based learning, the latter is learning the predetermined content;

from a supervisory point of view, the former is conscious, unsupervised learning, the latter is semi-conscious and supervised learning; from the student level, the former includes all levels, the latter is basically at the same level; from the perspective of the responsibility of teachers, the former teachers have no responsibility, that is, the Students can decide their own learning, while the latter teachers have the responsibility of that every student must successfully complete the study and gain credits (Barak et al., 2016). MOOC is a ruler, while SPOC is a distinctive means of the ruler. For different levels of students, teaching requirements and methods are not the same (Malliga, 2013). For example, good students so easily accept the teaching content that they can learn more content in the certain, while the weaker students may understand the content over again, so as to must compress teaching content to improve student acceptance in the same hours (Watson et al., 2016). Due to similarities and differences, the combination of MOOC and SPOC is needed. MOOC course content can be built as a ruler, and the SPOC course content may be built based on MOOC rule, which may be higher or lower than the "ruler". The so-called "ruler" refers to the complete contents of a curriculum, which should be taught with the depth and breadth degree. The "distinctive" is reflected not only in the content selection, but also in the teaching methods with the same content for the different levels and specialties students.

MOOC courses can (i) ensure the teaching quality, (ii) ensure the students to receive high-quality curriculum in the case of different level of teachers with the purpose of contribution to educational equity, differentiated instruction for different levels of students, and specialties teaching, and (iii) fully mobilize the enthusiasm and initiative of students and teachers.

2.3.3 The difference from flipped classroom

MOOCS / SPOCs provide students with a second class - network classroom, and the first classroom refers to the traditional classroom (Lage et al., 2000). Many people will understand MOOC/SPOCs as "flipped classroom", that is, "teaching and learning" in the traditional classroom and "Discussion and Q & A" after-school are overturned. I believe that flipped classroom is conditional, firstly, the students are confirmed to complete the learning contents prescribed by MOOC /SPOCs; Second, small classes or small groups are more conducive to teach or discuss. For good students accustomed to discuss and ask questions, better effect is achieved through flipped classroom, while students with the weak foundation and less willing to ask questions in class, flipped classroom can affect their interest in learning. The survey in our school shows that students still want teachers to "talk ideas and outline, stress the focus and difficulty of processes and simulation, use less term and list more sample, adopt interactive form with questions and discussions in the classroom, and so on.

But whether or not flipped, classroom teaching mode should be changed. Several teaching mode can be selected, such as "classroom-based, network-supplemented" "classroom-supplemented, network-based," "online and offline complementary mode" and so on. Specifically, (i) the complete teaching content may be placed on network platform, and students can freely choose what to learn; classroom teaching select less and fine content for detailed lecture, so that try to take care of most students. (ii) Online teaching is more suitable for the fragmentation of knowledge to concisely explain the difficulty of the content, and offline teaching should be more emphasis on the idea of the content, explain the difficulties of content through

interactive communication to guide students to learn more network course. (iii) Online Class is more suitable for self-learning with freedom of learning space and time, while the small classes can easily carry out discussions and exchanges, the shows of results and reviews to promote independent learning. Currently, blended teaching model based MOOC/SPOCs have been considered to be the future direction of education reform in universities (Yuan & Powell, 2013).

2.3.4 How to build MOOCS / SPOCs courses?

Many ideas and suggestions are as follows. (i) More school may construct open courses of MOOC and SPOC Share combination. In terms of our practices, I think that a complete course consists of two dimensions. The horizontal dimension is the complete course content recognized by everyone and content division; the vertical dimension for the same course content is course resources of same or different categories constructed by teachers in different the schools. This established a complete teaching resource library open to all teachers and students. (ii) Construction of courses is suitable to learner of different classes and levels. I recommend that the same course may be constructed into courses adapt to the learners at different levels, so that MOOC is not only "universal" but also "high-level". The word "universal" refers to that all learners can be harvested, and "high-level" refers to the level of the course cannot be reduced, reflecting the breadth and depth of the curriculum. Students can study in the same course, depending on their interests and learning process to autonomous, dynamic select beginner, intermediate or advanced class. In other words, learner only select courses level before graduation. Beginner, intermediate and advanced classes are covered complete course content, but the video may be different in depth, the end assessment is also different.

3. Teaching Reform Practice of SPOC Course

Author and teaching team opened firstly SPOC course "Chemical Engineering Thermodynamics" in self-development self-learning platform of applied chemistry courses. That is the first large-scale SPOC teaching practice. Teaching platform is divided into six parts including instructional videos, electronic courseware, assignments, online testing, discussion, performance records. Teachers can maintain and update the featured content of the course in the background (Massyrova et al., 2015).

In our school, applied chemistry profession has four classes for about 200 students; each class is divided into about 10 groups with about five people in a group. "Chemical Engineering Thermodynamics" Course opened instructional videos for 30 times, shared electronic courseware of seven chapters content (PPT) with corresponding to online test-questions, as well as total simulation exercises. Students can propose their own discussion topics, also be guided by the teachers. Unlike typical SPOC courses, our self-learning platform shows the main features that each group prepare their own courseware PPT, and then uploaded to platform for all other students to learn, and also prepare the corresponding exercises, while in the classroom teaching process, part of chapters in the course can be taught by the student; other students can ask and discuss questions. This formation of teaching atmosphere conducive to provoke students' interest in learning and develop their comprehensive ability, such as students' self-learning ability, cooperate ability, making courseware ability, speech skills and so on. In addition, the platform set up a "Student Guide" to

provide students with the learning content and methods, and set a number of discussion topics combined with online and offline teaching / learning manner, such as "I have some recommendations"" my feelings for this lecture "and so on.

4. Conclusion

Further development of MOOCs obviously is inseparable from technological innovation. Online courses are new forms of teaching developed in the new space-time Internet. Its vitality is clearly subject to impact and constraints from Internet technology. Over the past decade, the structure, function, and the service level of the Internet has greatly improved, and the operating costs continuously reduce, in particular applications of cloud computing, wireless networks, intelligence and other new technologies in the Internet improve humanity, visualization, mobile and intelligent level of the network. This brings a strong impetus to enhance the quality of online courses. On the other hand, we must also recognize that MOOC also exacerbated the "digital divide", manufacturing a variety of "islands of information", exacerbating polarization between prestigious universities and general universities. In addition, MOOC cultivate and foster a new generation of network learners, but also produce a large number of Internet addicts. The terrible negative impact on the education information cannot simply be attributed to the information itself, and we must reveal deep Root in the objective and impartial manner.

The past 15 years, Chinese teaching reform in university courses and higher education information technology has already been done through a lot of practice and theoretical exploration, which has accumulated rich experience and profound lessons. Therefore, we should adopt neither a nihilistic attitude, nor blindly optimistic attitude. As the trend of curriculum reform in worldwide universities, MOOCs should be looked as a qualitative change in the University Teaching. Chinese policy-makers university leaders, academic leaders and the teacher teams of quality courses must get down to seriously study and research. Chinese universities can truly get profound understanding to real change for the world universities, which is extremely important for Chinese universities to the world stage in the 21st century.

Acknowledgements

The research is supported by a Project Funded by the Flagship Major Development of Jiangsu Higher Education Institutions (No. PPZY2015B113) and Teaching Research Project of Yancheng Teachers University(16YCTCJY042).

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Developing and Validating Standards for Clinical Learning Environment at Nursing Faculty.

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Abstract

Background: In recent years, there is an increasing interest and concern regarding the role of the learning environment in undergraduate nursing education. **Aim:** The study aimed at developing and validating standards for clinical learning environment at Nursing Faculty Mansoura University. **Design:** A methodological design was utilized. **Subjects and methods:** The study sample composed of three groups: clinical instructors group, expert (jury) group and students group. Data was collected by using three tools: An Opinionnaire sheet to check face and content validity by jury, Questionnaire sheet to identify the importance of the developed standards from clinical instructors, nursing student's opinion and observation checklist to test the applicability of developed standards. **Results:** The study results revealed that the proposed standards were agreed upon their content and face validity by majority of jury experts. There were statistically significant relations between opinions of students and clinical instructors about importance of structure standards. **Recommendation:** Using the standards and criteria developed for clinical learning environment as strategies to improve nursing training and clinical learning. The faculty laboratory and training environment should prepared with adequate supplies and equipment required for each student for training.

Key Words: Clinical learning environment, Nursing Faculty, Standards, Validation.

Introduction

Nurses represent a very important component of the medical team. A poorly graduate nurse might not just hinder the team's effectiveness, additionally cause inferiority health care. Clinical learning lies at the center of nursing education that aids to organize students for the type of work they'll must to be compelled to do as professional nurses. Moreover, actual world clinical expertise permits nursing students to improve their skills. So, clinical learning permits nursing students to become skilled staff (Eta et al., 2015).

Learning within the clinical atmosphere provides students with early and intensive clinical experiences throughout their coaching considering that nursing is practice-based profession. Clinical learning environment is that the place wherever student nurses are well-informed for the fact of their qualified duties. Students learn in environments wherever they're nurtured. They respond when clinical instructors have specific and well structure approach and that they will simply communicate with them as a result of they're mostly rely on them in the clinical learning

situation (**Kaphagawani & Useh, 2013**).

There's a gap in merging theory to training that has been of concern for a prolonged time in nursing education that have an impression on students learning in clinical skills (**Kelly, 2007**). Many studies have showed that few clinical settings are ready to offer student nurses with an effective learning environment. The main target in clinical environment to develop clinical academic standards and capabilities designed for enhancing students' information and to market their practical experience (**Mousa et al., 2012**).

A standard is a document that has necessities, qualifications, indicators or characteristics which will be done systematically to make sure that supplies, goods, procedures and facilities are suitable for their goals (**CEN-CENELEC Management Centre, 2016**). It is an extent of what's expected to occur during the present or anticipated situations. The purpose of a standard is to achieve a reliable basis for individuals to share identical expectations for product or service. Also, outline terms so there's no confusion among these ones applying the standards (**Fazal, 2011**).

Significance of the study

The quality and well-being of health care may be a worldwide concern. These concerns are relying on skillful individuals and adequate resources being accessible on clinical setting. Definitely, this lack of management within the environment is what makes it a worthy and significant learning expertise; however, it additionally creates threats to quality (**Koontz et al., 2010**). As a result, there's a great need for standardize clinical learning environment that has social, emotional and skilled support to reduce anxiety and build positive learning experiences and successively facilitates demonstration of clinical competency (**Berntsen&Bjork, 2010**).

Aim of study

The aim of the present study was to develop and validate standards for clinical learning environment for nurse students at Nursing faculty, Mansoura University.

Research hypothesis

H1: There is a significant difference among clinical instructors and nursing student's opinion on the importance of choosing clinical learning environment for students.

H2: The proposed standard will be applicable in the clinical learning environment for students.

Subjects and methods:

1-Study Design: -

A methodological design was used to carry out this study.

2-Setting: -

The study was conducted at faculty of nursing, Mansoura University. The faculty of nursing was established at 1994, it consists of eight academic nursing departments (Adult Nursing, Critical Care Nursing, Maternal and Gynecological Nursing, psychiatric and Mental Care Nursing, Nursing Administration, Pediatric Nursing, Gerontological Nursing, Community Health Nursing).

3- Subjects: -

The study sample composed of three groups namely expert jury group (31), clinical instructors group (114), and students group (331).

4-Tools of data collection: -

Data collected through using following three tools:

1-An Opinionnaire sheet: This tool was developed by researchers based on literature review (**American Nursing Association (ANA), 2010; Chan (2002)**) and aimed to test face and content validity of the proposed standards by jury experts. It includes two parts :**The first part** was developed for data related to demographic data of the jury experts such as: age, experience years and specialty. **The second part** related to validity of the proposed eight standards divided into three parts as: structure(4 standards) , process(3 standards)and outcome standards(1 standard),all of them with 37 related criteria.

Scoring system: (Jecklin, 2004)

- For face validity: the response was either agree or disagrees. 2=agree and 1= disagree.
- For content validity: the response was either Yes or No. 2 = Yes and 1 = No.
- The sub-items with 60% agreement or more than 60% was considered to agree upon and valid.

2-Questionnaire sheet: This tool was developed based on statistical analysis of jury opinion regarding content and face validity and necessary modifications were done and aimed to identify the importance of the proposed standards from clinical instructors, nurse student's viewpoints (clinical instructors including demonstrators and assistant lecturers, nurse students). It includes two parts: **The first part** related to demographic data of clinical instructors as: age, qualification and years of experience department. Demographic characteristics of students as: age, gender, academic level. **The second part** related to clinical instructors and nurse students opinion upon the importance of proposed 8 standards and 36 related criteria due to omission of one criterion based on statistical analysis of jury opinion.

Scoring system: (Jecklin, 2004)

- The response was either important or not important. 2 = important and 1 = not important.
- The sub-items with 60% agreement or more than 60% was considered to agree upon its importance.

3- Observation checklist: It was developed by researchers and aimed to determine the applicability of developed standards. It contains two parts: **The first part** was related to observation date and the observation period. **The second part** including 8 standards with 36 criteria and their sub criteria.

Scoring system: (Jecklin, 2004)

- The response was either applicable or not applicable. 2 = applicable and 1 = not applicable.
- The criteria with 60% applicability or more than 60% was considered to be applicable in clinical setting.

5-Validity and reliability:

The data collection tool reviewed by 31 experts from faculty of nursing at Mansoura University to test face and content validity of tool. The tool tested for its reliability by using Cronbach alpha test. It was 0.86.

6-Pilot study:

A pilot study was carried out on 10% of 3 studied groups (jury experts, clinical instructors, nursing students) were randomly selected to test the clarity, feasibility of the tools and necessary modifications were done accordingly.

7-Fieldwork:

It was started from the beginning of February 2016 to the end of June 2016 through the following four different phases:

First phase: It was characterized by the development of the standards guided by literature review and an opinionnaire sheet was developed by researchers. Tool was distributed to be filled by jury experts in their work setting for testing face and content validity of the proposed standards.

Second phase: it was characterized by the development of a questionnaire sheet based on the results of expert's validity of the proposed standards. This sheet was distributed to participants (clinical instructors and nurse students).

Third phase: The researchers designed observation checklist based on the developed standards. It was used to check the applicability of the developed standards with their criteria, through observing the clinical learning environment.

Fourth phase: it was characterized by the development of standards for clinical learning environment based on the results obtained from opinionnaire sheet and questionnaire sheets.

8-Ethical Considerations:

- Ethical approval was obtained from the research ethics committee of the Faculty of Nursing – Mansoura University.
- An official permission from the dean of the faculty of nursing to conduct this study.
- Privacy and confidentiality of the collected data were assured.
- Participation in research is voluntary and Participants were assured that withdrawing from the study was at any stage without responsibility.

Statistical Analysis

Data entry and statistical analysis were done using Statistical Package for Social Science (SPSS), version 21. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means and standard deviations for quantitative variables. Chi-Square (χ^2) test was used to test association between variables. F value of ANOVA test was calculated. Correlation coefficient(r) test was used to test the closeness of association between two variables. Statistical significance was considered at p-value <0.05 while, p-value of <0.001 indicates a high significant result.

Results

Table (1): Demographic data of jury experts (n=31).

This table shows that more than half of expert group (53.3%) aged <40 years old. Regarding specialty, 20% of them are Community health specialists and lower percentage 6.7% are obstetric specialists. Concerning years of experience, shows that more than half of expert group (53.3%) had <15 years of experience, while 46.7% were ≥ 15 years of experience.

Figure (1): Opinion of jury experts about content and face validity of the preliminary questionnaire (n=31).

This figure shows that 90% of expert group agree about applicability and measurability of preliminary questionnaire and 93% of expert group agree about relevance and face validity of questionnaire.

Table (2): Demographic data of the studied clinical instructors (demonstrators and assistant lecturers) (n=114).

This table shows that, regarding clinical instructors age, all demonstrators aged from 23-<30 years old while more than half of assistant lecturers 57.5% aged from the same age with highly statistically significant relation $p = 0.0001^*$. The high percentage of demonstrators 95.5% and 74.5% of assistant lecturers are females with statistically significant relation $p = 0.001^*$. As regards to specialty the high percentage 17.9% of demonstrators and 19.1% of assistant lecturers are Medical-Surgical specialists. Most of demonstrators 79.1% had 1-<6 years of experience while, 66.0% of assistant lecturers had 6-10 years of experience with highly statistically significant relation $p = 0.0001^*$

Table (3): Demographic data of the studied nursing students (n =331).

This table shows that 47.4% of the studied nursing students had 20 years old with 2nd academic level while 21.5% had 21 years old with 3rd level and 84.6% of them are females.

Table (4): Opinion of the studied demonstrators in comparison with assistant lecturers about the importance of standards for clinical learning environment (n=114).

This table concluded that, 98.5% of demonstrators and 97.9% of assistant lecturers agree about the importance of structure standards (all of both groups 100% agree about Standard 2. equipment and supplies and Standard 4. clinical policies with 98.2% of total agreement. Regarding process standards, 97% of demonstrators and 97.9% of assistant lecturers agree about its importance with 97.4% of total agreement.

Table (5): Opinion of the studied clinical instructors in comparison with nursing students about the importance of standards for clinical learning environment (n=445).

This table shows that 98.2% of clinical instructors (100% of them agree about Standard 2. equipment and supplies, Standard 4. clinical Policies). While, 95.5% of nursing students agree about the importance of structure standards (97.3% of them agree about standard 3. Manpower, standard 4. Clinical Policies) without any statistically significant relation. As well, 97.4% of clinical instructors and 97.6% of nursing students agree about the importance of process standards (Standard 7. Student Involvement had high percent of agreement for both groups) without any statistically significant relation.

Table (6): Applicability of standards for clinical learning environment at the study seven departments by three observations (n=7).

This table shows that structure standards had 85.7% of applicability followed by 71.4% for process

standards. Regarding structure standards, Standard 1. Faculty laboratories had the lowest percentage 71.4% of applicability. As regards to process standards, Standard 5. Task Orientation had 85 % followed by 71.4% for Standard 6. Personalization and Standard 7. Student Involvement.

Table (1): Demographic data of jury experts (n=31).

Variables	The study experts (n=31)	
	N	%
Age years:		
<40	16	53.3
≥40	13	46.7
Specialty:		
Gerontology	4	13.3
Administration	5	16.7
Pediatric	4	13.3
Adult Nursing	4	13.3
Critical Care Nursing	3	10.0
Psychiatric and Mental Care Nursing	2	6.7
Community health Nursing	6	20.0
Maternal and Gynecological Nursing	3	6.7
Experience years:		
<15	16	53.3
≥15	15	46.7

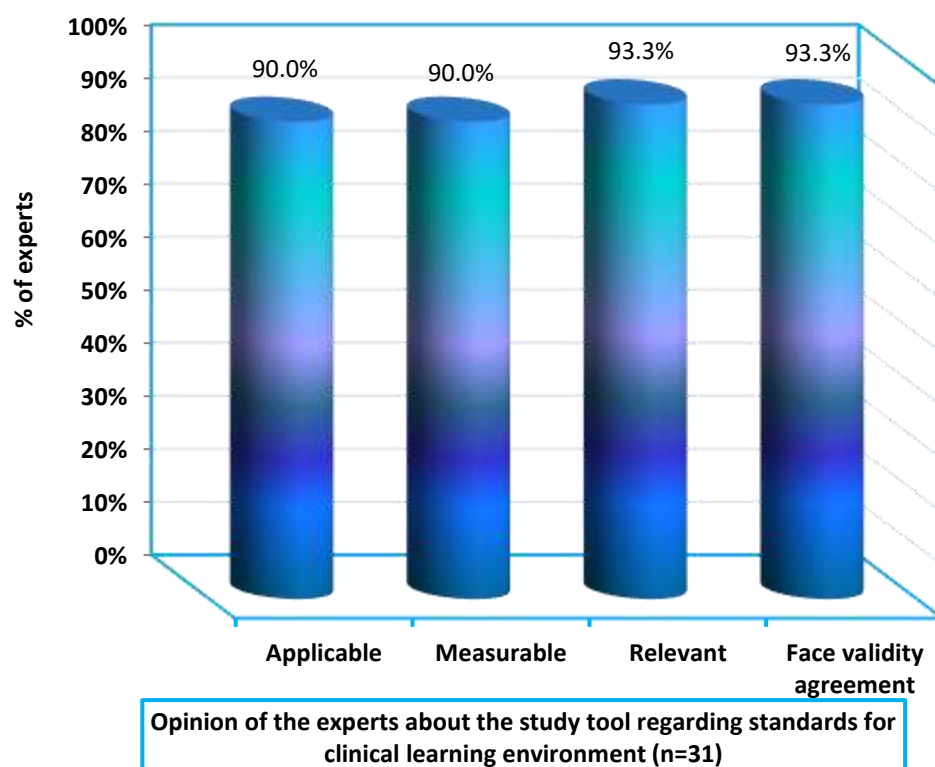


Figure (1): Opinion of jury experts about content and face validity of the preliminary questionnaire (n=30).**Table (2): Demographic data of the studied clinical instructors (demonstrators and assistant lecturers) at Mansoura faculty of nursing (n=114)**

Variables	The studied clinical instructors (n=114)						χ^2	P
	Demonstrators (n=67)		Assistant lecturers (n=47)		Total (n=114)			
	N	%	N	%	N	%		
Age years:								
23-<30	67	100	27	57.4	94	82.5	34.577	0.0001*
30-35	0	0	18	38.3	18	15.8		
>35	0	0	2	4.3	2	1.8		
Gender:								
Males	3	4.5	12	25.5	15	13.2	10.716	0.001*
Females	64	95.5	35	74.5	99	86.8		
Specialty:								
Nursing administration	5	7.5	7	14.9	12	10.5	3.804	0.802
Community health Nursing	9	13.4	6	12.8	15	13.2		
Critical Care Nursing	12	17.9	4	8.5	16	14.0		
Psychiatric and Mental Care Nursing	9	13.4	6	12.8	15	13.2		
Adult Nursing	12	17.9	9	19.1	21	18.4		
Maternal and Gynecological Nursing	9	13.4	5	10.6	14	12.3		
Pediatric Nursing	6	9.0	5	10.6	11	9.6		
Gerontological Nursing	5	7.5	5	10.6	10	8.8		
Experience years:								
<1	13	19.4	0	0	13	11.4	84.483	0.0001*
1-<6	53	79.1	7	14.9	60	52.6		
6-10	1	1.5	31	66.0	32	28.1		
>10	0	0	9	19.1	9	7.9		

*Significant (P<0.05)

Table (3): Demographic data of the studied nursing students (n =331).

Variables	The studied nursing students (n=331)	
	N	%
Age years:		
19	103	31.1
20	157	47.4
21	71	21.5
Gender:		
Males	51	15.4
Females	280	84.6

Academic level:		
1 st level	103	31.1
2 nd level	157	47.4
3 rd level	71	21.5

Table (4): Opinion of the studied demonstrators in comparison with assistant lecturers about the importance of standards for clinical learning environment (n=114).

Standards for clinical learning environment	The studied clinical instructors at Mansoura faculty of nursing (n=114)						χ^2	P
	Demonstrators (n=67)		Assistant lecturers (n=47)		Total (n=114)			
	Important		Important		Important			
	N	%	N	%	N	%		
A-Structure standards:								
Standard 1. Faculty laboratories	65	97.0	45	95.7	110	96.5	0.020	0.877
Standard 2. Equipment and supplies	67	100	47	100	114	100	-	-
Standard 3. Manpower	66	98.5	46	97.9	112	98.2	0.220	0.639
Standard 4. Clinical policies	67	100	47	100	114	100	-	-
Total	66	98.5	46	97.9	112	98.2	0.220	0.639
B-Process standards:								
Standard 5. Task orientation	66	98.5	46	97.9	112	98.2	0.220	0.638
Standard 6. Personalization	65	97.0	46	97.9	111	97.4	0.100	0.754
Standard 7. Student involvement	65	97.0	46	97.9	111	97.4	0.100	0.754
Total	65	97.0	46	97.9	111	97.4	0.100	0.754
C-Outcomes standards:								
Standard 8. Student's satisfaction	64	95.5	45	95.7	109	95.6	0.170	0.684

Table (5): Opinion of the studied clinical instructors in comparison with nursing students about the importance of standards for clinical learning environment (n=445).

Standards for clinical learning environment	The studied subjects at Mansoura faculty of nursing (n=445)		χ^2	P
	Clinical Instructors (n=114)	Nursing students (n=331)		

	Important		Important			
	n	%	n	%		
A-Structure standards:						
Standard 1. Faculty laboratories	110	96.5	316	95.5	0.040	0.845
Standard 2. Equipment and supplies	114	100	305	92.1	8.140	0.004*
Standard 3. Manpower	112	98.2	322	97.3	0.050	0.824
Standard 4. Clinical Policies	114	100	322	97.3	1.940	0.164
Total	112	98.2	316	95.5	1.100	0.293
B-Process standards:						
Standard 5. Task Orientation	112	98.2	318	96.1	0.650	0.419
Standard 6. Personalization	111	97.4	324	97.9	0.100	0.963
Standard 7. Student Involvement	111	97.4	327	98.8	0.380	0.537
Total	111	97.4	323	97.6	0.050	0.824
C-Outcomes standards:						
Standard 8. Student's satisfaction	109	95.6	329	99.4	5.580	0.018*

*Significant (P<0.05)

Table (6): Applicability of standards for clinical learning environment at the study seven departments by three observations (n=7).

Standards for clinical learning environment	Applicability of standards at the study departments during 3observations (n=7)								χ^2	P
	First		Second		Third		Average of 3 observations			
	Applicable		Applicable		Applicable					
	n	%	n	%	n	%	n	%		
<u>A-Structure standards:</u>										
Standard 1. Faculty laboratories	5	71.4	5	71.4	6	85.7	5	71.4	0.520	0.769
Standard 2. Equipment and supplies	7	100	6	85.7	5	71.4	6	85.7	2.330	0.311
Standard 3. Manpower	6	85.7	6	85.7	5	71.4	6	85.7	0.620	0.734
Standard 4. Clinical Policies	6	85.7	6	85.7	5	71.4	6	85.7	0.620	0.734
Total	6	85.7	6	85.7	5	71.4	6	85.7	0.620	0.734
<u>B-Process standards:</u>										
Standard 5. Task Orientation	6	85.7	5	71.4	6	85.7	6	85.7	0.620	0.734
Standard 6. Personalization	5	71.4	5	71.4	6	85.7	5	71.4	0.520	0.769
Standard 7. Student Involvement	5	71.4	5	71.4	6	85.7	5	71.4	0.430	0.807
Total	5	71.4	5	71.4	6	85.7	5	71.4	0.430	0.807

Discussion

Clinical learning is the core of nursing education. Several factors are established to influence students' growth of clinical competency. These factors include students' contact to a various type of clinical experiences, learning in realistic clinical settings, independent learning, and also the provision of a positive environment

(Alhaqwi&Taha,2015).

The study findings indicated that the proposed standards were agreed upon their content and face validity by majority of jury experts. These results were agreed with the study results of **Costa, Duggan & Bates (2008)**, whom stressed on development of standardized scales that were valid and reliable in Portuguese students and the importance of accurate translation and validation processes to measure the ideas of interest in a very credible approach. As **Australian Skills Quality Authority (2015)**, that emphasize on importance of validation to identify the capability of the tools they use and regulate these tools to satisfy their requirements. This may facilitate guarantee confidence within the quality of assessment. It'll additionally make sure that your assessment is valid, reliable, adaptable and fair.

Relating to face validity of the study tool, most of jury group agree concerning face validity concerning standards of clinical learning environment were written in educational context, intelligible, realistic. All of them showed that study tool enough to assess items concerning standards for clinical learning environment. Their agreements could show the high concern and importance concerning this subject from their points of view.

On identical line **Truong (2015)**, conducted face validity for the clarity of the directions, items, and response format and also the adequacy of content of the instrument in relevance the construct being measured; that's, in terms of variety, simplicity, and scope of the individual items that it contained whether or not the items adequately measured all of the scale of the construct. As well as the study results of **Dadgaran, et al., (2016)**, they centered on application of face validity concerning study tool identify the importance of every standard, reduce the improper expressions and also the needed modifications were applied supported the jury's opinion.

Concerning the structure standards, was the most important followed by process standards and outcome standard from clinical instructor's viewpoints. All clinical instructors (demonstrators and assistant lecturers) agree concerning equipment and supplies standard and clinical policies standard followed by manpower and finally faculty laboratories characteristics standard. While not statistically significant relation between the two group. This result may related to that availability of equipment and supplies in clinical laboratories is the most important aspect for creating effective clinical learning environment. As well clinical policies standard provides the opportunity for the student to learn and safely practice clinical skills in a controlled environment that ensuring a high-quality practice that consistently achieve these positive outcomes.

The study results were agreed with the study of **Morgan (2006)**, who clarified the role of clinical skills laboratory equipment and facilities as being essential in creating students ready for follow practice and link

what that they had learnt to the activities in clinical setting. Additionally, to **Durham & Alden (2008)**, emphasize on importance of clinical policies as orientation to students concerning structure work assignment that's needed of students in all laboratories and clinical activities.

These results was in dissimilarity to the findings of **Doody & Condon (2012)** , which found that interaction between the learner and the teacher includes the center of education and learning. As student learning happens through active engagement with the topic matter, lectures is also ineffective for such engagement. **Haraldseid, Friberg&Aase (2016)** at Kingdom of Norway, illustrated that involvement of students within the method of developing new technological learning material enhances student identification of necessary learning needs. Further, the utilization of students' associated teachers' information in a co-design method seems to be the main optimal level of involvement for each students and instructors.

The present study results showed that, no statistically significant relations between opinions of students and clinical instructors relating to importance of structure standards (Faculty laboratories, Manpower, Clinical Policies) and process standards. These results were in the same line with the study results of **Happel (2008)**, when reported that relation between student and clinical instructors that enough time and support from clinical instructors was a very important aspect of a positive clinical placement in mental health care. As well, **Levett-Jones et al., (2009)** found that the relation between staff and students is the most vital influence on nursing students' sense of belonging and learning.

This findings in agreement with **Morbach (2015)**, who determined that instructors who encourage student's participation and develop positive rapport and social relationships with their students maintain the professional boundary student interactions that enhances the academic expertise of the students. There have been statistically significant relations between opinions of students and clinical instructors concerning importance of outcomes standards.

These findings supported by **Suikkala&Leino-Kilpi (2005)**, who showed that students reported themselves as highly satisfied with the scale regarding the mentorship relationship, as that student' experiences of their relationships and of being treated as distinctive people are supporting agents for their learning. Additionally, to, **Brynildsen et al., (2014)** at Kingdom of Norway, who pointed to the students' satisfaction was completely associated with all the individual items of the factors comprising the educational environment in clinical settings.

The present study demonstrated that the structure standards had the high level of application followed by process standards. Regarding to structure standards: equipment and supplies, Manpower and clinical policies had the same level of applicability followed by faculty laboratories standard. In a similar study, **Croxon&Maginnis (2007)**, they concluded that a strong need to supply appropriate quantity of simulation procedures and facilities with their clinical skills, overall the students powerfully supported the read that the clinical laboratory preparations ready them for follow within the clinical setting. This result was congruent with **Rye (2008)**, who stressed that all the respondents agreed that the learning opportunities based on the clinical policies that facilitated their ability to apply their knowledge to practice.

Regarding to process standards, as task orientation had the high percentage of applicability. These results were agreed with those of a study carried out by **Bigdeli et al, (2015)** , who showed that, students perceived task orientation as an important factor that influences the outcomes of their clinical placement. The students perceived the opportunities for themselves to be directly involved with hands-on skills often controlled by clinicians and clinical teachers. It is apparent that the participants have enjoyed applying their learned skills into practice in the clinical environment. As well **Yazdankhah (2008)** also indicated clinical learning environment clear course objectives and tasks were the most important factors in clinical educational environments. This findings was also supported by **Smedley and Morey (2010)**,who found that together with personalization, student involvement (the extent to which students participate actively and attentively in hospital ward activities) was the most important aspect of students' preferred clinical learning environment.

Conclusion

The study concluded that the proposed standards were agreed upon their content and face validity by majority of jury experts. Also, structure standards is the most important followed by process standards and outcome standard from clinical instructors (demonstrators and assistant lecturers) points view without statistically significant relation between two groups. There were statistically significant relations between opinions of students and clinical instructors about importance of outcomes standard. The structure standards had the high percentage of applicability followed by process standards.

Recommendation

Based on the results of this study, it was recommended that, Using the standards and criteria developed for clinical learning environment as guide-lines to improve practical training and clinical skills. The faculty laboratory should be prepared with sufficient materials and equipment for training of all students. Provide workshops: a structure faculty development programs that focus on practical teaching skills.

Development and the educational strategies directly applicable to those teaching skills. A safe environment refers to emotional, cultural and professional safety, as well as physical safety and a non-judgmental, environment wherever learners feel it is safe to participate, raise queries, applicable ratios of learners to educators, to make sure educators aren't given an excessive amount of responsibility to be effective or conscious of individual learners and additionally to make sure learners have access to practiced clinicians as needed.

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An Empirical study of the Forms of Exercising Censorship in the Daily Sudanese Political Newspapers

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Abstract

Forms of exercising censorship in the daily Sudanese political newspapers. An empirical study, from Jan 2017 to Jun 2017. The main objective to this study was identified forms of exercising censorship in the daily Sudanese political newspapers that may limit the freedom in the vocational work of Sudanese journalists in the political news sections. The descriptive method is used to describe the situation and analyze the results. Observation and questionnaire were used as tools of this study. 340 samples were chosen from journalists working in the Sudanese newspaper institutions, representing intended sample from field study community. The results were: censorship is applied in the Sudan's newspapers; self-censorship topped the forms of censorship, the importance of censorship exercised by the editor-in- chief, and the journalists participating in the questionnaire stated that the importance of censorship is for refrain them from committing breaches.

Keywords: censorship, forms of censorship, political newspapers, journalists

1. Introduction

All around the planet, authoritarian rulers and their officials hold forth about the "responsibility of the press." most of the time, their preaching and talk of the need for codes of conduct or ethical guidelines serve to clip the wings of independent journalists and tame the press. Their invocation of lofty notions of patriotism, honor, reputation, and respect for authority are meant to deter investigations and exposes of their abuses of power or ill- acquired wealth. Ethics are also brandished when the press covers sensitive subjects, such as religion, nationalism, or ethnicity. Under the pretext of protecting minorities against hate speech, or of preventing incitement to violence, government often strive to censor stories that are in the public interest and should be told. In authoritarian countries, call for journalists to exercise a sense of responsibility or decency is mostly code for censorship.

According to Goldstein (2000) (Metternich once defined censorship as the right to hinder the manifestation of ideas which disturbed the peace of the state, its interest and its good order)

2. Literature Review

2.1 *Censorship*

Government attempts to control and manipulate the media are universal because governments throughout the world believe media effects are important political forces. This belief is based on the assumption that institutions which control public information shape public knowledge and behavior and thereby determine the support of opposition of citizens and officials to the government and its policies (Graber, 2003: 16).

Through control over mass information institutions, governments everywhere seek to preserve the political system as a whole as well as to regulate the media and other social institutions which depend on them for publicity. While control occurs in all societies, its nature and purposes vary. Authoritarian countries control more extensively and more rigidly than non authoritarian ones (Graber, 2003: 16).

2.1.1 *Role of Media in Authoritarian Regimes*

In authoritarian systems, philosophy of media operation assumed that the government is basically good and operates for the benefit of its people. Since the government is well- intentioned, and its policies are carefully determined, it follows that the mass media must not interfere with the operations of the government. It is not proper functions of the press to criticize the basic system or its rulers, beyond pointing out minor deficiencies in policy and suggesting adjustments in line with prevailing policies. Basically the press is a supporter of the government and its policies, rather than its adversary and critic. However, criticism about inefficiencies or corruption of minor officials may be allowed. In most authoritarian polities, the mass media must take positions which further the goals of the government. News must accord with the prevailing ideology and confirm its accuracy. But the media may be free to provide information or entertainment of their choice, as long as the offerings do not hurt the state or interfere with public policies (Leon, 1973: 119-130).

2.1.2 *Control methods: Authoritarian System*

The methods by which governments control the newspaper vary, depending on the type of political system. So do the major objectives for control. In authoritarian societies, the major objective is to place control into the hands of friends of the regime and to make sure that their output remains supportive of most government policies. There is little attempt to keep foes of the regime out of the newspaper business (Graber, 2003: 20-21).

- a. In many authoritarian societies, control over newspapers content is accomplished by limiting access to the newspapers business. For example, the government may grant newspaper franchises only to carefully selected people who support the government fully in all its endeavors. Often such franchises bestow monopoly control, and people who lack them cannot enter the newspaper business.
- b. Other methods used to control newspapers content are subsidies to favorite publishers or favoritism in the allocation of tightly controlled newspaper stocks. Newspaper publishers whose activities displease the government may find themselves out of business because they lack paper.

- c. Newspapers may also be controlled through manipulating access to news. For instance, the government may release information only to favored publications, putting less favored ones effectively out of business.
- d. In addition to controlling entry into the newspaper business through franchises and access to news, authoritarian governments often limit what may be published. Several methods are used. In some countries, nothing may be printed until it has first passed the government censor. The censor may delete any story which the government deems objectionable. Elsewhere, these deletions are made after the papers have already been printed. This leaves tantalizing white spots or missing pages. (in Sudan television and radio scripts are often prepared directly by government officials and must be broadcast without editorial changes)
- e. Authoritarian societies frequently use treason and sedition law to control newspapers output. Treason and sedition are usually broadly defined in these countries so that anything that is critical of government is deemed treasonable or seditious. People judged guilty of these crimes may be severely punished. The punishment may be removal from the newspaper business, prison sentences, or even death. These are extremely strong deterrents to keep people from publishing stories which attack the government.

Thus the researcher sees that; most publishers in totalitarian societies avoid difficulties with the official censor and with treason and sedition laws by refraining from using material which is likely to be objectionable. Government censorship then becomes replaced largely by self-censorship, making the job of the official censor much easier.

2.2 forms of censorship

2.2.1 Self-censorship: Most newspapers practice self-censorship. Often this is dictated by what the editor considers good taste as well as by contemporary community standards. Although it is true that standards tend to grow more liberal, most editors make a serious effort not to offend the sensibilities of their readers. The obscene language of the law court, the gruesome details of a brutal murder, the “inside” story behind a politician’s downfall, or the “real dope” about divorce of a prominent citizen may be censored from the story. The reader may not be given all the information about events reported or reports on all events. The newspaper to this extent fails to report the news fully. Often, it may not be the public’s taste as much as the editor’s that generates the censorship (Harriss, 1985: 232).

Also occurs as a result of the relationship between reporters and the sources that provide information on their beats. A symbiotic relationship develops between reporters and sources on beats, with the result that stories having political implications may be suppressed. Consequently, beat reporters must often practice self-censorship, keeping their most sensational stories to themselves in order to protect their beats.

Some self-censorship involves a predisposition to support the government line. The press is particularly vulnerable to government claims that revealing certain information would not be in the national interest. As the Sudan Press and Printed Press Materials Act explains; journalist shall abide by the following: “not to publish any secret information, relating to the security of the land, or the disciplined forces; not to publish

any information, relating to the disciplined forces, as to plans, drilling and mobilization, and the information shall be taken from the official spokesman of the force concerned” (Harriss, 1985: 68).

2.2.2 State Censorship: State censorship represented on national security. Because information about foreign relations is more difficult to corroborate and because they are citizen as well as reporters, members of the press are susceptible to the administration’s line on foreign policy. Appeals to support presidential policies are made in the name of “national security” and “protection of vital interests”. Such appeals usually prove irresistible. Appeals to national security are complicated by competition among news outlets. In some cases, journalists keep a story out of the papers, only to see it broken by someone else (Harriss, 1985: 68). Perhaps the oldest and most controversial issue of all is that of the relationship of media to the security and authority of the state. The media are often thought to have a responsibility not to undermine the social order in any fundamental or violent way. While the issue might appear to be settled in favor of the media by constitutional guarantees of press freedom, some reserve power could usually be invoked by the state in extreme situations, and the modern period has offered numerous instances where the temporary breakdown of civil order, or the actions of terrorists, or the fear of crime, or the pursuit of some minor war or an issue of government confidentiality, has reawakened controversy about press freedom and its limitation. In general, authorities everywhere have shown a consistent inclination to want to manage the news, even if they stop short of censorship.

2.2.3 Public Censorship: The press was repeatedly described by the ruling elements as a disease or a mental poison that threatened society and therefore required strict controls. Although the fears and hatred directed toward the press were substantial and intense, the authorities were even more alarmed by media such as caricature, theater, and cinema that communicated with an audience broader and than that reached by the press, even encompassing the dreaded, often illiterate ‘dark masses’ who could not read but were not blind or deaf (Goldstein, Robert. 2000: 5).

Relations between media and society are often mediated through a wide range of more or less informal, but often organized, pressure groups which seek to influence directly what the media do – especially by trying to set limits to what they publish. There are many examples of established bodies, such as religious, occupational or political bodies, complaining or arrange of issues, often to do with matters of morality perceived political bias or minority representation In anywhere there is much pressure on the media to be positive towards minorities of all kinds, including ethnic groups, women, and more sensitive to the needs of vulnerable groups like children, poor, disabled and homeless people and the mentally ill (Mc Quail Denis, 1994: 203).

the social role of the press, concerned with the general quality of the news about events of the day and of the world as supplied to the average citizen, who depends on the media in order to reach informed choices and judgments (Mc Quail Denis, 1994: 137).

Ethics are also branched when the press covers sensitive subjects, such as religion, nationalism, or ethnicity. Governments often strive to censor stories that are in the public interest and should be told. I authoritarian

countries, calls for journalists to exercise a sense of responsibility or decency are mostly code for censorship. (Committee, to Protect Journalists (CPJ). *Attacks on the Press*, 2014: 104).

It is usually impossible to distinguish unacceptable pressure from the general tendency of the media to try please as many of their audiences as possible and to avoid hurting minorities or encouraging antisocial activities. The media are also wary of legal reprisal and inclined to avoid unnecessary controversy or departures from verifiable facts which are in the public domain.

Truth, under law, is not simply what news editors believes is the truth or what someone told a reporter is true. From a legal standpoint, truth is what can be proved in court to be true. Occasionally, therefore, a journalist will say, "I know the guy is a crook, but I can't prove it". So, a story about him is not published (Mc Quail Denis, 1994: 205).

At a minimum, the truth discipline requires that if a journalist publishes anything that might mislead, he must take steps to correct the misimpression. the journalist also should generally provide readers a context in which to understand these materials and, if he has reason to disbelieve what they say, the evidence supporting his disbelief..It only suggests that journalists have a responsibility to shed light on the ones that are dubious(Mc Quail Denis, 1994: 205).

The reason for permitting a journalist to violate the ordinary truth discipline and publish something he thinks is false is that the significance of the statement, accurate or inaccurate, far outweighs the risk that it will mislead people. It is impossible to avoid this kind of balancing test. Onto one side of balance goes the significance of the utterance and the level of the public's interest in knowing of it onto the other goes the likelihood that temporary belief by others in the statement will have irreversible consequences, the severity of those consequences, and the degree of doubt the journalist has concerning the truth of the statement(Mc Quail Denis, 1994: 24 - 5).

3. Methodological Procedures

3.1 *Type of Research*

This is a descriptive research, is identified, analyzed and evaluated the characteristics of a certain group, or attitude. It is mostly featured by identification or studying current facts concerning the nature of certain phenomenon, attitude or a group of people, events, or conditions with the purpose of obtaining information, regardless to the availability or lack of predetermined hypothesis, because descriptive studies do not necessarily include causative hypothesis which is subjected to test or study. It also aims to assess how frequently a certain phenomenon is occurring and to which extent is it related to another phenomenon or a group of phenomena (Hussein, 1983: 128). According to this definition, the research identified how Sudanese journalists selects news. As well as to study the extent to which the journalist is influenced by Sudanese Values, and what is he doing to preserve such values? This research depends on the statistical approach in counting, measuring, and extracting the indicators upon which the inference depend. The researcher, in the same time uses the qualitative analysis, in addition to the statistical analysis to complete the aspects of the study, and analyzed the results.

3.2 Methodology of the Study

The researcher uses the descriptive methodology (that aims to study the current facts concerning the nature of a phenomenon, attitude, a group of events, or conditions with the aim of obtaining sufficient and accurate information about it without mentioning its reasons or controlling it) (Hussein, 1976: 123). Some of the descriptive researches was used.

3.3 Research Questions

To what extent are Sudanese journalists in the daily political newspapers facing censorship?, Which kinds of censorship do Sudanese journalists think more important?, Do Sudanese journalist think that the censorship of the Editor-in-chief important to the journalistic work?, For which reason is the censorship of the papers essential?

3.4 Field Survey Methodology

The researcher used the survey method in this study, because the survey research has several functions, one of which is to predict responses. In addition, the survey results are used to characterize attitudes or behavior – in this study the survey used to characterize the forms of exercising censorship in the daily Sudanese political newspapers - depending on the topic, questions may be designed to yield attitudinal information that is peculiar to a time and circumstance, or they may target more enduring opinions that reflect a person's position over time (Nation, 1997: 284).

In this study researcher have written closed-ended, and open- because (the answers of open-ended questions take more time to analyze than those from closed- ended questions that can be quickly coded and tabulated.) (Nation, 1997: 109).

3.4.1: Questionnaire Procedures

1. Methodological steps to be followed by the researcher in studying the field survey:

The researcher designed a questionnaire for collecting data from the sample members. The questionnaire is an instrument, or a facility for data collection in a form composed of a list of questions directed to the interviewees. The interviewee answers these questions by himself to obtain information about a particular subject. It may be sent by mail, and is called the mail questionnaire or may be distributed manually (Aziz, 2000: 53).

Structuring the questionnaire is important in any kind of survey research, but especially in surveying journalists. The questionnaire should begin with questions that are not sensitive or difficult to answer, with the more sensitive or difficult questions near the end. Field research forms (questionnaire and interview) are prepared according to a systematic steps determined by the type and size of data to be collected through this tool (Aziz, 2000: 304). These steps are as follows:

1. Identifying the number of information required: the questionnaire included a set of questions, prepared, formulation by the researcher and will present to a group of professors specialized in Press studies and

Science research methods*¹², to clarify their remarks and inclusion so the application form become valid for the purposes of study.

2. Determine the quality of the information required: the main objectives of this study is linked to identify the forms of exercising censorship in the daily Sudanese political newspapers. Questions of the form will focus in taking the views of samples in some of the issues relating to the profession.

3. Identify the general structure of the newspaper: the questionnaire divided into eight main sections:

Section I: includes background information about the journalist (A journalist in this study means, all journalists working for the Sudanese political newspapers, differing on their functional quality, also means contractors and no contractors journalists with the newspapers they worked for), where the form is directed to him containing a specific questions about the gender, specialization, duration of practicing the profession of journalism, functional capacity, and such questions would be given a general description of the characteristics of the sample.

Section II: Questions of this section included questions aimed to knowledge the forms of exercising censorship in the daily Sudanese political newspapers, however researcher asked closed- ended questions first before an open-ended question to ensure journalists response.

3.4.2 The Prior Test of Questionnaire: The researcher tested the questionnaire to assure its logical and empirical validity, by displaying on a group of professors, experts and specialists to utilize from their observation.¹³ The researcher conducted the necessary modification to the questionnaire, and then performed an initial test on a limited sample and similar to the original sample to assure its validity. To achieve this, the researcher tested the questionnaire on a sample amounted to 10% of the community field study.

3.5 Sampling:

The researcher used the style of the sample in the study where the researcher resorts to use the following sample:

Purposive (Intended) sample: To select the sample of journalists the researcher followed these steps:

Firstly: The researcher used the intended sample, to select the actual practitioner for censoring and editing of the political news in the political Sudanese paper organizations¹⁴, this definition of journalists excluding independent journalists who work for several different news organizations, the researcher distinguished between two main levels of the journalists in the paper institutions of Sudan. Researcher further defined journalists as those who had responsibility for preparation or transmission of political news stories- the first level, represent the editors-in-chief, executive editors, secretaries of editing, heads of the political department, the second level represent the editors working on political department, and according to this conception, the researcher will meet with the actual number of kinds of the sample set for the gatekeepers

1. *Hassan Alzain, Hashim Aljaz, Bedr Aldin Ahmed Ibrahim, Muatasim Babikir, Mohyy AldinTatawi, Abd Alahim Musa Yaagoub, Abd Alkarim Gorani.

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* See the appendix (the list of political newspapers).

of political news at the Sudanese journalist institutions, which are 25 institutions issued daily politics newspapers during the period of distribution of questionnaires to the journalists*.

For the researcher to be more accurate in determining the number of members of the research sample, among the community of journalists, this has a number of four thousand journalists (4000) who are recipients of journalist registration for professional journalism. As for the actual practitioner of press for all Sudanese newspapers reach to two thousand five hundred press (2500), according to statistics from the General Union of Sudanese Journalists, so the researcher used the following statistical equation using a specialized statistical, so the number was as follows:⁽¹⁵⁾

$$n = \frac{Z^2 \sigma^2}{E^2}$$

E^2

Z = level of confidence

σ = population SD

E = acceptable amount of sampling error

$$\frac{Z^2 \sigma^2}{E^2}$$

$$E^2 = 340$$

$$\frac{(1.96)^2 (0.5)^2}{E^2} = \frac{3.8416 \times 0.25}{E^2}$$

Secondly: data collection, the researcher used the personal interview for the distribution of search forms prepared before, and to supervise on the answers of the research sample and to collect data, the researcher has used face to face interview to collect data:

1. Through personal interview, an explanation and interpretation of the objectives of the study is conducted this help the samples to fill the questionnaire according to background knowledge.
2. Access to the sample in their press environment has been completed all aspects of this study where the researcher knowledge on the climate in the various political newspapers organizations in Sudan Republic.
3. Data collection difficulties; sample required 340 journalists, represented the journalists are working in the all daily political newspaper institution, after questionnaire distributed, through personal interview method, the researcher collected 312 form, and lost 28 form, because different reasons were said by sample obligators.

4. Results

Research Question 1: *To what extent are Sudanese journalists in the daily political newspapers facing censorship?*

In respect to what extent the Sudanese journalists are subjected to censorship, the study revealed as in table No. (1)The following: the rate of 45.7% said they are sometimes subjected to censorship, and 22.0% said

3. Bruce Bowerman, Richard T.O Connell (1997) Applied Statistics -Improving Business process- UK, Irwin Mc Graw, p 347.

they are rarely subjected to censorship, 18.3% of them said they are subjected to censorship frequently, and 14.0% of them said they are never subjected to censorship.

Table 1. Extent of censorship in the Daily Sudanese Political Newspaper

Extent of censorship		Frequency	Percent	Valid Percent	Cumulative Percent
	Always	55	17.6	18.3	18.3
	Sometimes	137	43.8	45.7	64.0
	Rarely	66	21.1	22.0	86.0
	Never	42	13.4	14.0	100.0
	Total	300	95.8	100.0	
	Missing System	13	4.2		
Total		313	100.0		

Table 1. To what extent are Sudanese Journalist facing censorship?

From this perspective most of the sample of people participating in the questionnaire agreed that they are subjected to censorship, however their subjection varies from frequently, to sometimes to rarely, while the majority are subjected frequently, sometimes or rarely to various types of the censorship.

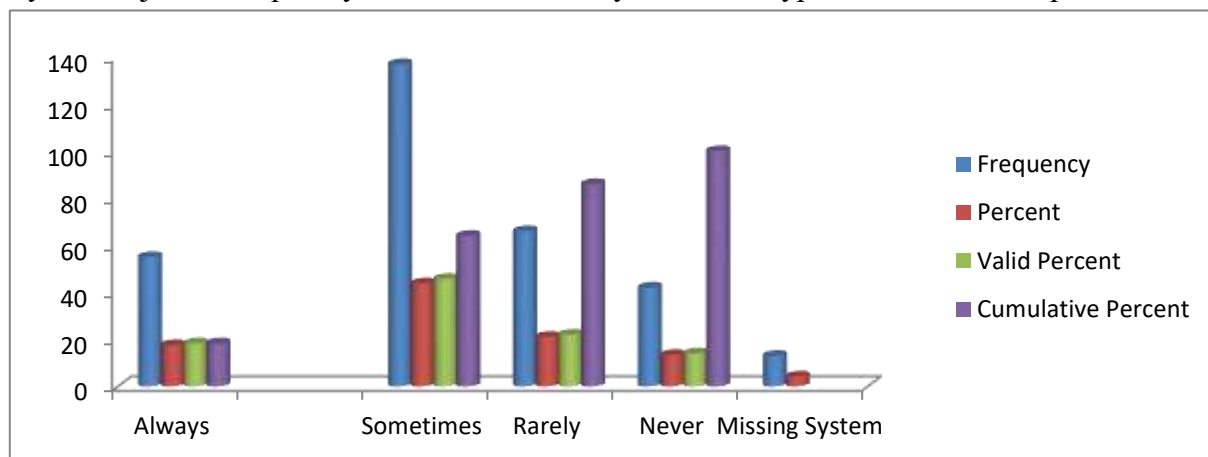


Figure 1. Extent of Censorship in the Daily Sudanese Political Newspaper

Research Question 2: Which kinds of censorship do Sudanese journalists think more important?

Through using the arithmetical average for the members of a sample in the Sudanese papers, self-censorship topped the forms of censorship for the sample with an average (1.66), in the 1st place 5.1% of editors-in-chief, second place 7.0% of director editors, third place 4.5% of editorial secretaries, fourth place 10.8% of head of news section, fifth place 72.6% of editors.

Table 2. Kind of Censorship Applied in the Sudanese Newspaper, Arranged according to their importance, given No (1) to most important till No (5).

		Self-Censorship					Total
Official job		1	2	3	4	5	
	Editor in chief	8	0	2	0	0	10
		80.0%	.0%	20.0%	.0%	.0%	100.0%
		5.1%	.0%	10.0%	.0%	.0%	4.5%
	Director- editor	11	1	2	0	0	14
		78.6%	7.1%	14.3%	.0%	.0%	100.0%
		7.0%	5.3%	10.0%	.0%	.0%	6.3%
	Secretary	7	0	2	1	1	11
		63.6%	.0%	18.2%	9.1%	9.1%	100.0%
		4.5%	.0%	10.0%	8.3%	7.7%	5.0%
	Head of news section	17	4	0	3	1	25
		68.0%	16.0%	.0%	12.0%	4.0%	100.0%
		10.8%	21.1%	.0%	25.0%	7.7%	11.3%
	Editor	114	14	14	8	11	161
		70.8%	8.7%	8.7%	5.0%	6.8%	100.0%
		72.6%	73.7%	70.0%	66.7%	84.6%	72.9%
Total		157	19	20	12	13	221
		71.0%	8.6%	9.0%	5.4%	5.9%	100.0%
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Cross table 1. Shows; which kind of censorship do you think more important? Arrange according to importance giving No (1) to most important till No (5).

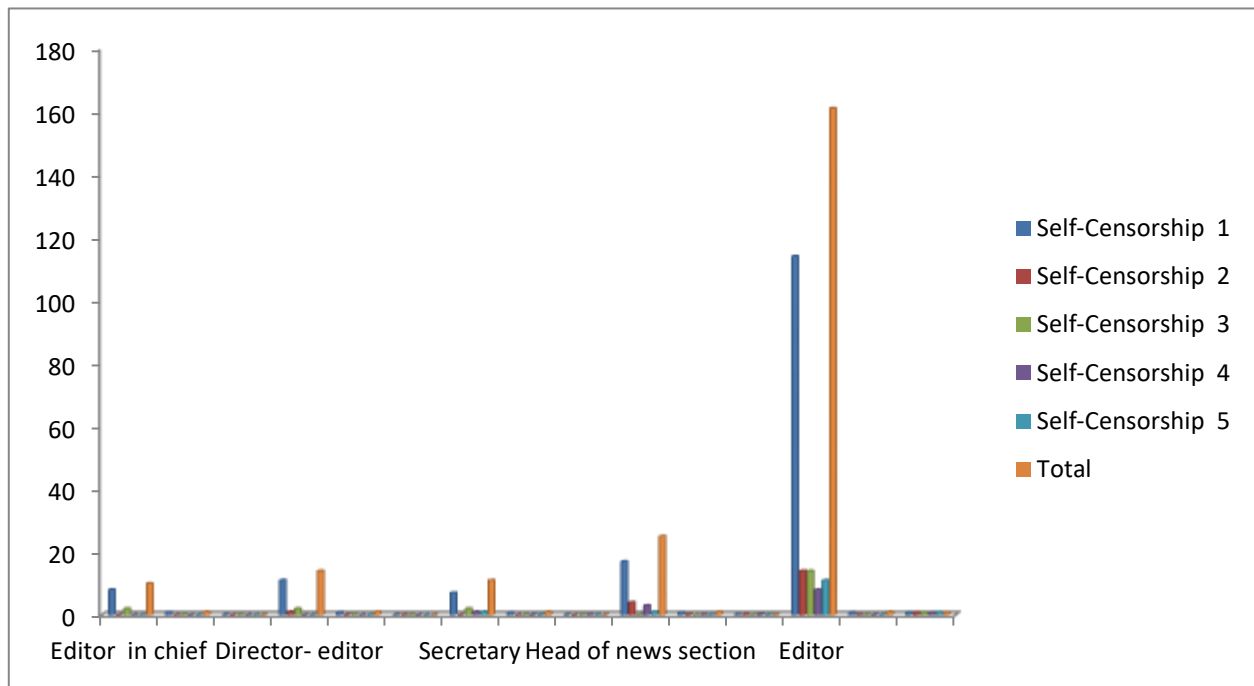


Figure 2. Relationship between, an official jobs, and self-censorship

By using chi-square test the researcher found out that the probability value is 0.59 which is larger than the moral level that is 0.05, this indicates the absence of a relation between the occupational situations of journalists and how much they are vulnerable to self-censorship.

Thus the research approves the Government censorship becomes replaced largely by self-censorship, making the job of the official censor much easier.

	Value	Df	Sump. Sig. (2-sided)
Pearson Chi-Square	14.453(a)	16	.565
Likelihood Ratio	19.689	16	.235
Linear-by-Linear Association	.619	1	.431
N of Valid Cases	221		

Chi-Square Tests1. Self-censorship

In 2nd place is the direct censorship by the Editor-in-chief with the average 2.79, it is selected in the second place by 6.9% of editors in chief, 6.9% of director editors , 2.3% of editorial secretaries, 9.2% of head of news section, and 74.7% of editors.

Table 3. Direct Censorship.

		Direct censorship by the Editor-in-chief					Total
occupation status		1	2	3	4	5	
	Editor-in-chief	0	6	1	2	1	10
		.0%	60.0%	10.0%	20.0%	10.0%	100.0%
		.0%	6.9%	1.9%	3.4%	16.7%	4.5%

Director – editor	1	6	3	4	0	14
	7.1%	42.9%	21.4%	28.6%	.0%	100.0%
	6.7%	6.9%	5.6%	6.8%	.0%	6.3%
Secretary	1	2	4	4	0	11
	9.1%	18.2%	36.4%	36.4%	.0%	100.0%
	6.7%	2.3%	7.4%	6.8%	.0%	5.0%
Head of news section	4	8	8	4	1	25
	16.0%	32.0%	32.0%	16.0%	4.0%	100.0%
	26.7%	9.2%	14.8%	6.8%	16.7%	11.3%
Editor	9	65	38	45	4	161
	5.6%	40.4%	23.6%	28.0%	2.5%	100.0%
	60.0%	74.7%	70.4%	76.3%	66.7%	72.9%
Total	15	87	54	59	6	221
	6.8%	39.4%	24.4%	26.7%	2.7%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Cross table 3. Shows the relationship between an official job, and the direct censorship by the Editor-in-chief

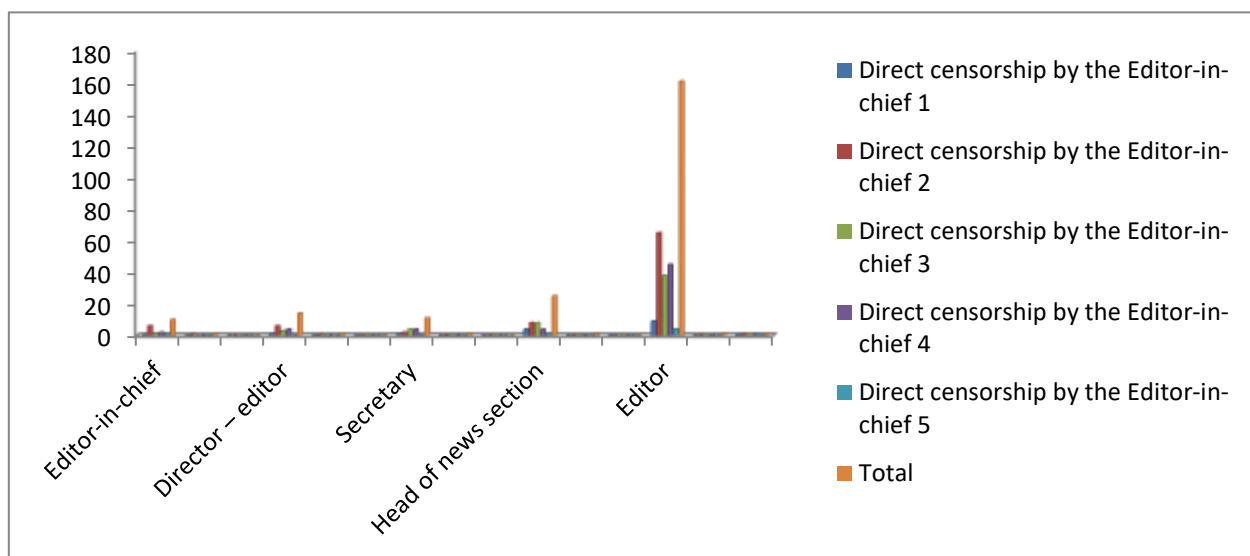


Figure 3. The relationship between an official job, and the direct censorship by the Editor-in-chief
By using chi-square test the researcher found out that the probability value is 0.59 which is larger than the moral level that is 0.05, this indicates the absence of a relation between the occupational situations of journalists and how much they are vulnerable to censorship by the Editor-in-chief.

	Value	df	Sump. Sig. (2-sided)
Pearson Chi-Square	13.730	16	.619
Likelihood Ratio	13.862	16	.609
Linear-by-Linear Association	.035	1	.851
N of Valid Cases	221		

Chi-Square Tests 2. Direct censorship by the Editor-in-chief

In 3rd place is organizational censorship to ensure that journalists are performing the editorial duties they are assigned for, that is by an arithmetical average 3.2, of Editor-in-chief at the rate of 1.5%, 6.0% of director editors, 3.0% of editorial secretaries, 16.4% of head of news section, 73.1% of editors.

Table 4. Organizational Censorship.

		Organizational censorship to make sure that journalists carry out the duties assigned to them.					Total
Official job		1	2	3	4	5	
	Editor-in-chief	0	4	1	2	3	10
		.0%	40.0%	10.0%	20.0%	30.0%	100.0%
		.0%	7.5%	1.5%	3.6%	8.8%	4.5%
	Director- editor	0	3	4	6	1	14
		.0%	21.4%	28.6%	42.9%	7.1%	100.0%
		.0%	5.7%	6.0%	10.7%	2.9%	6.3%
	Secretary	2	5	2	1	1	11
		18.2%	45.5%	18.2%	9.1%	9.1%	100.0%
		18.2%	9.4%	3.0%	1.8%	2.9%	5.0%
	Head of news section	2	3	11	6	3	25
		8.0%	12.0%	44.0%	24.0%	12.0%	100.0%
		18.2%	5.7%	16.4%	10.7%	8.8%	11.3%
	Editor	7	38	49	41	26	161
		4.3%	23.6%	30.4%	25.5%	16.1%	100.0%
		63.6%	71.7%	73.1%	73.2%	76.5%	72.9%
Total		11	53	67	56	34	221
		5.0%	24.0%	30.3%	25.3%	15.4%	100.0%
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Cross table 4. Shows, organizational censorship; to make sure that journalists carry out the duties assigned to them

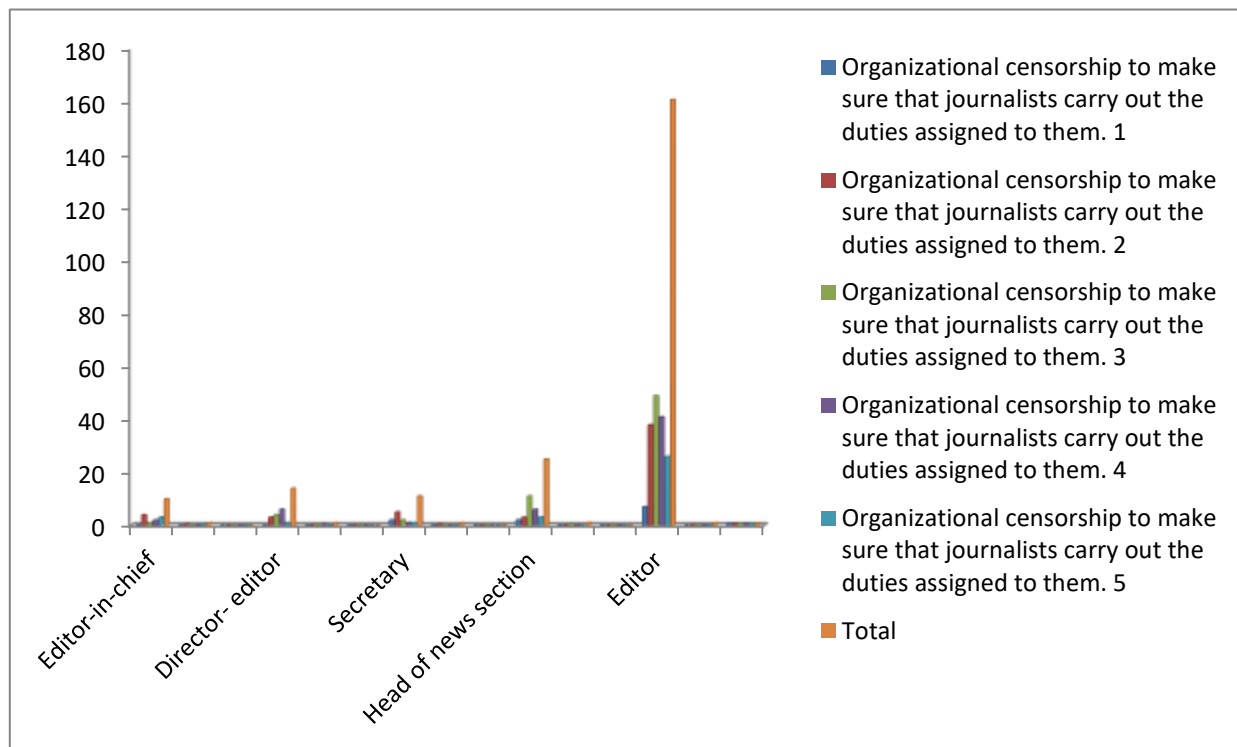


Figure 4. Organizational censorship; to make sure that journalists carry out the duties assigned to them. By using chi-square test the researcher found out that the probability value is 0.59 which is larger than the moral level that is 0.05, this indicates the absence of a relation between the occupational situation of journalists and how much they are vulnerable to organizational censorship to ensure that they are performing the journalistic duties for which they are assigned.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.329	16	.252
Likelihood Ratio	18.987	16	.269
Linear-by-Linear Association	.060	1	.807
N of Valid Cases	221		

Chi-square tests 3. Organizational censorship

In 4th place is the Public censorship at an average of 3.4, this is acquired by editors-in-chief at the rate of 5.3%, and director editors at the rate of 5.3%, editorial secretaries at the rate of 8.8%, head of news section at the rate of 14.0%, editors at the rate of 66.7%.

Table 5. Public Censorship.

	Public censorship.					Total
Official job	1	2	3	4	5	
Editor-in-chief	1	0	4	3	2	10
	10.0%	.0%	40.0%	30.0%	20.0%	100.0%
	5.0%	.0%	10.3%	5.3%	3.4%	4.5%

Director- editor	1	2	1	3	7	14
	7.1%	14.3%	7.1%	21.4%	50.0%	100.0%
	5.0%	4.3%	2.6%	5.3%	11.9%	6.3%
Secretary	0	2	2	5	2	11
	.0%	18.2%	18.2%	45.5%	18.2%	100.0%
	.0%	4.3%	5.1%	8.8%	3.4%	5.0%
Head of news section	1	8	3	8	5	25
	4.0%	32.0%	12.0%	32.0%	20.0%	100.0%
	5.0%	17.0%	7.7%	14.0%	8.5%	11.3%
Editor	17	35	29	38	43	162
	10.5%	21.6%	17.9%	23.5%	26.5%	100.0%
	85.0%	74.5%	74.4%	66.7%	72.9%	73.0%
Total	20	47	39	57	59	222
	9.0%	21.2%	17.6%	25.7%	26.6%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 5. Shows the relationship between an official job and public censorship

By using chi-square test the researcher found out that the probability value is 0.59 which is larger than the moral level that is 0.05, this indicates the absence of a relation between the occupational situations of journalists and how much they are vulnerable to popular censorship.

	Value	df	Sump. Sig. (2-sided)
Pearson Chi-Square	16.508	16	.418
Likelihood Ratio	18.335	16	.305
Linear-by-Linear Association	1.828	1	.176
N of Valid Cases	222		

Chi-Square Tests 4. Public censorship

The state's censorship came in the 5th and last place in respect to importance to sample of people participating I the questionnaire with an average 3.8, that is by editors-in-chief at the rate of 3.8%, and director editors at the rate of 5.8%, and editorial secretaries at the rate of 70.2%.

Table 6. State Censorship.

	State censorship						Total
Occupation status	1	2	3	4	5	6	
Editor in chief	1	0	2	3	4	0	10
	10.0%	.0%	20.0%	30.0%	40.0%	.0%	100.0%
	4.5%	.0%	5.6%	8.1%	3.8%	.0%	4.5%
Director- editor	1	2	4	1	6	0	14
	7.1%	14.3%	28.6%	7.1%	42.9%	.0%	100.0%

		4.5%	9.5%	11.1%	2.7%	5.8%	.0%	6.3%
	Secretary	1	2	1	0	7	0	11
		9.1%	18.2%	9.1%	.0%	63.6%	.0%	100.0%
		4.5%	9.5%	2.8%	.0%	6.7%	.0%	5.0%
	Head of news section	1	3	3	4	14	0	25
		4.0%	12.0%	12.0%	16.0%	56.0%	.0%	100.0%
		4.5%	14.3%	8.3%	10.8%	13.5%	.0%	11.3%
	Editor	18	14	26	29	73	1	161
		11.2%	8.7%	16.1%	18.0%	45.3%	.6%	100.0%
		81.8%	66.7%	72.2%	78.4%	70.2%	100.0%	72.9%
	Total	22	21	36	37	104	1	221
		10.0%	9.5%	16.3%	16.7%	47.1%	.5%	100.0%
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Cross tab 6. Shows the relationship between; an official job and, state censorship

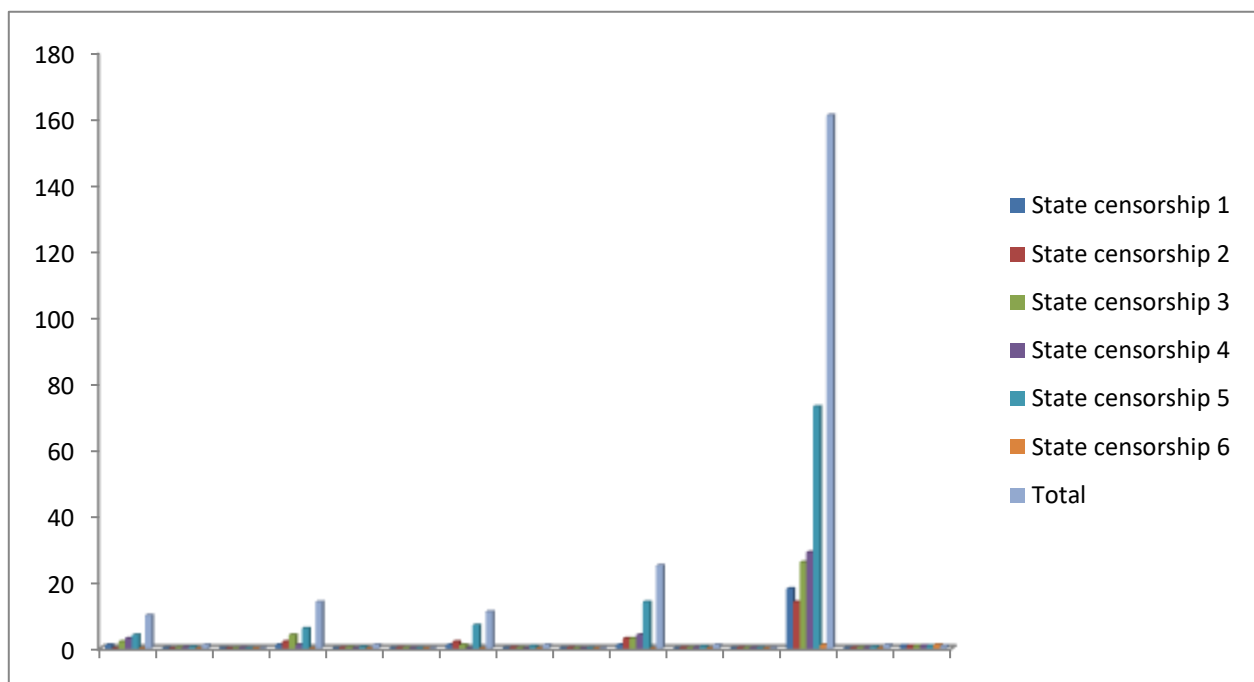


Figure 5. The relationship between; an official job and, state censorship

By using chi-square test, the researcher found out that the probability value is 0.59, which is larger than the moral level that is 0.05; this indicates the absence of a relation between the occupational situations of journalists and how much they are vulnerable to state censorship.

	Value	Df	Sump. Sig. (2-sided)
Pearson Chi-Square	11.226	20	.940
Likelihood Ratio	14.082	20	.826
Linear-by-Linear Association	.019	1	.890
N of Valid Cases	221		

Chi-Square Tests 5. State Censorship

Research Question 3: Which kinds of censorship do you think more important?

Selah- uddin Hafiz asserted that self-censorship, (that is defined as an inner feeling that makes the journalist aware of the paper's vocational criteria for publishing) controls the journalists under the effect of two factors:

1st , The long period during which the press is subjected to censorship implanted in the conscience of journalists a feeling of permanent apprehension of the occurrence of the caveats of censorship and the prohibitions of publishing.

2nd , The resorting of the ruling authority to the formation of a dominating body inside the press from within the journalists, to undertake the self-censorship on what is be or not to be published.

The study revealed that the most vital type of censorship is the self-censorship, and direct censorship is by the Editor-in-chief and the organizational censorship. The results also showed the drop in the state's censorship and the Public censorship in spite of their importance. The state's censorship gains its importance from the legislations, the laws and prohibitions of publication that prevails in the papers, and the state's- censorship is also through the Intelligence Corps, the National Security and the State Security Investigation, besides the decrees of the attorney general for prohibiting the publishing in some cases in addition to the prevailing issues, this is what is confirmed by the director editors.

Table 7. Forms of more important censorship

	N	Mean	Std. Deviation
Self-censorship.	226	1.66	1.190
Direct censorship.	226	2.79	1.005
State censorship.	226	3.84	1.374
Organizational. Censorship.	226	3.22	1.120
Public censorship.	227	3.40	1.325
Valid N (list wise)	226		

Table 7. The arithmetical mean of, kinds of important censorship

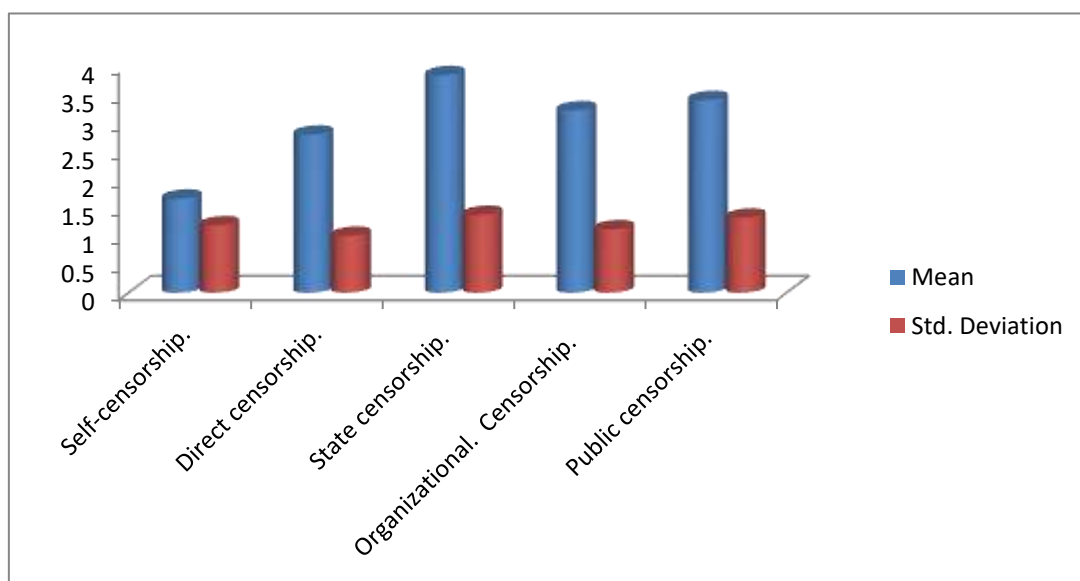


Figure 6. kinds of important censorship

Research Question 4: Do you think that the censorship of the Editor-in-chief important to the journalistic work?

Table 8. Points out that, 43.9% of the journalists participating in the questionnaire said censorship of the press work by the authority and Editor-in-chief are essential (sometimes), 39.2% of them said (yes), while 15.0% of them said (No).

Table 8. Importance of the Editor's –in- chief censorship to the journalistic work

Do you think that the censorship of the Editor-in-chief important to the journalistic work?				
	Freq	Percent	Valid Percent	Cumulative Percent
Yes	118	37.7	39.2	39.2
Sometimes	132	42.2	43.9	83.1
No	45	14.4	15.0	98.0
I don't know	5	1.6	1.7	99.7
Missing	1	.3	.3	100.0
Total	301	96.2	100.0	
Missing System	12	3.8		
Total	313	100.0		

Table 8. Shows; Do you think that the censorship of the Editor-in-chief important to the journalistic work.

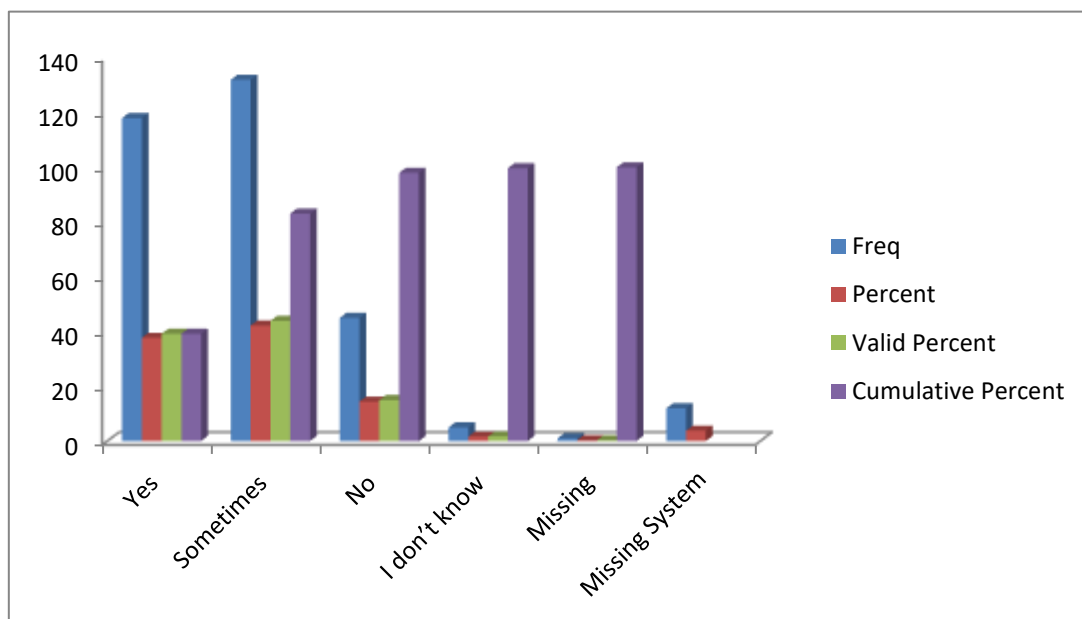


Figure 7. Importance of the Editor's –in- chief censorship to the journalistic work

Table 9. Pointed out that 58.3% of the journalists participating in the questionnaire state that the importance of censorship is for refrain from committing breaches, and the rate of 33.9% of them stated that the censorship protects the journalists, 7.8% of them mentioned all the aforementioned reasons.

From the above-mentioned it is clear that there is a sort of agreement between the majority of the people who participated in the questionnaire on the importance of the censorship of the authority and the editor-in- chief to avoid committing violations.

Table 9. Reasons that make the censorship of the papers essential

Reasons	Freq	Percent	Valid Percent	Cumulative Percent
Refrain from committing breaches	14	4.5	7.8	7.8
	105	33.5	58.3	66.1
Censorship is protection of journalists	61	19.5	33.9	100.0
Total	180	57.5	100.0	
Missing System	133	42.5		
Total	313	100.0		

Table 9. Shows; for which reason is the censorship of the papers essential?

5. Conclusion

The study proved that Sudanese journalists are sometimes subjected to censorship, the more types of censorship exercised by journalists on the news, is self-censorship, where the journalists select the news that conform with the editorial policy of newspapers in which they work since the process of collecting information from news personalities, and this in turn reduces the effectiveness of the journalists in the making of compound and effective news. These journalists also stressed the importance of censorship exercised by the editor-in- chief, and the journalists participating in the questionnaire stated that the importance of censorship is for refrain them from committing breaches.

6. Acknowledgement

The research financed Haliema Mohammed Sulieman, Assistant Professor at department of Communication and Information Technology, Imam Abdurrahman Bin Faisal University (Previously University of Dammam), Dammam, Kingdom of Saudi Arabia.

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Appendix

Newspapers Studied:

No	Newspapers Name
1	Ajrass Al-Hurray
2	Akbar Al-youm
3	Akhir Lahtha
4	Al- Tareeq
5	Al- Taghyeer
6	Al- Intibaha
7	Akhbar Al- Sudan
8	Al- Sahafa
9	Sadaalahdas
10	Al-Ahram Al- youm
11	Al-Ayyam
12	Sada Al- Ahdath
13	Al-jareeda
14	Al-Rai Al-Aam
15	Al-Raid
16	Al-Sudani
17	Al- Shahid
18	Alwan
19	Al-Watan
20	Al-Wifaq
23	Sudan tribune

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The perception of the economic agents on the quality and the control in the certification of wines in Geographical Indications (GIs)

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Abstract

Since 1992 geographical indications have become a reference for product quality, especially in the food sector in the European Community. The identification of the products with the place of production was a strategy used in antiquity, mainly to identify the origin of the wines, being this the pioneer product. The research was developed in the demarcated wine regions of Portugal. This country is considered the birthplace and the pioneer in the regulation of Geographical Indication (GI). The first demarcated region was that of the Douro, where Port wine is produced. Seals identifying the products of the region demarcated for distribution to producers undergo a certification process, described in the Specification Manuals, formulated according to the rules established in the GI, which each producer must follow. Therefore, the research, sought to identify the process of certification of products originated from Portuguese GIs in Portugal, and the perception of economic agents on the control, good practices and quality, in relation to the distribution and control of certification stamps. The methodology used was field, documentary and bibliographic research by the use of questionnaires. For the economic agents, the quality of the products is satisfactory, not requiring changes taking into account the way in which it is being distributed and controlled.

Key-Words: Geographical Indications; Economic Agents; certification of wines.

Introduction

Geographical Indication is a distinctive sign of communal property, of Germanic origin, where communal property means "community interest". It is also considered (Almeida, 2014) to be an indivisible, inalienable right and ownership belongs to the collectivity, that is, to those who work in the geographical region of the

Geographical Indication (GI). The implementation of GI represents the valorization of a typical and notorious product of a region, where a space of reflection on control and quality as a community policy is proposed, which economic agents must follow to differentiate the products in the market (ARFINI et al, 2010).

However, control mechanisms exist as a prerequisite for the certification of GI products, despite ownership and independence, and can be carried out by public or private entities. In the case of private entities, they are governed by regulations established by the governmental authorities, that regulate and supervise them. The author also points out that, in countries such as France and Italy, control is done entirely by private entities, being only supervised by public institutions. Another form of control is self-control, a model used by the Champagne Region in France, which is done by the company itself.

The quality of GI certified products, if standardized and documented, increases consumer confidence and safety. Norms and regulations are a landmark and a uniform methodology that ensures clear competitiveness between economic agents that use GIs and increase the credibility of these products vis-à-vis consumers (VANDECANDELAERE et al (2010)).

The control of Portuguese wines certified as DOC or PGI, from the Decree of Law no. 212/2004, which regulated the so-called "Institutional Reform of the Wine Sector", was carried out by public and private institutions. The Wine and Wine Institute (IVV) and the Regional Wine Commissions (CVRs) were restructured and significant changes were made in the functioning of these entities. The CVRs, from that decree on, are known as "Wine Certification Entities" and the obligation to be accredited by the Portuguese Accreditation Institute (IPAC), according to NP EM 45011, are responsible for controlling the production and certification of wines.

The process of certification of origin in Portuguese geographical indications undergoes a series of regulated requirements and present in the handbook of specifications, constructed according to each of the demarcated regions, depending on the type of wine produced in that regional demarcation (Almeida, 2014). The quality of wines in the context of the European Union is strictly based on the characteristics of geographical origin and regulated by the Resolution 479/2008. The resolution establishes support measures, regulatory measures, rules on trade with third world countries and rules on potential production. In this way, the entire certification process carried out by the certifying entities must meet the requirements stipulated in the regulation.

In Portugal and throughout Europe, as mentioned earlier, the certification process has specificities according to the characteristics of each demarcated region. Thus, wine producers commercializing products of the GIs, either protected designation of origin (PDO) or protected geographical indication (PGI), must apply for certification at the certifying entities. According to INFOVINI (2016), "wine commissions or certification boards are cross-professional and autonomous boards whose main function is to supervise viticultural techniques and vinification processes." In addition to also having functions of promotion and dissemination of the wine products of the demarcated region.

The present work has as its objectives to identify the control process for the certification and to analyze the perception of the economic agents on the quality and good practices in the geographical indications of wines in Portugal. The methodology used was quantitative, bibliographical and documental research.

Literature Review

Certification of products in geographical indications:

Certifications of origin in geographical indications as distinctive signs are a collective tool for the sustainable development of territories and marketing promotion with the aim of highlighting places, people and products (Kakuta, 2006). According to the origin and the form of production, geographical indications are designated as Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI) for products of the European Union. According to Rival et al (2016), the protected designation of origin refers to products originated in a region whose quality or characteristics are essentially and exclusively from the geographical environment, including natural, human, cultural and social factors which extraction and transformation occur in a limited geographic area.

While for IGP products, protection is granted to those that are processed locally but can be mixed with some external ingredients. PGI refers to a product coming from a region with a certain quality, reputation or other characteristics that can be attributed to that origin. In addition to that, the production or processing steps must occur within the delimited geographical area. At least one of the production, processing or preparation stages originates in the delimited area (RIVAL et al, 2016).

The particular qualities of certain products, attributable to their geographical origin, began to be known by pointing out the location where they were produced. According to Kakuta (2006), the specificities of the products are directly related to the production area and it is the commitment of the producers that guarantees the quality in the elaboration perceived by the consumers.

Tonietto (2002) describes geographical indications as organizations that:

"In practice, these concepts give legitimacy to the production with delimited geographical origin, whose products have typical characteristics and quality determined by the climate, the soil, the technology of production and elaboration, where the man with his know- faire" (TONIETTO, 2002).

According to Vandecandelaere et al (2010), the certification process does not occur automatically and the rules must be clear and count on public support policies. The author considers that the GI system is complex because it involves multisector, multilevel, public and private sectors, becoming important factors for the success of coordination and training of the actors.

Giovannucci et al (2009) argues that the implementation of a GI comprises several activities and requirements, part of the constitution of an entity or organization that will manage product certification, based on standards of control procedures that must be followed by producers.

They play a fundamental role for the organization of GIs, the groupings or the association of producers as a legal entity, both in the application for registration and in the management and control (Soeiro, 2005). According to Bagal and Vittori (2011), international agreements for the creation of GIs do not foresee the creation of an association or collective entity as a prerequisite, but consider it a success factor for the consolidation of this type of productive arrangement. In practice, it establishes rules of relations between internal stakeholders directly involved in the process (horizontal cooperation) as well as relations with external actors (vertical cooperation).

However, they are activities inherent to the groupings, alterations and requests for cancellation of the specifications; supervision of the effective protection of registered GIs; control of the conformity of production to the product specification; information, promotion and any activity aimed at improving value; the effectiveness of quality schemes and monitoring the position of products on the market (SOEIRO, 2005).

Almeida (2014) states that the principles to be verified in the control and certification are contained in the specifications, standards to be followed by producers in the Demarcated Region, which are decided among the participants of the GI, obeying the legal criteria for each product.

In accordance to the Regulation (EC) No 1151/2012 that regulates the quality schemes for agricultural products and food supply, Article 7, deals with the product specifications for PDOs and PGIs. In this same article, the minimum that the Specification Handbook of each GI must present is described as follows:

- (a) the name to be protected as a designation of origin or a geographical indication, as used in the trade or common language, and only in the languages which are or have been historically used to describe the product concerned in the defined geographical area;
- (b) the description of the product, including the raw materials, where appropriate, as well as the main physical, chemical, microbiological or organoleptic characteristics;
- (c) the definition of the delimited geographical area.
- (d) the evidence that the product originates in the geographical area
- (e) the description of the method of obtaining the product and, if appropriate, the local, authentic and constant methods as well as information on packaging. if the applicant grouping considers and justifies, with sufficient specific product-related grounds, that the packaging must be carried out in the defined geographical area in order to safeguard the quality; ensuring origin or ensuring control; taking into account Union law, in particular in the field of the free movement of goods and the freedom to provide services;
- (f) the elements that establish: (1) the relationship between the quality or characteristics of the product and the geographical environment and (2) if appropriate, the relationship between a given quality, reputation or other characteristic of the product and geographical origin
- (g) the name and address of the authorities or, if available, the name and address of the boards that verify the compliance with the provisions of the product specification in accordance with Article 37 and their specific tasks;
- (h) any specific labeling rules governing the product in question (REG.EU 1152/2012, Article 7).

Certification and control, quantity, quality, physical-chemical analysis, organoleptic analysis and physical controls are part of the certification. The certifying entity is also responsible for the application of fines, due to non-compliance to the GI regulation (Almeida, 2014). There is a need for representatives of GIs to provide the market with products that are consistent, standardized and recognized by consumers (CERDAN et al, 2010).

Certification Process

The process of certification of wine origin, notoriously in Portugal, began with the establishment of the General Company of Agriculture of the Vines of Alto Douro in 1756 by Marquês de Pombal. The certification consisted from the demarcation of the Douro Region on, in a process of qualification of wines produced exclusively in the Region. The wine would have the certification seal, such as Port or Douro wine, and it had as its main objective to avoid adulterations, to balance production and trade, as well as price stability. In the region of the Douro, 335 marks of stone were distributed including the designation of a factory, where the certified wine is produced (CARDOSO, 2014).

Currently, the plan for certification establishes a series of requirements to be verified and followed by the economic agents who wish to certify the product. As Tregear et al (2007) puts it:

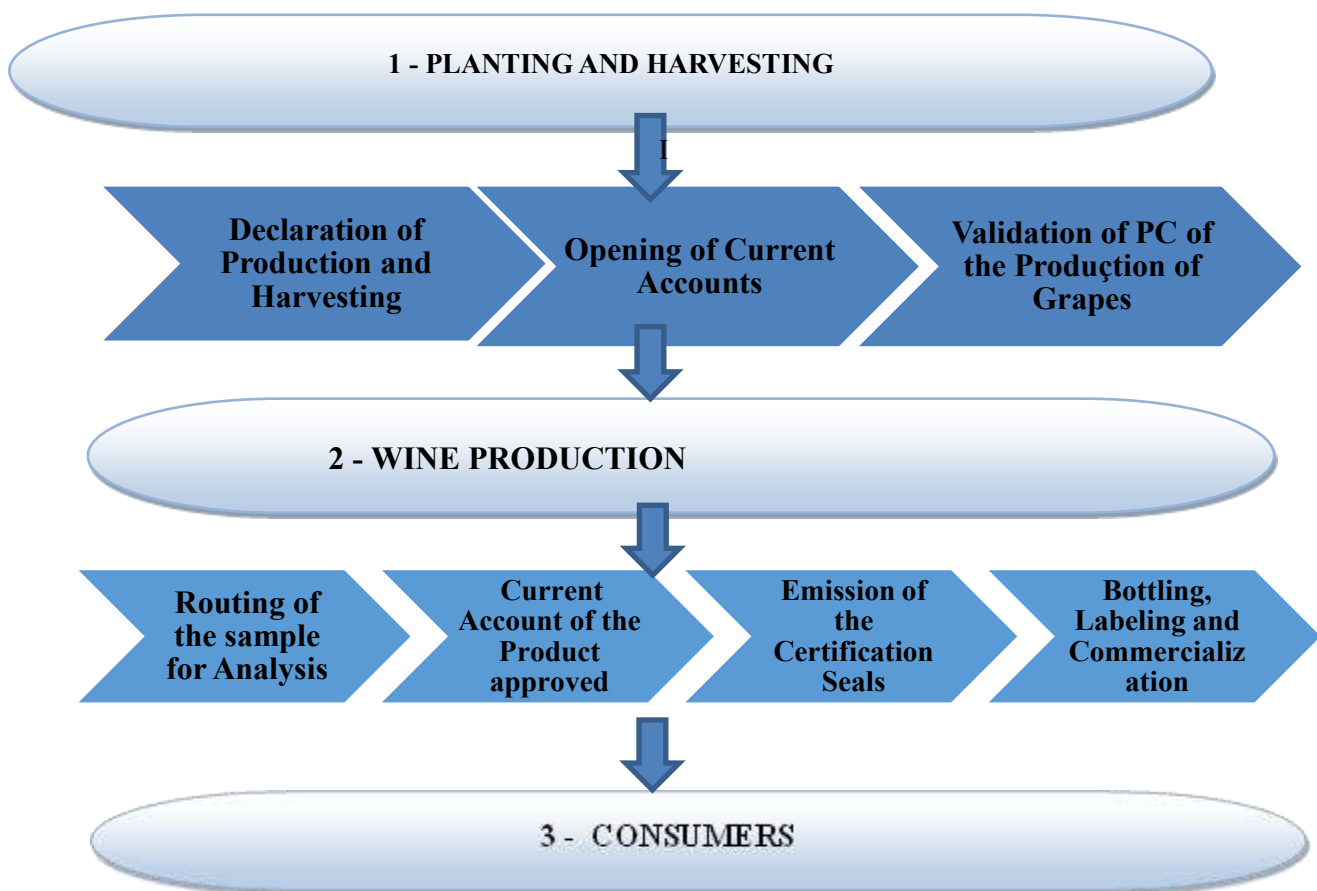
The quality of products certified in GIs is defined as the specification of production practices and characteristics of the product according to the "know-how", enumerated in a participatory manner, with the economic agents and controlled by the certifying entity. The producers involved, both in the production of grapes and in the production of wines, agree to fulfill the predetermined specific characteristics, in order to receive the certification seal and what should appear on the label of the products.

Although products of geographical indications are products with a characteristic history, they can not be tight in their mode of production, but should seek to follow what determines the consumers not only locally, but as far as their production reaches. Thus, products originated in demarcated territories, over the years have acquired new characteristics to adapt to legal trends and market aspects, re-adjusting to the changes in production techniques, commercial, environmental, social and cultural (MARESCOTTI, 2006).

For Marescotti (2006), the relationship between time and memory, local traditions and culture, that is, the "know-how", requires constant innovation as well as the appearance of products, so that the valorization of the typical regional product is not impaired.

The quality of the products is not linked to a single individual or producer but to a community of actors through the connection that united them and that have been changing and consolidating itself over time. Quality aspects bring credibility to the consumption of products and serve as a basis for the "collective reputation" for the specialization of the region or place where they are produced (RANGNEKAR, 2004) Some control and quality actions are directly related to the work of the economic agent and others are carried out in the headquarters of the certification entity or in laboratories accredited by IPAC. Wines that are approved and eligible to receive IG's guarantee seal undergo the certification process as shown in the flow chart below. According to Almeida (2014), the activities related to the geographical indications of wines aiming at product certification have the following steps to be controlled and audited by the certifying entity.

Flowchart of the Wine Certification Process



Source: Adapted from http://www.vinhosdoalentejo.pt/detalhe_conteudo.php?id=96

The stages of analysis and supervision for acquiring the certification seal go through the following criteria that has to be followed by the economic agents who are part of the IGs.

1 Protection, promotion and market regulation: The protection in the IGs requires more than the protection of the geographic name, but it has made necessary the association of the product, local origin and factors related to quality. In relation to the strategies for the placement of products in the market, according to Ragnekar (2004), the ones considered relevant are those of products, of communication, of prices and distribution.

2 Regulations: So that producers can benefit from the incorporation or aggregation of value to products of origin, it is necessary to establish rules, standards and regulations. If the rules are not fulfilled, they can damage the image of GI against the consumers. Therefore, according to the authors Vandecandelaere et al. (2010), the determinant in the aggregation of the value of the GI lies in the behavior of the producers, respecting the determined collective principles, that turns the product typical and valuable. "So that consumers are able to contribute to preserve the specific characteristics of the GI product on the market, it is important to establish well-defined rules and to require compliance."

3 Control: the controlled practice is related to the quantity and quality of the products. According to (Almeida, 2014) it has a direct relation to the proof of the place where the grapes are used for the production and the oenological follow-up are produced in a handbook called "Specification Handbook" in which the operations carried out in the production process are noted down and recorded.

The control in the GIs after implementation is characterized by three types: internal, external control and self-control. Cerdan (2010) understands internal control as what is carried out within the scope of the Management Entity through regulation, inspection and certification of the products. While external control is the type which is carried out by an accredited organization contracted by the Management Entity. Concerning self-control, this is done by the producer himself who controls his own production. What the European Union has done according to Cerdan (2010) is "to combine an external control of an official board to internal controls. This control of an official board must have the guarantee of exemption and impartiality, which are the necessary values to guarantee the specificity of a GI".

The compliance with collective rules and protection against counterfeiting becomes effective if it provides punishment of wrong behavior, for it can improve the return on product acceptance, especially if accompanied by the consolidation of a collective system of governance and promotion in the markets.

4 Physical-chemical analysis: in this analysis, the physicochemical characteristics of the specific laboratories of oenology are evaluated, such as relative density, alcohol content, hydrogenation potential (pH), total acidity, volatile acidity, free sulfur dioxide (SO₂), total SO₂, sugar and dry extract. The parameters of each of these variables are determined according to the type of wine produced, the legislation and the standards determined in the geographical indications.

5- Sensorial analysis or organoleptic analysis: it is a tool to evaluate the quality of the wines trying to identify the defects and to describe the qualitative attributes. The characteristics of wine are analyzed through sight, smell and taste. According to the author, the work is divided into four parts: by the senses, the description of the stimuli, the comparison with established standards and the judgment (RIZZON, 2010).

6 - Physical Controls: the controls of the production, circulation and trade of products of the wine sector that are originated in the geographic area of operation, being able to carry out inspections and to take samples in the vinification facilities, distillation, storage, bottling, distribution, wholesale and retail and in the transport container as well. And it also requests all documentation and information necessary to verify compliance with specific rules of the wine sector (CRVV, 2017).

After undergoing the control and the analysis steps, the products receive the certification seal and it is considered that they conform to the specifications of the demarcated region. According to Marescotti (2006), "certification seals are mechanisms and signs of information used by producers to stimulate favorable responses from consumers when they are faced with the choice of products of the same category."

Quality and Good Manufacturing Practices

The consumer identifies products certified in a GI by their specific quality and by the way they are produced. When certified they undergo a process of analysis through quality tools and good seal certified manufacturing practices, after attending the specifications regulated in each GI. Products linked to their origin and derived from GIs are the result of technical, social and economic relations. The identification of these products by the consumers in the relationship they maintain within the productive chain takes place through the recognition of the geographic name linked to the know-how and to the cultural traditions of the IG's encompassing region, which provides a collective reputation (BELETTI, MARESCOTTI, TOUZARD, 2015).

According to Anonym (2003), the evaluation of the quality of products or services in the GIs is based on their social benefit (Integral Quality) and highlights three components of quality:

Certified product quality: validation of the technical characteristics of the product regarding its social impact; certified quality of the process and place of origin; highlights and emphasizes society's know-how, the respect for traditional processes of work and the origin of products; valued quality; characterized by values collectively shared.

Wine Certifying Entities in Portugal

The control of production for the right to use the PDO or PGI seal is, therefore, carried out by the Wine Certification Entities in Portugal, which are designated by the Ministry of Agriculture and Sea through Ordinances by complying with requirements established in the Decree-Law No 212/2004 of 23 August and Order No. 22 522/2006. The entities accredited by IPAC follow the rules of Regulation 765/2008 of the European Community. According to the characteristics determined for each of the demarcated regions, an entity to be accredited starts to develop activities of evaluation and recognition of technical competence. In relation to the accredited entities that analyze the wines, they perform tasks as controllers and certifiers of PDO and PGI products.

In the demarcated regions, wines are produced according to the differentiated characteristics of the grape varieties and the types of wines produced which are listed in the table below.

Chart 1: Certifying Entities

Certifying Entity	Accreditation	Types of Wines
CVR of Green/Minho Wines	297/2008	White, Red, Rose, Fortified and Sparkling wines
CVR of Trás-os-Montes	1234/2008	White and Red
IVDP	AP	Port Wine (Fortified Wine), Red and White
CVR Távora-Varosa	197/2012	White, Red and Sparkling
CVR of Bairrada	193/2012	Red, Rose and Sparkling
CVR of Dão	37/2011	Red, White, Rosé and Sparkling
CVR of Beira Interior	280/2011	White, Red, Rosé and palhete, Sparkling
CVR of Lisboa	739/2008	White, Red and Sparkling.
CVR of Tejo	738/2008	White, Red, Rosé, Sparkling wines, Fortified wines
CVR of Península de Setúbal	614/2008	White and Red
CVR Alentejana	1000/2008	White, Rosé and Red
CVR of Algarve	1135/2010	White and Red
IVBAM	AP	Fortified Wines
CVR of Açores	C0036/2014	White and Fortified Wines

Source: Adapted from IVV- Instituto da Vinha e do Vinho de Portugal.

According to the Portuguese Accreditation Institute (IPAC), accreditation has been used by governments as a form of decentralization of state tasks, rationalizing costs but maintaining control and vigilance in the

same way. It is so that in the certification of wines, the Institute of Douro and Port Wine (IVDP) and Institute of Wine, Embroidery and Handicraft of Madeira (IVBAM) are entities of public nature and the others of private nature. The analyzes for certification are performed through accredited Laboratories, which perform Sensory Analysis and Physical-Chemical Analysis. They also have a chamber of tasters for sensory analysis. To certify, the entities that maintain the control of the management of the GIs should elaborate plans taking into account the legal and sanitary norms of the product. According to the Institute of Vine and Wine (IVV, 2015) in the Autonomous Regions of the Azores and Madeira, certification boards are regulated by their own regional norms.

Methodological Approach

The variables for analysis were collected through the application of a questionnaire, based on the Likert Scale, to 62 economic agents (participants) and members of GIs. The methodological procedures addressed in the present study or the means to achieve the objectives was the quantitative research. They were carried out through the application of questionnaires that consisted of two parts: one of identification and the other made up of closed questions based on the Likert scale. In the Likert scale, it was used a scale of 5 alternatives disagrees; disagrees in part; indifferent, agrees in part and fully agrees. Sixty-two questionnaires were applied from April to July / 2016 to the economic agents that are part of the 14 (fourteen) Geographical Indications of Portugal.

In relation to the documentary research, additional information about the Management and Certification Entities of the GIs was collected on websites, regulations, internal documents, specifications, board and senior management reports and minutes of meetings.

Presentation and Analysis of the Results Obtained

The Economic Agents who answered the questionnaire are characterized as follows according to table 1:

Table 1 - Characterization of Economic Agents

Economic Agents	Respondents	Percentage %
Farm Producer	10	16,13
Businessman / Winery	46	74,19
Businessman / Retail	3	4,85
Businessman / Tourism	1	1,61
Association or Cooperative	1	1,61
Manager / Certifying Entity	1	1,61
Total	62	100

Source: Prepared by the authors

Table 2: Identifies the number of questionnaires answered by the Economic Agents of the Management and Certification Entities of Geographical Indications. Porto / Douro were responsible for 33.88% of the answers obtained being so the highest index.

Table 2 - Geographical Indications to which Economic Agents are linked

Geographical Indications	Respondents	Percentage %
Verdes Vinhos	10	16,13
Trás-os-Montes	4	6,45
Porto e Douro	21	33,88
Távora-Varosa	---	----
Bairrada	6	9,68
Dão e Lafões	4	6,45
Beira Interior	3	4,84
Lisboa	6	9,68
Tejo	---	----
Península de Setúbal	1	1,61
Alentejo	4	6,45
Algarve	1	1,61
Madeira	2	3,22
Açores	0	----
Total	62	100

Source: Prepared by the authors

Control

Chart 2- Control

CONTROL	AGREEMENT LEVEL (%)				
	D	DP	I	AP	AT
1-The distribution of the certification stamps is satisfactory	5 (8,06)	3 (4,84)	6 (9,67)	21 (33,87)	27 (43,55)
2-The way the certification stamps are distributed must change	23 (37,10)	4 (6,45)	12 (19,35)	16 (25,81)	7 (11,29)
3-The results obtained are socialized to all the beneficiaries by the entity	10 (16,13)	9 (14,52)	23 (37,10)	15 (24,19)	5 (8,06)
4-The functioning of the Regulatory Board and the Regulation of Use (Specifications Handbook) are clear and objective.	9 (14,52)	10 (16,13)	13 (20,97)	23 (37,10)	7 (11,28)

Source: Prepared by the authors

Item 1: the distribution of certification stamps is satisfactory with 77.42% (48) agreeing to the form of distribution, only 12.90% (8) disagreeing and 9.68 (6) did not opinate.

Item 2: the way the certification stamps are distributed should change according to 37.10% (23), 43.55% (27) disagreed and 19.35% (12) did not opinate.

Item 3: the results obtained are socialized to all the beneficiaries by the management entity- 32.25% (20) agreed, 30.65% (19) disagreed, 37.10% (23) did not opinate.

Item 4: If the functioning of the Regulatory Council and the Regulation of Use are considered clear and objective- 48.38% of economic agents agreed, 30,65 (19) disagreed and 20.97% (did not opinate).

Chart 3 - Quality and good manufacturing practices

Quality and good manufacturing practices	GRAU DE CONCORDÂNCIA (%)				
	D	DP	I	CP	CT
1-There have been improvements in "wine quality" promoted by the Certifying Entity / Manager	2 (3,23)	5 (8,05)	3 (4,84)	26 (41,94)	26 (41,94)
2-Good Manufacturing Practices are considered for the emission of the seals	9 (14,52)	6 (9,67)	16 (25,81)	17 (27,42)	14 (22,58)
3-There is agreement with the form of evaluation of the quality for certification	6 (9,67)	7 (11,29)	7 (11,29)	26 (41,94)	16 (25,81)
4-Product quality and good practices are socialized and discussed in a participatory manner.	16(25,81)	14(22,58)	13(20,97)	14(22,58)	5(8,05)

Source: Prepared by the authors

In the analysis of Table 3, we find the following information:

Item 1: there have been improvements in "wine quality" promoted by the Certifying Entity / Manager: 83.88% (52) agreed, only 11.28% (7) disagreed, and 4.84% (3) did not opinate.

Item 2: Good manufacturing practices are considered for the emission of seals or just the way the product is produced is considered: 50% (31) agreed, 24.19% (15) disagreed, and 25.81% (16) did not opinate.

Item 3: There is agreement with the form of quality assessment for certification: 67.75% (42) agreed, 20.96% (13) disagreed and 11.29% (7) did not opinate.

Item 4: Product quality and good practices are socialized and discussed in a participatory manner: agreed 32,26 (20), disagreed 48,39 (28) and 22,58 (14) did not opinate.

Conclusions

The definition of the demarcated region or geographical indication goes through a series of arrangements to be consolidated among the economic agents in a participatory way. Among the arrangements, there are control and quality specifications and good production and marketing practices. The certification stamps to be distributed must be validated by all phases of the certification process, as ex-ante and ex-post.

In the demarcated regions of Portugal, the economic agents when answering the questionings made in the research showed satisfaction with the certification process and the issuance of the stamps, norms and regulations. That happens even because the product with DOPs or IGP certification acquires notoriety also by the way the certification system is developed. Certifying entities play roles of integration between the

different economic agents through policies for the placement of products in the market, the development of the region, the protection of culture and sustainability.

The quality of products directly linked to the place of origin is a relevant factor for the consumer, which associates characteristic attributes created through their affective ties with the place.

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Application of LEGO Mindstorms Kits for Teaching Mechatronics Engineering

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Abstract

One of the major educators' challenges is to teach the theoretical lessons with practical examples that can be taught in the classroom or teaching laboratories. The application of these examples will face a major problem for students in engineering: the difficulty of understanding and seeing how a mechatronic device works in everyday life. This requires the use of tools that enable the construction of different low cost prototypes to assist in student learning. Another challenge to educators is the need to motivate students during the lessons and to present models that students can make and develop on their own. Within this context this paper presents a pedagogic proposition based on the use of LEGO Mindstorms kits to teach practical lab activities in a mechatronics engineering course. The objective is to develop teaching methodologies with the use of these LEGO kits in order to motivate the students and also to promote a higher interdisciplinarity, by proposing projects that unify different disciplines. Thus, the paper is divided into three parts according to the educational experiences implemented in the course of mechatronics engineering at the Federal University of Uberlândia, Brazil. The first part presents the use of the kits in robotics discipline. The second part presents the use of the virtual kits in the Computer Aided Design discipline with zero-cost. The third part presents a multi-disciplinary project EDROM in mechatronics using LEGO kits.

Keywords: Mechatronics; Robotics; CAD; EDROM; LEGO

1. Introduction

The use of new technologies in teaching and learning processes is currently increasing. Educational robotics has made remarkable progress in several educational environments [1-3]. In spite of the usefulness and the versatility of such an educational tool, it is not widely used in Brazil, mainly due to the high costs of the equipment. In [4] was affirmed that the popularity of robotics kits in education is significantly higher in the developed countries (typically Western Europe and North America), while the kits are still on the edge of breaking into the market of developing countries (South Asia and Africa). In function of initiative of RoboCup Brazil Federation that promote robotics competition (http://www.cbrobotica.org/?page_id=6&lang=en) I include the Brazil in the edge, i. e., is in the accelerated progress of incorporation of robotics kits in undergraduate curses of Mechatronics Engineering. A current problem has motivated the development of this research comprising a low cost solution to implement in

the Mechatronics Engineering course at the Federal University of Uberlândia (UFU).

Today, in the market, there are several kits specially designed for education, in which students are required to have fun at the same time as they learn the bases of Mechatronics [4-7].

One of the major educator's challenges is to teach the theoretical lessons with practical examples that can be taught in the classroom or teaching laboratories. The application of these examples will face a major problem for students in engineering: the difficulty of understanding and seeing how a mechatronic device works in everyday life. This requires the use of tools that enable the construction of different low cost prototypes to assist in students' learning [8]. Another challenge to educators is the need to motivate students during the lessons and to present models that students can make and develop on their own [9-10].

Aiming to satisfy these needs, the Massachusetts Institute of Technology [11] developed a programmable bricks used by LEGO in the Mindstorms kits.

LEGO® kits are used directly on three fronts of the UFU Mechatronics Engineering course: robotics discipline (professional 9th term), in the Computer Aided Design (initial discipline of the 3rd term) and EDROM (Development Team in Mobile Robotics) multi-disciplinary extension activity.

Thus, this paper reports about development of activities to build physical and virtual mechatronics prototypes using the LEGO® kits.

Firstly, LEGO Mindstorms NXT kit and its relationship with the mechatronics and robotics are presented. After, examples of parallel robotics structures are presented focusing in the singularity analysis.

Section III presents the methodology and some projects developed using LEGO kits for the construction of virtual models in Computer Aided Design.

Section IV presents some projects developed by a team of students, competition-based program, also using LEGO kits.

Finally the discussion and conclusions are presented.

2. Robotics and LEGO

Mechatronics can be defined as the synergistic integration of precision mechanical engineering, electronics, intelligent control, and systems thinking about the design of smart products and processes [8].

According to Rosario [12], the graduation in mechatronics should be based on: i) solid fundamentals and as extensive as possible, ii) systemic and multidisciplinary approach involving mechanics, electronics and computing, and iii) learning based on experimentation, in order to eliminate the gap between purely academic project and the real world, with its limitations and compromises. It is understood, therefore, that in a mechatronics engineering course, students should be offered the opportunity of doing activities that develop their design skills in the real world, their multidisciplinary teamwork ability, communication and time management skills [13].

LEGO Mindstorms NXT kit used in this work is formed by: a PLC (Programmable Logic Controller) with 32-bit processor; three interactive geared servo motors that feature built-in rotation sensors (sensitive to one degree out of 360°) for precise control; ultrasonic sensor; sound sensor; light sensor; touch sensor and a set of pieces LEGO TECHNIC. The NXT microprocessor can be programmed to exhibit autonomous behavior using either a PC or a MAC. After building a robot, users can create a program with feature

LabVIEW software from National Instruments which works with a graphical language or using software based in language C. The communication with the computer is made using Bluetooth or a USB cable. The ultrasonic sensor enables a robot to “see” obstacles, to measure distances and to respond to movement. A sound sensor enables robots to respond to sound commands with sound patterns and tone recognition. A light sensor permits color differentiation and a touch sensor reacts to contact or release allowing robots to “feel” their surroundings.

In this way, the Fig. 1 shows the relationship between LEGO Mindstorms and Mechatronics. Students can apply concepts of mechatronics to robotic structure, with the construction of mechanical part using a set of LEGO pieces technique, sensors allowing interaction with the environment, programming the robot to give it intelligence and finally a processing unit, PLC, to connect the parts.

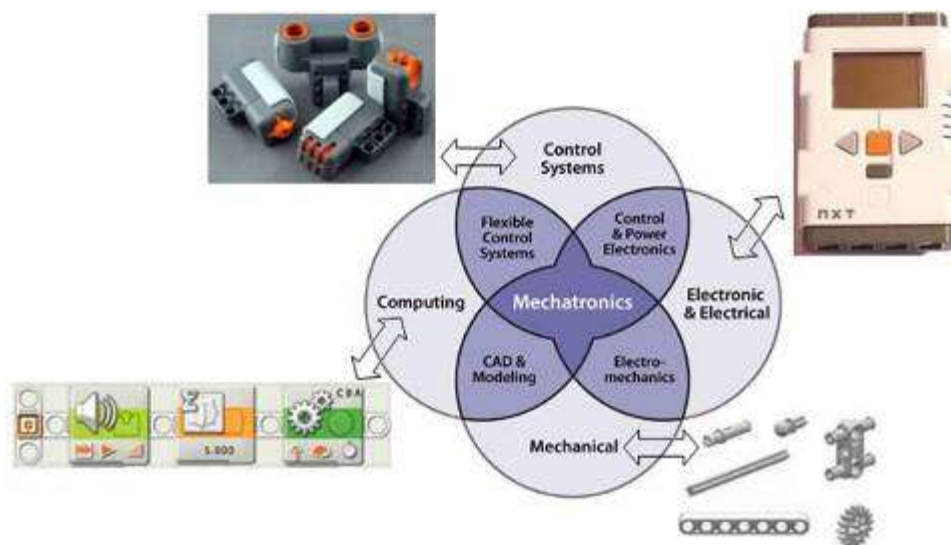


Figure 1. Relation with Mechatronics and LEGO Mindstorms.

These LEGO Mindstorms kits are used at the graduation course of Mechatronic Engineering at UFU and allow the construction of the multibody system like parallel robot structures in the discipline of Robotics. The multibody system consists on a structure composed by segments that can be rigid or flexible, connected together by joints. A multibody system that has been widely studied in recent years is the so-called parallel manipulator. A parallel manipulator typically consists of a moving platform that is connected to a fixed base by several serial chains, called limbs [14].

Parallel robot structure prototypes have been conceived and built together with the development of theoretical investigations on kinematics and dynamics, but the cost and time to develop these prototypes is high. The attention is focused on a number of possible industrial applications such as manipulation, packing and assembly/disassembly machines, motion simulation, milling machines, toys and sensors.

A few papers report the undergraduate LEGO applications [10, 13-14]. Ebert-Uphoff [10] used LEGO and other inexpensive prototypes of parallel manipulators as an efficient educational tool to teach undergraduate students not only the basics of parallel manipulators but also reinforce another disciplines.

For undergraduate teaching, one of the difficulties is to view the function and to understand the parallel

structures in a robotics course, its workspace, singularities and collisions between the segments. The use of LEGO kits allows the easy view of these problems, as detailed in our works [13-14].

Therefore, one of the important limitations of parallel mechanisms is that they may lead to singular configurations in which the stiffness of the mechanism is lost. The physical meaning of a singularity in kinematics refers to those configurations in which the number of degree of freedom (dof) of the mechanism changes instantaneously. The kit LEGO permits visualize this problem.

Other important characteristic of manipulators is the workspace. The workspace is the set of position and orientation configurations in which the end-effector is controllable and the workspace determines geometrical limits on the task that can be performed. The workspace of parallel kinematic mechanisms has in general a complex volume shape. Again the use of LEGO kits allows the visualization the workspace and its different configurations with the change of the parameters of the structure under study.

Thus, this paper uses LEGO Mindstorm Kits to facilitate the teaching of robotics and the visualization of singularities, workspace and understanding the functioning of robotic three-dimensional structures described in the next items.

2.1 Example – Parallel Structure 5R and the Singularities.

Close to or in singular configurations, the parallel manipulator becomes uncontrollable. In these configurations, the mechanism tends to lose its stiffness while gaining extra degrees of freedom. Physically, when the mechanism is in a singular configuration, the structure cannot resist an external wrench applied to the end-effectors (mobile platform), therefore it may collapse [15].

The five-bar manipulator is a typical parallel manipulator with the minimal degrees of freedom, which can be used for positioning a point in a region of a plane. A 5R parallel manipulator consists on five bars that are connected end to end by five revolute joints, two of which are connected to the base and actuated, as shown in Fig. 2(a).

In this structure, the direct singularities occur when A_1B_1P or A_2B_2P , Fig. 2(a), are completely extended or folded [16]. These singular configurations are complex configurations where the actuators cannot resist to applied forces and/or moments on the moving platform and this loci singularities are inside the workspace. The singularities due to inverse kinematic model correspond to the configurations in which the moving platform loses one or more degrees of freedom. These singularities occur when A_1B_1 is parallel to B_1P or when A_2B_2 is parallel to B_2P . These singularities determine the boundary of the workspace.

The singularity positions illustrated in Fig. 3 were obtained from the initial positioning of the 5R mechanism free of singularity, Fig. 2(b), and the movement of the servomotors to the loci of singularity. In these configurations or close to them, the structure locks or loses control and the students can visualize these problems.

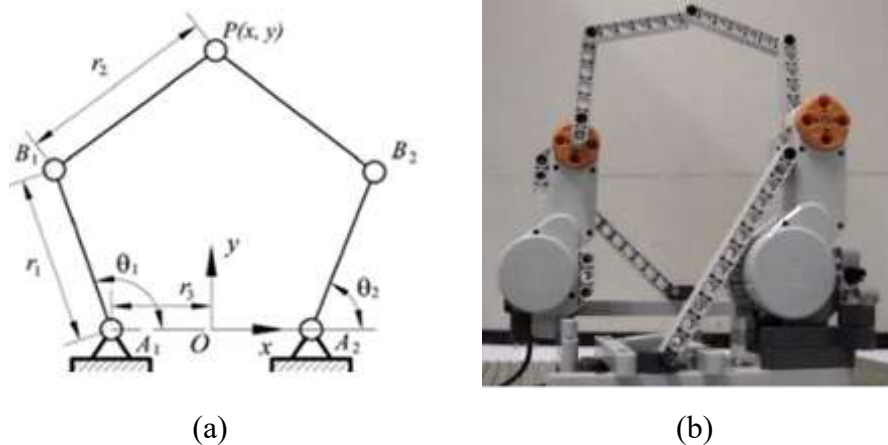


Figure 2. (a) Parameters of the 5R Mechanism; (b) Prototype assembled with LEGO.



Figure 3. Some singularity configurations of 5R mechanism built with LEGO.

2.2 Construction of three-dimensional Parallel Structures.

This section describes some three-dimensional robotic structures developed with LEGO Mindstorm kits. The purpose of these assemblies with LEGO is to show the functioning of these structures facilitating students' understanding of the applications of these structures in the discipline of robotics.

As shown in Fig. 4(a), the kinematic chain of the Delta parallel manipulator is composed of three identical serial kinematic chains that share the base or fixed platform and the mobile platform [17]. For each serial chain (from the base to the end-effector), the links are coupled by an actuated revolute joint and the passive revolute joints. Fig. 4(b) shows the LEGO Delta manipulator built. During the experimental tests of the Delta structure built with LEGO the mobile platform always remained parallel to the base, Fig 4(c-f). Figure 4(f) represents a singularity configuration in which the segments are aligned.

Another built parallel structure is CaPaMan (Cassino Parallel Manipulator). CaPaMan is a 3 degree of freedom spatial parallel manipulator that has been designed at the Laboratory of Robotics and Mechatronics, in Cassino. It is composed by a fixed platform that is connected to a mobile platform by means of three leg mechanisms [18]. Each of these mechanisms is composed by an articulated parallelogram, a prismatic joint and a connecting bar, Fig. 5(a). The centers of the bases of these mechanisms are arranged at the vertices of an equilateral triangle in the fixed platform, so that the planes containing them, form angles of 120° , thus giving the symmetry properties of the manipulator, Fig. 5(a).

In order to construct CaPaMan using LEGO Mindstorms NXT kit, Fig. 5(b), it was necessary to construct a passive prismatic joint, Fig. 5(c).

Other examples LEGO parallel structures that are built and used in the Robotics course at UFU are presented in [14].

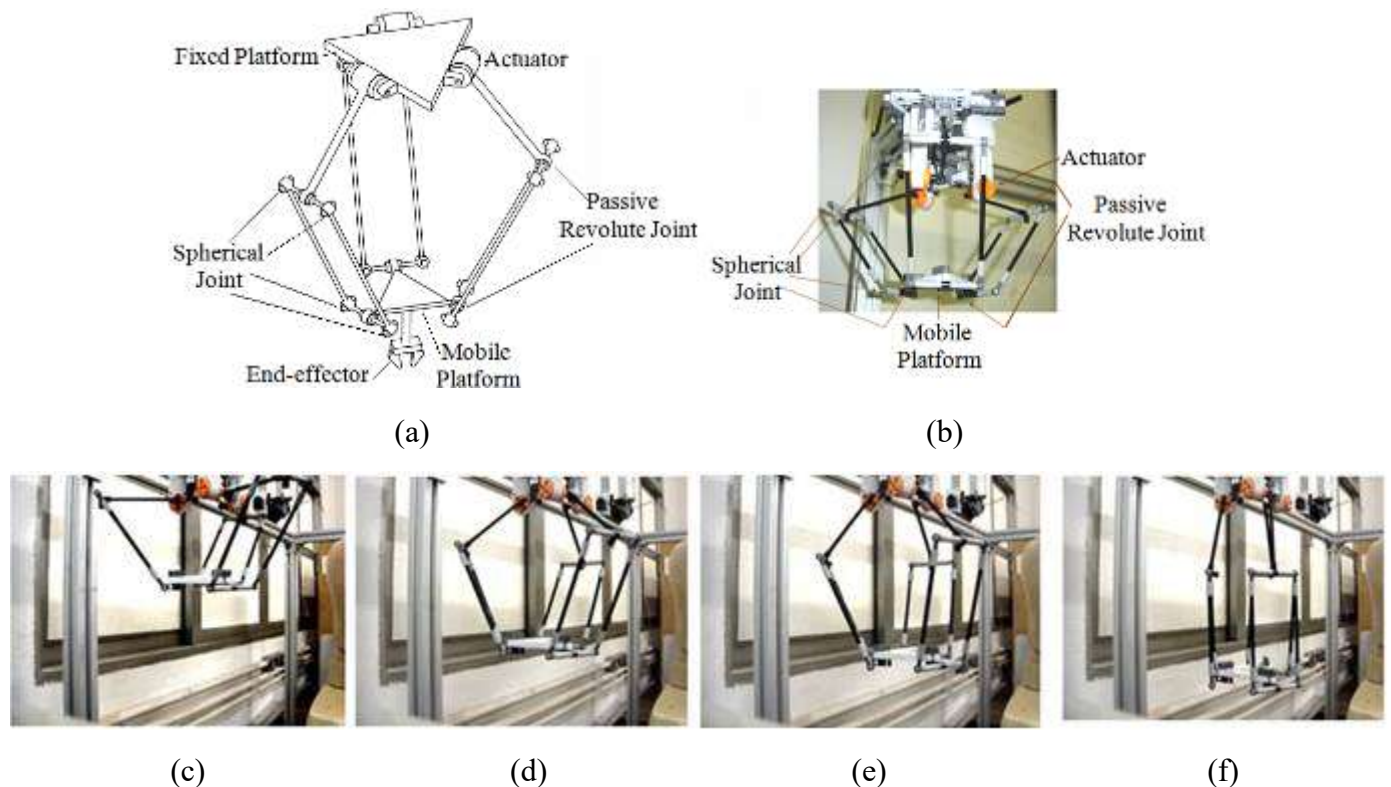


Figure 4. (a) Delta manipulator sketch; (b) Delta manipulator built with LEGO; (c-e) Sequence of moving the Delta manipulator; (f) Singularity configuration.

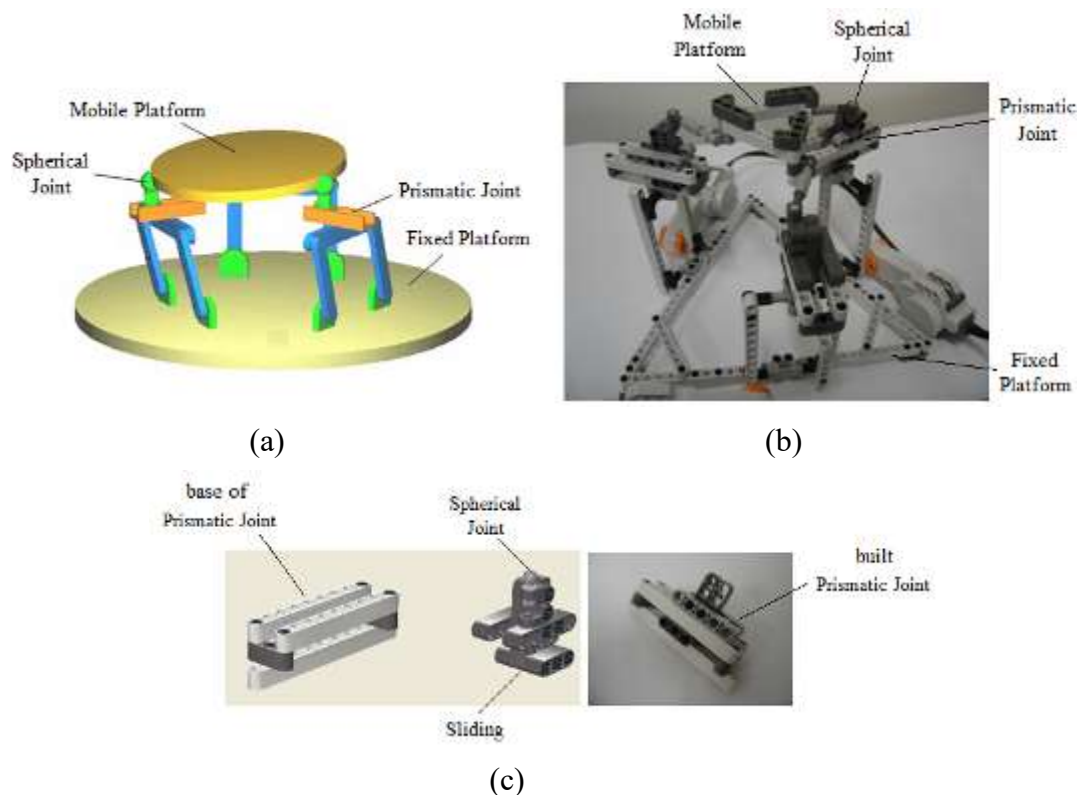


Figure 5. (a) CaPaMan sketch; (b) CaPaMan built with LEGO; (c) Prismatic joint built with LEGO.

3. CAD and LEGO

LEGO kits are also used in the discipline of Computer Aided Design (CAD). This course is mandatory for students and is offered in the third term. The purpose of this course is to enable students in the 3D modeling elements of machines and assemblies with simulation of movements. This course is offered with a workload of 45 semester hours. Currently, the CAD software used is the SolidWorks.

For students to learn a three-dimensional modeling tool and memorize the knowledge/features taught during the classes, they are divided into groups of up to 5 students and have to choose a LEGO kit for their virtual construction. The chosen kits often have more than 1,000 pieces, Fig. 6(a), which leads students to work in teams and manage large projects. As LEGO kits include all machine elements such as pins, gears, springs, bars, pulleys, etc. students end up implementing the software features for the construction of mechanical elements. Figure 6(b) shows the Taj Mahal virtual project with over 5,900 pieces.

After the construction of the pieces, students must assemble the kits using subassemblies make up the complete assembly, Fig. 7. Finally students must use the concepts that were taught in class to perform kinematics and dynamics motion simulations, for example, simulating the motion of the moving parts of an engine, Fig. 6(c).

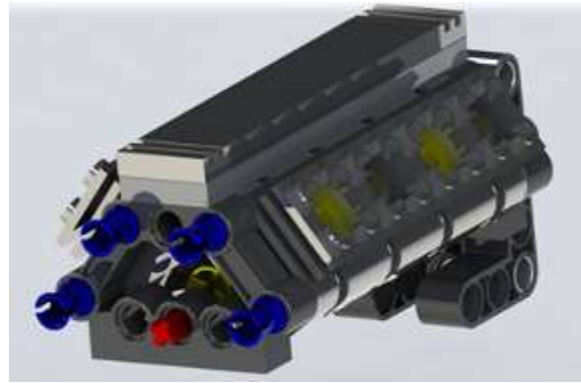
The use of LEGO kits in the CAD discipline motivates students to get the final result converted into 40% of the total grade of the course. As students must draw several pieces of different shapes and complexities, they are familiar with the basic CAD software for practicing the profession of engineering. Statically around 40% of the groups fail to complete the project in a timely manner due to lack of planning and to postponing the development of the project to the end of the semester.



(a)

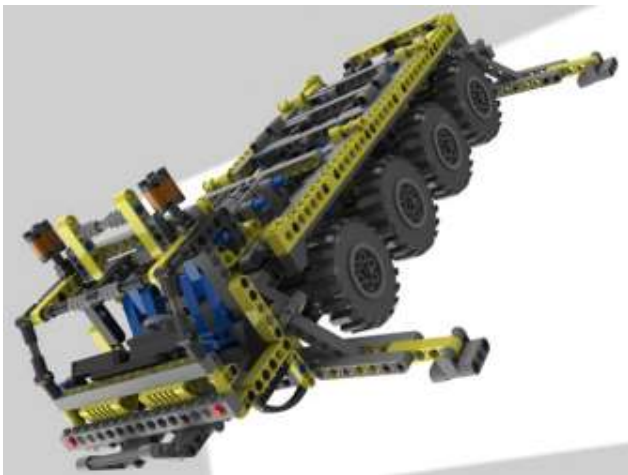


(b)



(c)

Figure 6. (a) Built virtual model LEGO; (b) LEGO Taj Mahal; (c) Engine.



(a)



(b)



(c)

Figure 7. Virtual LEGO Assembly.

4. EDROM and LEGO

EDROM (Team Development in Mobile Robotics) is an extension activity at the Federal University of

Uberlândia. EDROM aims to: participate in competitions involving the development of mechatronic systems; promoting technical and academic development of its members; encourage the entrepreneurial spirit of team members; promote contact of students with the job market and perform outreach activities inherent in undergraduate courses. This team works in technology development, as it becomes more popular because of competitions such as humanoid robot soccer competitions and robots built with LEGO parts, etc., making it a showcase for the dissemination of technological development. The EDROM has taken part in competitions since 2010.

The EDROM uses the LEGO Mindstorm NXT and EV3 kits in competition modality IEEE Standard Educational Kit (SEK) and IEEE Open. These competition modalities are an initiative of the IEEE Robotics & Automation Society in Latin America.

The IEEE SEK modality aims to present a challenge for graduation students, so it generally changes every two years. Students need to build autonomous robots using education kits approved for competition. Students work with up to two robots cooperative with embedded programming. External commands are not allowed, the robots must be autonomous.

In the IEEE Open modality, students can use any material for the development of robots. The challenging task usually tries to reproduce the real challenges of robotics in a smaller scale.

In the literature have few papers that work with LEGO in the undergraduate engineering but focusing in specific disciplines. In [6, 19-21] the LEGO was used to teach programming. In [22-24] the LEGO kits were used to teach control and in [25] to teach industrial automation.

The development of robots by EDROM students enables the integration and practical application in several disciplines that are part of the UFU Mechatronics course curriculum with emphasis on: Introduction to Mechatronics engineering; Technical drawing; Algorithms and computer programs; Differential and Integral Calculus 1; Analytic Geometry; Machine Drawing; Programming Applied to Engineering; Differential and Integral Calculus 2; Linear Algebra; General Physics I; Experimental Physics I; Differential and Integral Calculus 3; Kinematics; Computer Aided Design; Metrology; Mathematical Methods Applied to Engineering; Dynamics; Basic Electronic for Mechatronics; Optics; Optics Laboratory; Electric Circuits for Mechatronics; Computer Organization and Architecture I; Digital Electronics; Linear System Control; Dynamics of Machines; Elements of mechanics; Operating Systems; Instrumentation; Digital Control of Systems; Digital Signal Processing; Industrial Networks; Digital Systems for Mechatronics; Power electronics for Mechatronics; Database; Simulation of Automated Systems; Industrial Automation and Robotics. Almost 60% of the obligatory disciplines are used directly in the development of robots.

Figure 8 shows some of the robots that were developed and the year when they were used. A curiosity about the robots developed by EDROM is that they always have female names. This happens due to the predominance of male students in the course of mechatronics engineering at UFU.

In 2010 the IEEE modality OPEN aimed to develop an autonomous robot named FIONA, Fig. 8(a), that should manipulate products sent by producers and organize them in packages that would be sent to sales points later on. The full video can be accessed at: <http://www.youtube.com/watch?v=Rehs2V00V-Y>

In 2010 the goal of IEEE SEK was to develop two cooperative robots that must repair the pipeline, besides

the construction of an alternative pipeline in order to reduce the time of interruption in the oil flow. EDROM's project consisted in 2 robots of same aspects, named Vera and Lucia, built with 2 wheels and a sphere system that gives an appearance of a tricycle, Fig. 8(b). Each robot is capable of lift up the pipes using a claw and a system that just needs 1 servomotor. A count-lines system was created, improving the precision of the engines that rotate the robot wheels and give a best precision to make curves. It uses a color sensor to recognize the pipes. The full video can be accessed at: <http://www.youtube.com/watch?v=CGhRhgTRfb0>.

The challenge posed in IEEE SEK 2011 was to construct containment barriers, dikes, for population protection of a city situated near a river about to overflow. In an arena, an overflow that can occur in one or even in both sides of the river was simulated. So, the two robots that were built, named Vânia and Cristina, Fig. 8(c), must work cooperatively and autonomously to construct the barriers to contain the overflow. The programming was made using the language Not eXactly C [15]. It was chosen because the members of the team have knowledge about programming in C during the mechatronics engineering course.

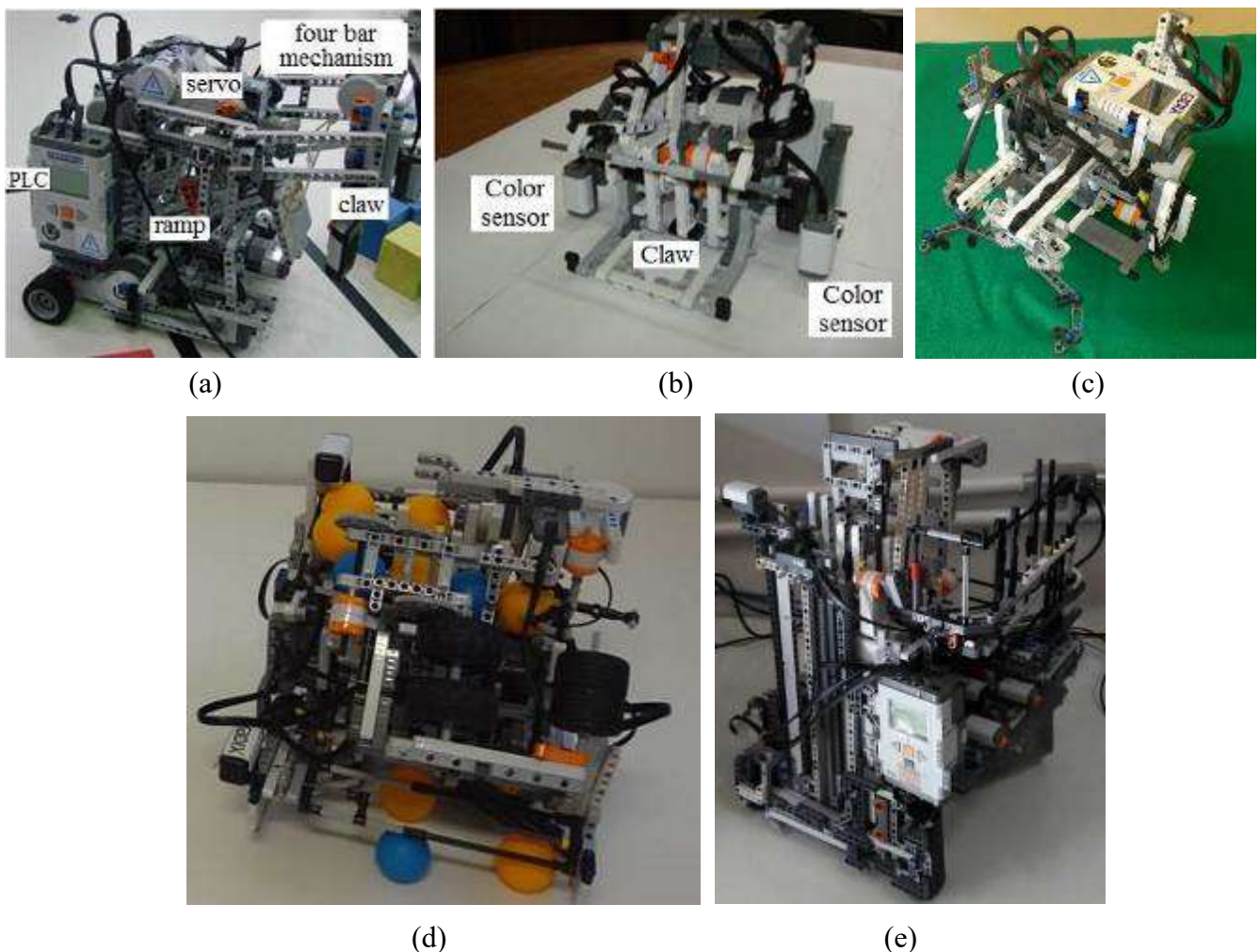


Figure 8. (a) Robot FIONA, 2010; (b) Robot Vera, 2010; (c) Robot Vânia, 2011; (d) Robot Sansa, 2012; (e) Robot Rey 2016.

From 2012 to 2014, the challenge presented to the teams was the THBall, that is a game in which the group

who acquires more points in 5 minutes wins the match. This game is played with two robots of each team. Robots have limited size, and they must fit in a cube of 250 mm. In the beginning of the match, the arena is organized with a Table-Tennis ball in orange and blue colors. Orange balls imply negative points to the team, and blue balls imply positive points. So, orange balls must be launched to the opponent side and blue balls must be maintained on the team's side. At the end of 5 minutes of game, the score is calculated and the one who has more points wins.

The full video of EDROM participation can be accessed at: <https://www.youtube.com/watch?v=nRMW5DHxtUE>.

In 2015 and 2016, the challenge presented was build a robot to explore the environment of a CLOCLON and rescue the inhabitants of a nation as the rescue color designated to the robot. The robot competed against another robot, created by another team, in the arena (CLOCLON). The robots should rescue SIMUs (humanoid polystyrene black) or ESITUs (humanoid polystyrene white), leaving the KIEFAs (humanoid polystyrene red) within the circular caves. As time is short, two robots, each from different teams, must enter the CLOCLON simultaneously, each seeking to rescue a specific nation (ESITU or SIMU). The ESITU nation should be taken to blue rescue area and the SIMU to green rescue area. The full video of 2016 EDROM participation can be accessed at: https://www.youtube.com/watch?v=_2li875ajnw.

The EDROM has participated in competitions since 2010 and has had excellent results, Tab. 1.

Mobile robots designed besides being applied to competitions allow: integration of several disciplines similar to the way that students will use them in the job market; managing deadlines to meet targets; development of teamwork; learning to deal with stress and unpredictable problems. These qualities are sought by companies and we have EDROM graduation students working or worked in multinationals as: HONDA; EMBRAER; Volkswagen and Mitsubishi.

Table 1. Team EDROM achievements.

Year	Competition	Modality SEK Classification
2010	Latin American Robotics Competition (LARC 2010)	2nd Place
2011	Latin American Robotics Competition (LARC 2011)	2nd Place
2011	Brazilian Robotics Competition (CBR 2011)	1st Place
2012	Latin American Robotics Competition (LARC 2012)	1st Place
2013	Brazilian Robotics Competition (CBR 2013)	2nd Place
2016	Latin American Robotics Competition (LARC 2016)	3th Place

5. Discussion and Conclusions

This paper presented a proposal for a multidisciplinary educational course in mechatronics focused on the use of Lego Mindstorms kits.

Takács et al. [4] compared different educational kits and the LEGO Mindstorms is the cheaper modular robotic kit in the market and had good reviews in the adopted criteria cost, modularity level, design, extension possibilities, compatibility, availability and portability.

The use of Lego Mindstorms kits made it possible to offer the students a systemic view of mechatronics engineering, including information technology (through programming), mechanical (through experience with the use of different types of transmissions, gears, bars) and electrical (through experimentation and activation of sensor and control). Other highlights are: reduced cost of deployment compared to traditional robotics labs, a paradigm shift in teaching methodology, with learning based on trial and encouraging the use of creativity in the solutions.

The undergraduate teaching of mechatronics engineering at Federal University of Uberlândia includes formal laboratory work for robotics teaching and final year projects. These activities utilize the fast development capabilities of the LEGO technical framework coupled with imagination and fun to provide the desired pedagogical outcomes.

Students find it difficult to see some existing problems in robotics such as the presence of singularities. Thus, the uses of kits from LEGO provided the illustration of these issues in a quick, easy and low cost way.

The use of LEGO kits in the CAD discipline motivates students to get the final result converted into 40% of the total grade of the course. As students must draw several pieces of different shapes and complexity they are familiar with the basic CAD software for practicing the profession of engineering. Statically around 40% of the groups fail to complete the project in a timely manner due to lack of planning and to postponing the development of the project to the end of the semester. In addition, this methodology is zero-cost.

In Machine Drawing/CAD discipline usually are used books [26-29] that present mechanical parts with geometry more simple than LEGO parts. Another point to be taken into consideration is that traditional books [26-29] present assemblies with much smaller parts than fifty. In the methodology presented in this paper students are encouraged to selecting kits from LEGO with over a thousand parts.

The development of LEGO robots by EDROM students enables the integration and practical application in several disciplines that are part of the UFU Mechatronics course curriculum. Almost 60% of the obligatory disciplines are used directly in the development of robots.

Another problem is to motivate the beginning undergraduate students that desire to learn about robotics and program these and the EDROM is one opportunity. Bower [20] considered strategies for teaching beginning students how to program mobile robots using the software LabVIEW applying one example in a DaNI Robot. But this strategies not add some skills desired by the companies. The EDROM mobile robots designed besides being applied to competitions allow: integration of several disciplines similar to the way that students will use them in the job market; managing deadlines to meet targets; development of teamwork; learning to deal with stress and unpredictable problems. These qualities are sought by companies.

To be part of EDROM, students must participate in a selection process. Students from the first to the sixth terms are selected. Students in the last semesters of the graduation are not selected because we intend to keep students in the team for at least one or two years. The team usually has 14 members. The mechatronics engineering course offers 20 vacancies per semester. In this way, they would be skillful to make the selection process out of 120 students. Usually 25 students participate in the selection process, which represents only 21% of possible candidates.

According to [30 and 31] engineering courses have few women. In [31] the following question is asked: "Can Robots in Classrooms Attract More Women to Engineering?". I can not answer yes, but I can evaluate the presence of women in the Mechatronics Engineering course of UFU and its direct involvement in activities involving robots. In general, every six months there are between 3 and 4 women per class out of 20 students of mechatronics engineering. Between the years 2010 and 2012 there was one woman in the team. Currently, there are 5 women in the team, which represents 36% of the team members and it shows women's interest and involvement with robots.

Thus, the use of LEGO Mindstorm kits provides complete learning solutions which cover important mechatronics engineering curriculum areas while stimulating creativity, problem-solving and team-working skills.

6. Acknowledgement

The author is thankful to UFU, EDROM, FAPEMIG, CNPq, CAPES for the partial financing support of this research work.

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Modified Version of Aronovsky Model for Predicting the Performance of Naturally Fractured Oil Reservoirs

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UAE

ABSTRACT

In this work the mathematical model developed by Aronovsky et. al. for predicting rates of free-water imbibition in naturally fractured oil reservoirs has been modified. The proposed model allows prediction of fractional oil recovery by spontaneous water imbibition in core samples with high accuracy.

The proposed modification involves development of an empirical correlation for the reservoir rock/fluid system-dependent parameter (λ) used in Aronovsky model and defined as rate of convergence. The key reservoir rock and fluid physical properties considered in this work include absolute permeability of the rock, porosity, initial water saturation, interfacial tension between oil and water (IFT), viscosity of oil, viscosity of water, and length of core sample.

The accuracy of the modified model is evaluated using the results of laboratory imbibition tests on nine limestone core samples. All imbibition tests were conducted at 90 ° C. The absolute per cent error based on laboratory versus calculated values of (λ) is found to range between 0.334 and 3.88.

The proposed model may also be applied for predicting fractured reservoir performance on field scale by simply replacing the core length by matrix block length when the block is totally immersed in water. Additional experimental work and/or field observations would be necessary to verify the reliability of the proposed modification.

Key Words: imbibition, fractured reservoirs, rate of convergence, Aronovsky model, and empirical correlations.

Introduction

In any natural or artificial water drive reservoir the oil recovery mechanism is controlled by (1) the external imposed pressure differential, and (2) the pressure difference due to capillarity. In highly fractured oil reservoirs the flow of oil is mainly through the fracture networks with little pressure gradient across the matrix blocks. Consequently, the capillary pressure gradient dominates the oil displacement process in the matrix block.

In oil/water, water-wet system, water has a natural tendency to penetrate (imbibe) the matrix and gravity forces reinforces capillary imbibitions. The expelled oil then is displaced by oncoming water through the fracture network to the producing well (Al-Lawati and Saleh, 1996). The capillary forces oppose the penetration of water into the matrix and the displacement is only possible if the driving force (gravity)

overcomes the resistance defined in terms of “threshold capillary pressure”. This is only possible for matrix of elements of a certain size (large blocks). It follows that oil cannot be expelled by water from an intensely fractured oil-wet reservoir. Such reservoirs have gained emphasis as a result of the failure of a number of water floods carried out on limestone; it would appear that the presence of small quantities of organic matter (such as coal) dispersed in the matrix can induce a wettability to oil which results in poor reservoir performance under water injection. Additional methods, other than water flooding, such as injection of chemical solution which involves the use of surfactants capable of altering matrix wettability, should be considered to increase the effectiveness of the capillary imbibition (Babadagli, 2001; Adibhatla and Mohanty, 2008). Also low-salinity or smart waters may be considered in this connection [Al-Attar, et. al., 2013 and Abubacker, et. al. (2017).

Several laboratory studies, mostly on sandstone cores, synthetic sandstone cores, and sand packs, were published using different fluid systems and different methods of imbibition. Some early laboratory work by Manon and Chilingar (1972) was performed on both linear and counter-current flow at both constant and variable rates. The first real work on imbibition that describes the process was made by Mattax and KYTE (1972). They reported results of experiments performed with fixed interfacial tension (IFT) showing that the dimensionless imbibition time (t_D) depends on the matrix geometry and physical properties of the fluids. They stated that, if imbibition oil recovery is plotted against the dimensionless scaling parameter $t(k/\phi)^{1/2}(\sigma/\mu_w L^2)$, the same recovery curve will be obtained for the model and for all matrix blocks of the same rock type and geometry. This means that imbibition tests on a small reservoir sample can scale imbibition behavior for all reservoir matrix blocks of the same shape and rock type. Where, t is imbibition time, ϕ is porosity, k is permeability, σ is IFT between the wetting and non-wetting phases, μ_w is water viscosity, and L is characteristic length of matrix block or sample. Zhang et al. (1996) reported that most experimental work on imbibition behavior is concentrated on the scaling aspect of the process in order to estimate oil recovery from reservoir matrix blocks that have shapes and sizes different from those of the laboratory core samples. Ma et al. (1999) generalized the shape factor which was proposed by Kazemi et al. (1992) to account for the effects of viscosity ratio, sample shape, and boundary conditions. The dimensionless time proposed by Ma et al. (1999) is defined as follows:

$$t_D = (k/\phi)^{1/2}(\sigma/\mu_m L_a^2) t \quad (1)$$

Where μ_m is geometric mean of the viscosities of the two phases, $(\mu_o\mu_w)^{1/2}$, and L_a is characteristic length. Li and Horne (2002) developed a general approach to scale the spontaneous imbibition data for gas-liquid-rock and oil-water-rock systems in both co-current and counter-current cases. Their definition of dimensionless time considers almost all the parameters physically involved, and takes the following expression,

$$t_D = c^2(kk^*_{re}/\phi)(P^*_c/\mu_e)(S_{wf}-S_{wi})/L_a^2 t \quad (2)$$

Where $kk^*_{re}/\mu_e (= M^*_e)$ is effective mobility of the two phases at the average water saturation behind the imbibition front (S_{wf}), P^*_c is capillary pressure at S_{wf} , S_{wi} is initial water saturation, and c is ratio of gravity force to capillary force.

Fischer and Morrow (2005) addressed oil recovery from cylindrical sandstone cores by spontaneous imbibition at very strongly water-wet conditions for viscosity ratios of unity. In all, 25 imbibition data sets

reported in their study for various boundary conditions were satisfactorily correlated by the Mattax and Kyte (1972) scaling group. They concluded that final oil recoveries for radially dominated imbibition were independent of viscosity whereas recoveries for linear imbibition were consistently lower and decreased by up to 2.5% PV with increase in viscosity.

Al-Attar (2010) investigated the response of oil-wet chalky limestone cores to free imbibition by alkali aqueous solution and surfactant solution. He concluded that addition of nonionic surfactant to the aqueous solution could change the surface wettability properties of the core matrix towards the water-wet regime. He also concluded that ultimate oil recovery by spontaneous imbibition and rates of imbibition are largely related to the IFT between oil and the imbibing fluid and to the permeability of the core sample.

The objective of this work is develop an empirical correlation for the rate of convergence of oil recovery to ultimate oil recovery by free imbibition from water-wet limestone core samples. The proposed correlation includes key rock and fluid properties which control the imbibition process. Such a correlation would be very useful in simulating laboratory imbibition test data and predicting oil recovery in fractured oil reservoirs on large scales.

Development of proposed modification

Imbibition is the spontaneous displacement of a non-wetting phase by a wetting phase under zero external pressure gradient. The rate of free imbibition is controlled by the physical properties of the rock/fluid system including rock wettability. Aronovsky et. al., (1958) proposed a simple mathematical model to describe the imbibition process and as follows.

$$r(t) = R (1 - e^{-\lambda t}) \quad (3)$$

Where:

$r(t)$: volume of oil in place recovered at time t , cc

R : volume of oil in place recovered at end of the imbibition test, cc

λ : rate of convergence, hr^{-1}

t : imbibition time, hr.

Equation (1) may be written as follows:

$$1 - [r(t)/R] = e^{-\lambda t}$$

$$\ln \{1 - [r(t)/R]\} = -\lambda t$$

$$\log \{1 - [r(t)/R]\} = -\lambda t / 2.303 \quad (4)$$

A plot of $\log\{1 - [r(t)/R]\}$ versus t would yield a straight line with slope $(m^*) = -\lambda / 2.303$ and thus $\lambda = -2.303 (m^*)$. The results of the free-imbibition tests presented in the following section were used to prepare the above plots and to determine their corresponding values of λ .

The next step was to correlate λ with rock/fluid system physical properties. For this purpose the various dimensionless scaling parameters developed by Mattax and Kyte (1972), Ma et. al. (1999), and Li-Horn (2002), and the conclusions made by Al-Attar (2010) were considered. By similarity with these scaling parameters and after attempting various combinations of grouping of variables, the following laboratory data-based empirical correlation has been found to accurately predict values of λ .

$$\lambda = 1.1309519 (k/\phi)^{0.5} (\sigma_{wo}) (S_{wi})^{3.49} / [(\mu_o - \mu_w) (L^2)] \quad (5)$$

Where:

k is the absolute permeability of the rock, md

ϕ is the porosity, fraction

σ_{wo} is the IFT between water and oil, dynes/cm

S_{wi} is the initial water saturation, fraction

μ_o is the oil viscosity, cp

μ_w is the water viscosity, fraction, and

L is the length of core sample, cm, and

1.1309519 is units' conversion factor.

Equation (5) is similar in form to the aforementioned scaling parameters and it shows that λ is largely sensitive to initial water saturation and length of core sample, and to a lesser extent to the viscosity difference between non-wetting and wetting phases, IFT, absolute permeability and porosity.

Results of experimental work

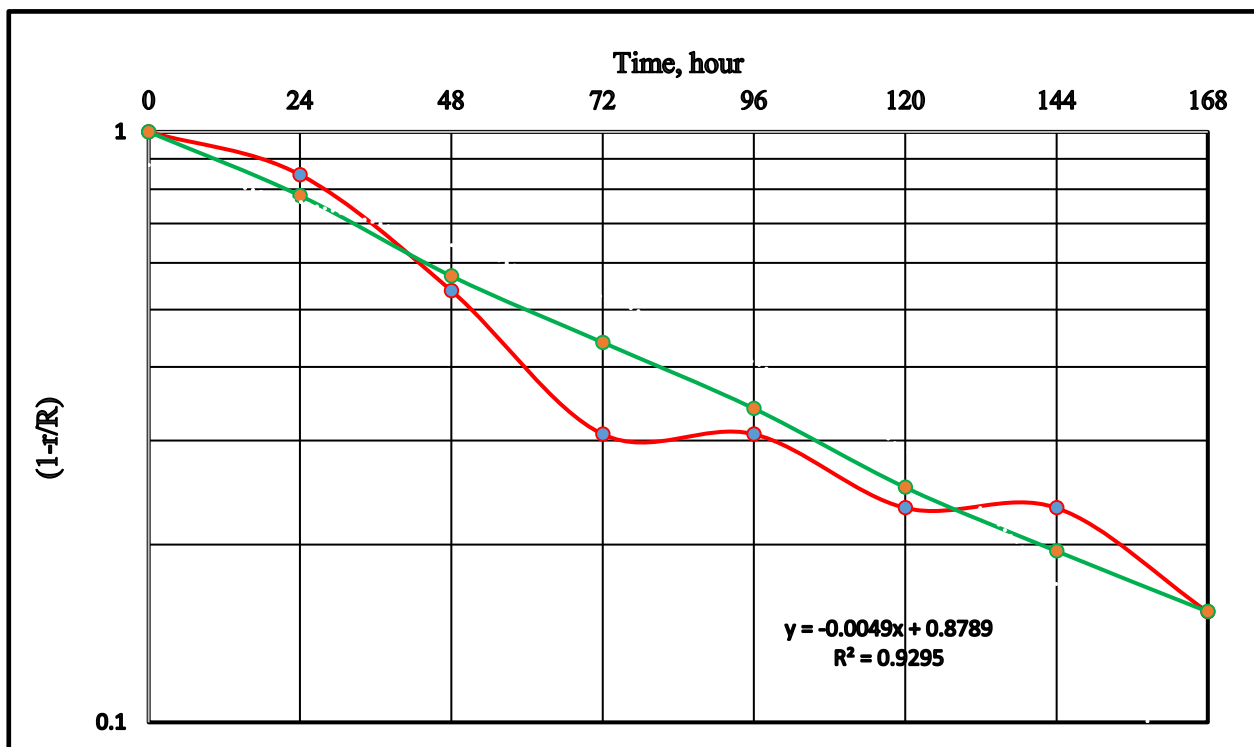
In this work the oil-saturated core sample were totally immersed in water and standard imbibition tests were conducted at 90 °C. The physical properties of the rock/fluid system used in these tests are listed in Table 1. The results of selected imbibition tests in terms of $[r(t)/R]$ versus time are presented in Table 2 and in terms of $\log\{1 - [r(t)/R]\}$ versus time are illustrated in Figs. 1 through 4. These results clearly show the exponential nature of oil recovery by the free imbibition process.

Table 1 Physical properties of the rock/fluid systems used in the experimental work.

Core No.	Imbibing Water	Air Permeability k , md	Porosity, ϕ , fraction	Initial Water Saturation, S_{wi} , fraction	Core Length, L , cm	IFT, σ_{wo} , dynes/cm
1	Sea Water (SW)	7.2	0.21	0.331	8.330	9.0
2	Sea Water (SW)	9.3	0.15	0.334	8.650	9.0
3	Sea Water (SW)	3.0	0.11	0.291	6.640	9.0
4	Sea Water Diluted 50 times (SWx50)	13.0	0.27	0.170	5.180	13.9
5	Sea Water Diluted 10 times (SWx10)	11.0	0.27	0.192	5.116	11.7
6	Formation Water (FW)	12.0	0.29	0.210	5.210	13.0
7	SW	12.0	0.29	0.195	5.210	9.5
8	SW	17.0	0.25	0.185	5.188	9.5
9	SW	17.0	0.25	0.180	5.188	10.8

Table 2 Results of imbibition tests of selected core samples; $[r(t)/R]$ versus time.

Time, hrs.	Core #4	Core #5	Core #6	Core #7
0	0	0	0	0
24	0.15	0.17	0.38	0.22
48	0.46	0.50	0.75	0.33
72	0.69	0.67	0.75	0.44
96	0.69	0.75	0.88	0.67
120	0.77	0.83	1.00	0.78
144	0.77	0.92	1.00	0.89
168	0.85	1.00	1.00	1.00
192	1.00	1.00	1.00	1.00

**Fig. 1. Plot of Eqn. (4) using imbibition test results of core no. 4 with SWx50.**

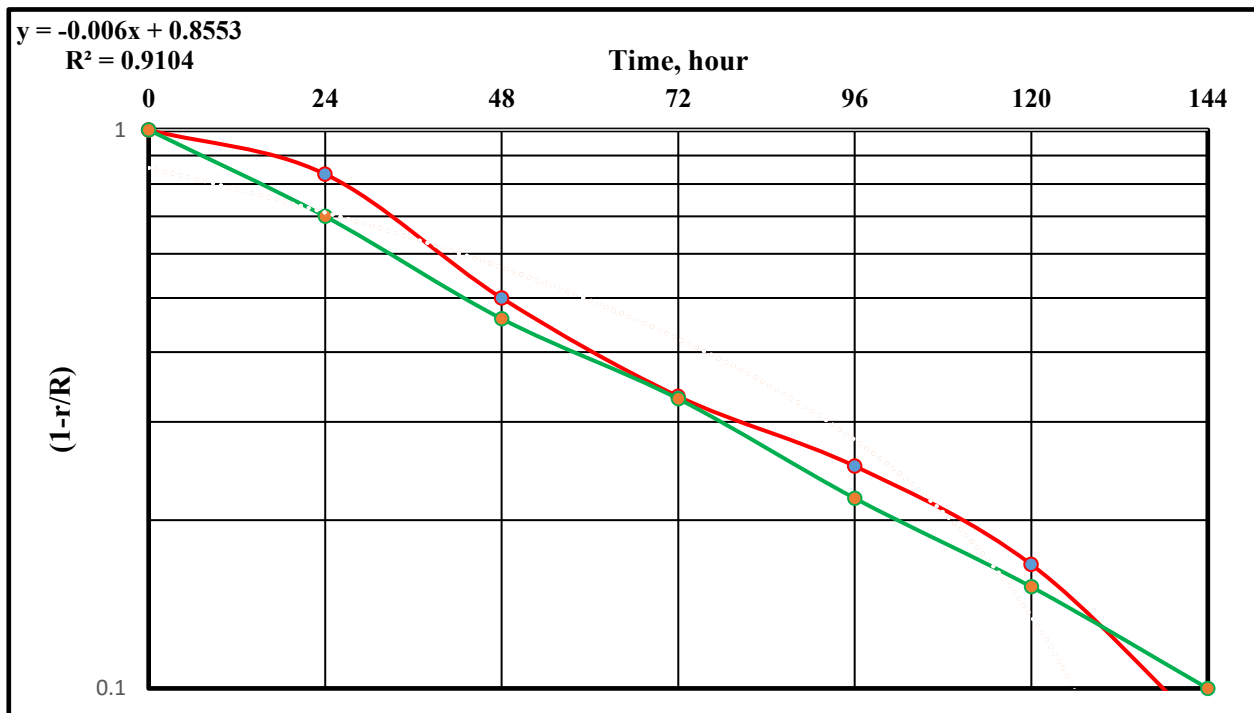


Fig. 2. Plot of Eqn. (4) using imbibition test results of core no. 5 with SWx10

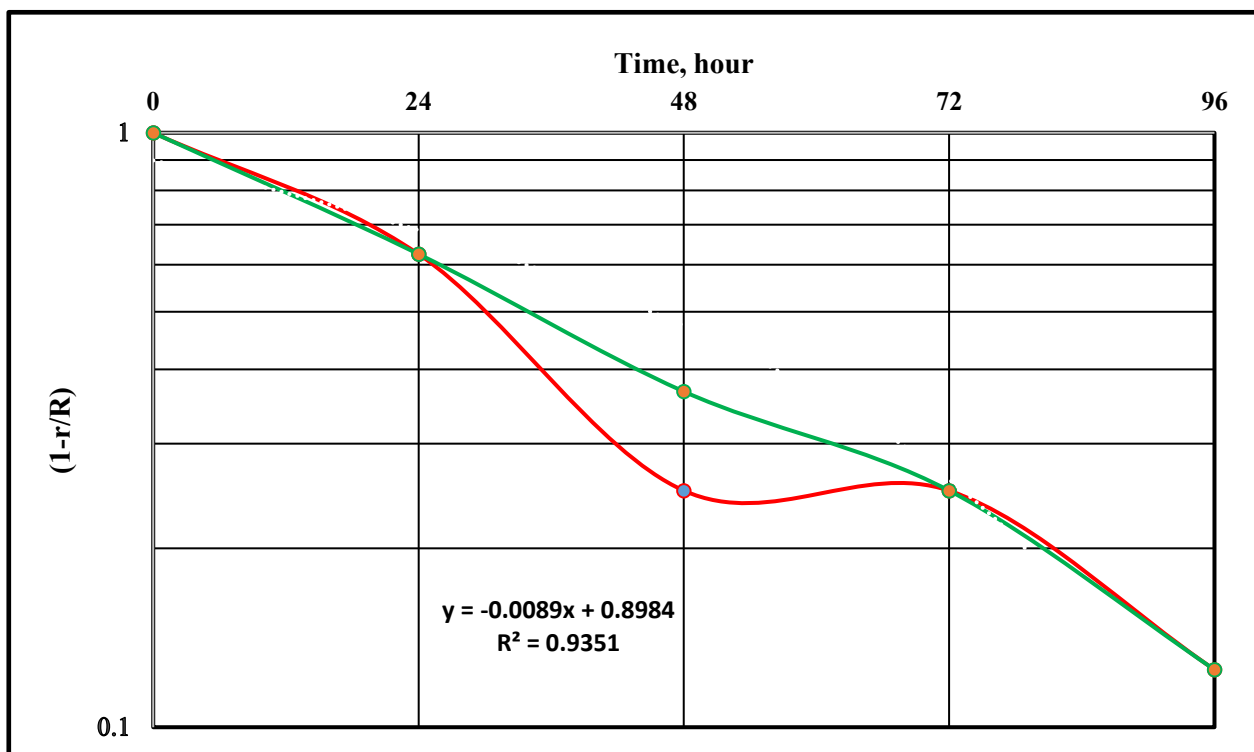


Fig. 3. Plot of Eqn. (4) using imbibition test results of core no. 6 with FW.

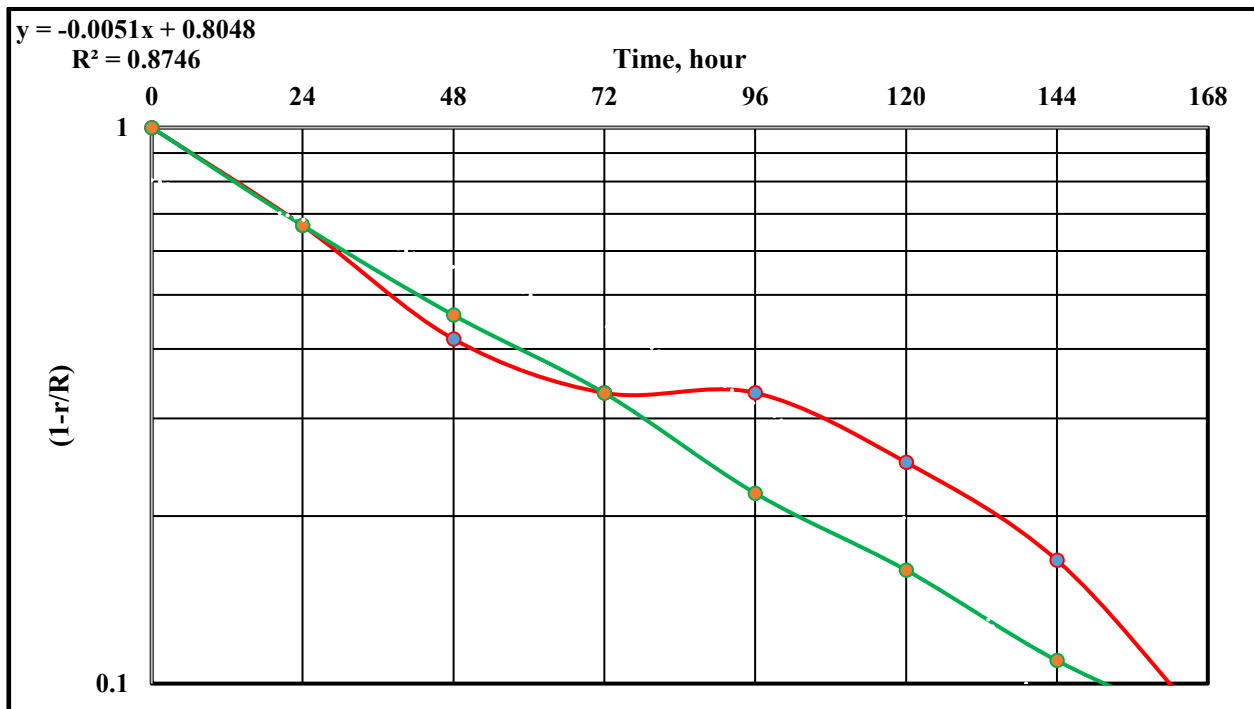


Fig. 4. Plot of Eqn. (4) using imbibition test results of core no. 7 with SW.

Results of proposed modification

Table 3 presents the results of calculations of λ by Eqn. (5) and the results of λ deduced from the slopes of plots of Eqn. (4). The last column of Table 3 shows the results of calculations of absolute per cent error of the two values of λ for each core. The range of this error ranges from as low as 0.334% up to 3.88% which gives confidence in the application of the proposed modification to predict the rate of convergence. A comparison between laboratory deduced- and calculated values of λ is also illustrated in Fig. 5 showing almost a perfect match on the 45 degree line.

Table 3 Evaluation of accuracy of predicted λ by the proposed model.

Core No.	Laboratory λ , hr ⁻¹	Predicted λ Eqn. (5), hr ⁻¹	Absolute % Error
1	0.008600	0.0085450	0.640
2	0.008000	0.0083102	3.880
3	0.006000	0.0058141	3.100
4	0.011285	0.0112473	0.334
5	0.013818	0.0135860	1.681
6	0.020497	0.0199834	2.500
7	0.011745	0.0113090	3.715
8	0.011745	0.0121920	3.800
9	0.012897	0.0126100	2.220

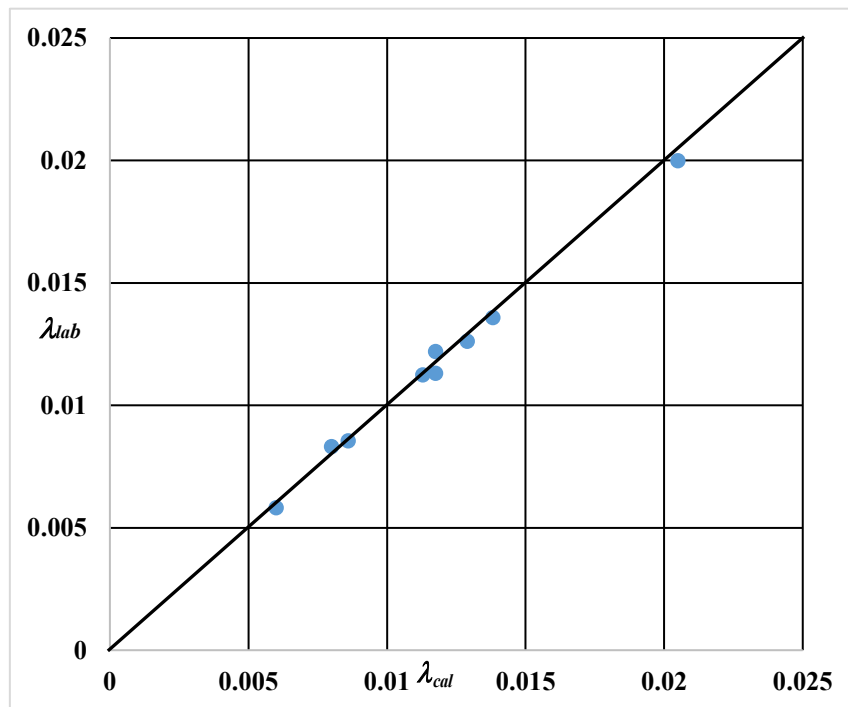


Fig. 5. Comparison between laboratory deduced and predicted values of λ .

Discussion of results

The Aronovsky et. al. (1958) mathematical model was developed to simulate the imbibition process in naturally fractured oil reservoirs. This model may only be used to predict reservoir performance when enough field production data were available. The technique presented in this work provides a simpler approach for predicting the performance of naturally fractured reservoirs using some basic physical properties of the reservoir rock/fluid system. These basic properties include porosity, absolute permeability, IFT and viscosity of the imbibing and imbibed phases, and the length of matrix block (core length), all of which can be easily measured in the laboratory.

The first step of development of the proposed modification involved plotting laboratory data of imbibition tests as $\log \{1 - [r(t)/R]\}$ versus time as shown in Figs. 1 through 4. The best trend line was then constructed through the plotted data points and rate of convergence (λ) calculated. These trend lines seem to closely match the actual trends of the experimental data which is to be expected considering the exponential trend of the imbibition process depicted by Aronovsky et. al. model.

The validity of the proposed modification presented in Eqn. (5) was tested using laboratory imbibition data of nine limestone core samples. The imbibing fluids include sea water (SW), formation water (FW), sea water diluted 10 times (SWx10), and sea water diluted 50 times (SWx50). In all tests, the values of rate of convergence (λ) deduced from imbibition plots almost perfectly matched those calculated by the Eqn. (5). Further attempts are necessary to develop a correlation for the ultimate oil recovery (R) by spontaneous imbibition process using laboratory and field data.

Conclusions

The following conclusions may be drawn from this work:

1. The Aronovsky et. al. mathematical model which describes the free imbibition process has been modified using laboratory imbibition tests on nine limestone core samples.
2. The accuracy of the modified version of Aronovsky et. al. model has been evaluated using the experimental data and the absolute per cent error is found to range between 0.334 and 3.88.
3. The proposed empirical correlation of the rate of convergence is found to be largely sensitive to the initial water saturation and length of the core sample. The same correlation may be applied to predict the performance of naturally fractured oil reservoirs using the physical properties of the reservoir rock/fluid system including the length of the matrix block.
4. No attempt was made to develop a correlation for the ultimate oil recovery, R , from the imbibition process.
5. Additional laboratory and/or field data are required to verify the reliability of the proposed modification.

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Age Perceptions, Knowledge, and Preventive Behaviors Regarding Cervical Cancer: Analysis from the 2005 Health Information National Trends Survey (HINTS).

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Abstract

Cervical cancer is considered to be the third most common type of cancer in women, and the second largest cause of deaths in women. Its toll is greatest in population that lack screening programs to detect precursor lesions (Roden, 2006). Almost all cervical cancer is caused by HPV (Human Papillomavirus), a common virus that is spread through sexual intercourse (Roden, 2006). It is widely believed among experts that most women who are diagnosed with cervical cancer today have not had regular pap smears or they have not followed up on abnormal Pap smear results. But the question is how knowledgeable are women regarding this deadly disease which is curable when detected early. We used a national representative sample of women in an exploratory analysis to shed light on how age differences characterize the perceptions, knowledge and prevention behaviors of cervical cancer. The five classes of women we investigated were women ages 18 – 34; 35 – 49; 50 – 64; 64 – 74; and 75+. The results indicate that women ages 50 – 64 were the most opinionated regarding the characteristics of cervical cancer.

Introduction

The Gale Encyclopedia of Cancer defines cervical cancer as a disease in which the cells of the cervix become abnormal and start to grow uncontrollably, forming tumors (2011). Research studies show that older women are at the highest risk for cervical cancer, while girls under the age of 15 rarely develop this cancer. In the United States the death rates from cervical cancer are higher among Hispanic American, Native American, and African American women than among Caucasian women (Gale, 2011). It is widely believed that the exact cause of cervical cancer is unknown. Diethylstilbestrol (DES), the use of birth control pills for a long period of time, age, smoking, weakened immune system, HPV infection, and lack of regular pap test are some of the major risk factors that could lead to cervical cancer (American Institute for Cancer Research, American Cancer Society, 2005). Despite increasing emphasis on the deadly nature of the cervical cancer epidemic, much work remains to be done in mapping the pathways between social characteristics and health outcomes via media communications (Parker, 2005).

Table 1: General Characteristics of respondents in terms of Race and Ethnicity

Variable		Race and Ethnicity			
	Total (%)	Hispanic	White	Black	Others
Smoking Status (N=4374)					
Current	730(16.7)	51(1.2)	540(12.3)	96(2.2)	43(1.0)
Former	1146(26.2)	52(1.2)	954(21.8)	91(2.1)	49(1,1)
Never	2498(57.1)	265(12.3)	1776(40.6)	271(6.2)	186(4.3)
Education (N=4420)					
Less than High Sch.	411(9.3)	102(2.3)	203(4.6)	74(1.7)	32(0.7)
High Sch. Grad	1137(25.7)	99(2.3)	871(19.7)	116(2.6)	51(1.2)
Some Col.	1348(30.5)	100(2.3)	991(22.4)	169(3.8)	88(2.0)
Bachelor’s	1010(22.9)	50(1.1)	813(18.4)	78(1.8)	69(1.6)
Post Bacc.	514(11.6)	23(0.5)	416(9.4)	32(0.7)	43(1.0)
Income (N=3456)					
<\$20,000	785(22.7)	108(3.1)	450(13.0)	166(4.8)	61(1.8)
\$20,000- <\$35,000	682(19.7)	77(2.2)	483(14.0)	89(2.6)	33(1.0)
\$35,000- <\$50,000	516(14.9)	42(1.2)	384(1.1)	59(1.7)	31(0.9)
\$50,000- <\$75,000	682(19.7)	46(1.3)	538(15.6)	48(1.4)	50(1.4)
\$75,000 or more	1091(31.6)	69(2.0)	896(26.0)	58(1.7)	68(2.0)
Insurance Status (N=4372)					
Yes	3896(89.1)	264(6.0)	3024(69.2)	366(8.4)	242(5.5)
No	476(10.8)	109(2.5)	243(5.6)	94(2.1)	30(0.7)

Table 2: General Characteristics of respondents in terms of age

Variable		Age Group				
	Total (%)	18-34	35-49	50-64	65-74	75+
Smoking Status (N=4458)						
Current	738(16.6)	142(3.2)	211(4.7)	279(6.3)	78(1.7)	28(0.6)
Former	1164(26.1)	86(1.9)	219(4.9)	422(9.5)	239(5.4)	198(4.4)
Never	2556(57.3)	477(10.7)	632(14.2)	699(15.7)	364(8.2)	384(8.6)
Education (N=4446)						

Less than High Sch.	415(9.3)	66(1.5)	55(1.2)	108(2.4)	82(1.8)	104(2.3)
High Sch. Grad	1156(26.0)	125(2.8)	212(4.8)	358(8.1)	236(5.3)	225(5.1)
Some Col.	1348(30.3)	236(5.3)	327(7.4)	430(9.7)	199(4.5)	156(3.5)
Bachelor's	1012(22.8)	194(4.4)	320(7.2)	312(7.0)	103(2.3)	83(1.7)
Post Bacc.	515(11.6)	79(1.8)	147(3.3)	189(4.3)	65(1.5)	35(0.8)
Income (N=3780)						
<\$20,000	794(21.0)	149(3.9)	138(3.7)	201(5.3)	132(3.5)	174(4.6)
\$20,000- <\$35,000	688(18.2)	107(2.8)	120(3.2)	187(4.9)	145(3.8)	129(3.4)
\$35,000- <\$50,000	517(13.7)	92(2.4)	120(3.2)	175(4.6)	73(1.9)	57(1.5)
\$50,000- <\$75,000	684(18.1)	111(2.9)	181(4.8)	263(7.0)	89(2.4)	40(1.1)
\$75,000 or more	1097(29.0)	189(.05)	403(10.7)	387(10.2)	82(2.2)	36(1.0)
Insurance Status (N=4571)						
Yes	4050(88.6)	574(12.6)	923(20.2)	1234(27.0)	692(15.1)	627(13.7)
No	521(11.4)	146(3.2)	169(3.7)	187(4.1)	9(0.2)	10(0.2)

Methods

To investigate the state of cervical cancer perceptions and prevention knowledge among U.S. adults, we analyzed data from the 2005 Health Information National Trends Survey (HINTS) for the purpose of determining any potential relationship of positive associations between people's awareness of cancer prevention recommendations and adherence to such recommendations. The data for this study came from the 2005 health Information National Trends Survey (HINTS), a nationally representative cross-sectional study of health media use and cancer-related knowledge among adults in the United States. The pool of respondents in the study is a good representation of the population to respond to the questions relevant to the study. We restricted the analysis to women over the age of 18. We consider socioeconomic and demographic variables linked to health disparities in cervical cancer and media use, including education, annual household income, race/ethnicity, age, and insurance status. We categorized education (as less than high school graduate, high school graduate, some college, or college graduate), annual household income (as less than \$25,000, \$25,000 to \$34,000, \$35,000 to \$49,000, \$50,000 to \$74,000, or \$75,000 and above), race/ethnicity (as Hispanic, white, black, native American, Asian, Hawaiian, or multiple races), insurance status (as yes, or no), and age (as 18 – 34, 35 – 49, 50 – 64, 64 – 74, or 75+).

From table 1 the data indicate that 57.1% of respondent have never smoked while 26.2%, and 16.7% of respondents were former and current smokers respectively. The data from table 1 also show that 30.5% of respondents have some form of college education, while 11.6%, 22.9%, 25.7%, and 9.3% had post bachelor's degree, bachelor's degree, high school diploma, and less than high school diploma respectively. With regards to household income, 31.6% revealed they had a combined household income of \$75,000 or more while 19.7%, 14.9%, 19.9%, and 22.7% said their combined income was \$50,000 - \$75,000, \$35,000 - \$50,000, \$20,000 - \$35,000, and less than \$20,000 respectively. In terms of insurance status, a vast majority of respondents, 89.1% do have health insurance while 10.8% said they do not have any form of health insurance coverage.

For specific cervical cancer questions, we obtained and analyzed the answers to the following questions: Do you agree that cancer is an illness that when detected early can typically be cured? Have you ever been tested for cervical cancer? Have you ever been treated for genital warts? Have you heard anything about a vaccine or shot to prevent cervical cancer? Do you agree that getting checked regularly for cancer helps find cancer when it is easy to treat? How many people who develop cancer do you think survive at least 5 years? Each of the questions is being analyzed in terms of race (or ethnicity) and age group. The questions used to assess respondents' awareness of cervical cancer prevention strategies were developed specifically by HINTS and were based on the HINTS conceptual framework, which describes consumer-oriented health communication. Our primary goal is to capture the age perceptions, knowledge, and preventive behaviors regarding these specific cervical cancer characteristics. We used basic descriptive statistic to examine the association among the various cervical cancer prevention questions. Before analyzing the specific cervical prevention questions as displayed in table 3 and table 4, we first examined the data from table 1 and table 2 to examine some general characteristics of the respondents to see the life experiences that could give them the insights into answering the research question questions.

Table 3: Specific cervical cancer questions in terms of race and ethnicity

Variable	Race and Ethnicity(Cancer Related)				
	Total (%)	Hispanic	White	Black	Others
Cancer is an illness that when detected early can typically be cured (N=4368)					
Agree	3737(85.6)	326(7.5)	2787(63.8)	392(8.8)	232(5.3)
Disagree	631(14.4)	42(1.0)	469(10.7)	72(1.6)	48(1.1)
Sometimes when a woman has a routine pelvic exam, she is tested for cervical cancer. Have you ever been tested for cervical cancer? (N=4402)					
Agree	4259(96.8)	345(7.8)	3209(72.9)	452(10.3)	253(5.7)
Disagree	143(3.2)	22(0.5)	78(1.8)	15(0.3)	28(0.6)
Have you ever been treated for genital warts? (N=4288)					

Agree	202(4.7)	20(0.5)	145(3.4)	26(0.6)	11(0.3)
Disagree	4086(95.3)	329(7.7)	3081(71.9)	422(9.8)	254(5.9)
Have you heard anything about a vaccine or shot to prevent cervical cancer? (N=4393)					
Agree	3458(78.7)	224(5.1)	2725(62.0)	317(7.2)	192(4.4)
Disagree	935(21.3)	143(3.3)	553(12.6)	150(3.4)	89(2.0)
Getting checked regularly for cancer helps find cancer when it is easy to treat. (N=4390)					
Agree	4164(94.9)	343(7.6)	3118(71.4)	434(1.0)	266(6.1)
Disagree	226(5.1)	27(0.6)	155(3.6)	31(0.7)	12(0.3)
Overall, how many people who develop cancer do you think survive at least 5 years? (N=4195)					
<25%	224(5.3)	35(0.8)	117(2.8)	43(1.0)	29(0.7)
25%	753(18.0)	105(2.5)	488(11.6)	114(2.7)	46(1.1)
50%	1755(41.8)	122(2.9)	1354(32.2)	162(3.9)	117(2.8)
75%	1300(31.0)	73(1.7)	1052(25.1)	107(2.6)	68(1.6)
Nearly all	163(4.0)	18(0.4)	111(2.6)	26(0.6)	8(0.2)

Table 4: Specific cervical cancer questions in terms of age

Variable	Age Group(Cancer Related)					
	Total (%)	18-34	35-49	50-64	65-74	75+
Cancer is an illness that when detected early can typically be cured (N=4409)						
Agree	3775(85.6)	579(13.1)	897(20.3)	1188(27.0)	599(13.6)	512(11.6)
Disagree	634(14.4)	119(2.7)	163(3.7)	199(4.5)	79(1.8)	74(1.7)
Sometimes when a woman has a routine pelvic exam, she is tested for cervical cancer. Have you ever been tested for cervical cancer? (N=4485)						
Agree	4340(96.8)	633(14.1)	1049(23.4)	1393(31.1)	679(15.1)	586(13.1)
Disagree	145(3.2)	74(1.6)	20(0.4)	13(2.9)	10(0.2)	28(0.6)
Have you ever been treated for genital warts? (N=4363)						
Agree	204(4.7)	35(0.8)	76(1.7)	73(1.7)	18(0.4)	2(0.0)
Disagree	4159(95.3)	661(15.2)	965(22.1)	1294(29.7)	649(14.9)	590(13.5)
Have you heard anything about a vaccine or shot to prevent cervical cancer? (N=4468)						
Agree	3507(78.5)	586(13.1)	904(20.2)	1149(25.7)	512(11.5)	356(7.8)
Disagree	961(21.5)	117(2.6)	169(3.7)	254(5.7)	175(3.9)	246(5.5)

Getting checked regularly for cancer helps find cancer when it is easy to treat. (N=4432)						
Agree	4203(94.8)	667(15.0)	1005(22.7)	1324(29.9)	653(14.7)	554(12.5)
Disagree	229(5.2)	35(0.8)	60(1.4)	71(1.6)	30(0.7)	33(0.7)
Overall, how many people who develop cancer do you think survive at least 5 years? (N=4228)						
<25%	228(5.4)	39(0.9)	60(1.4)	74(1.8)	32(0.8)	23(0.5)
25%	763(18.0)	137(3.2)	167(3.9)	231(5.5)	103(2.4)	125(3.0)
50%	1763(41.7)	284(6.7)	411(9.7)	529(12.5)	292(6.9)	247(5.8)
75%	1309(30.1)	200(4.7)	362(8.6)	435(10.3)	196(4.6)	116(2.7)
Nearly all	165(3.9)	22(0.5)	35(0.8)	63(1.5)	18(0.4)	27(0.6)

General Results and Discussions

Table 1 displays the smoking, education, income, and insurance status of the general representative sample in terms of race and ethnicity. The races have been listed as: Hispanic, White, Black, and Others (American Indian, Asian, Hawaiian, Multiple-Racial, and Refused, or Don't know). There is a distinct difference in the data of White, Black, Hispanic, and Other in the smoking category. Every race except 'White', shared similar amounts of both current and former smokers. For Caucasians, it is shown that they have more former smokers than the other races. They have 414 more former smokers than they do current smokers. The difference in the data may suggest that they are the most informed about the potential dangers associated with smoking as they also hold the largest amount of people that have never tried smoking. The education level shown in table 2 indicated that the majority of the respondents have attended some college. But the post baccalaureate status amongst the minority races are relatively low (98) in comparison to those of the white (416).

In table 2, the variables are listed in terms of five different ages range: 18-34, 35-49, 50-64, 65-74, and 75+. The trends of the data follow those of the race and ethnicity trends. In regards to smoking status, the data suggest that individuals smoke primarily during their middle years (35 – 64) and begin to dwindle during the later years. For former smokers it is shown that they are more former smokers than current smokers for every age group except 18 – 34. This difference could be attributed to the legal age to use tobacco products in the United States. Individuals who fall into this category may have not experienced any life threatening issues, such as cancer, associated with smoking. For education, the older generation experienced higher number of persons with less than high school education. Different laws governing education participation than the current ones could be the attributing reason the younger groups had smaller numbers. Despite that information in mind, 18 – 34 year olds had the lowest high school graduation rate amongst the groups. The data indicate that the most intelligent age range is 35 – 50. Those individuals experienced the highest number of bachelor degrees as well as post baccalaureate.

Table 2 also displays that income levels are distributed uniformly across the age groups. The numbers suggest that the younger ages experience low income levels and it increases through a normal working

career, then decreases during the areas of retirement. Insurance status highlights the level of seriousness that the older age groups (65–75+) take towards their health. They represented the lowest amount of uninsured persons in the data set. It is interesting that the 19 uninsured individuals who possibly could qualify for some form of governmental medical assistance still listed themselves as having no insurance.

Specific Cervical Cancer Results and Discussions

The education level shown in Table 1 indicated that the majority of people have attended some college. But the post baccalaureate status amongst the minority races are relatively low (98) in comparison to those of the white (416). The data are in agreement with the information in Table 3. The samples show that 85.6% of responders believe that cancer can typically be cured if it is detected early. For example, both Blacks and Hispanics share similar sentiments agreeing 8.8% and 7.5% and disagreeing 7.5% and 1.0% respectively. It appears that being exposed to some form of higher education is likely to place the respondent in an environment to garner awareness of health issues. In accordance with the sample indicating they feel that cancer can be cured if detected early, 96.8% said they have been tested for cervical cancer. In terms of race the sample is overwhelmingly low (4.7%) who agree compared to 95.3% who disagree for those who have previously been tested for genital warts. The response is alarming due to the answer to the previous question, “Have you ever been tested for cervical cancer?” The sample responded “Disagree”, but is skewed (4.7% agree and 95.3% disagree) when asked about testing regarding genital warts. The lack in awareness of Human Papillomavirus (HPV) and the links between genital warts and cervical cancer can be attributed to the alarming results (Parker, 2005). With regards to the question, “Have you heard anything about a vaccine or a shot to prevent cervical cancer?” majority (78.7%) agree as compared to 21.3% who disagree. In terms of race, Hispanics are somewhat split regarding the question (224 agree while 143 disagree). For Blacks, 317 agree while 150 disagree. It is important to note that Blacks, Hispanics, and Asians reported lower perceived cancer risk than Whites (Ross, 2010). Finally for Caucasians the results follow as 2725 to 553 in favor of the question. The slight disparity could be attributed to the education level. Of the 4390 who responded to the question, 4164 women believe getting checked regularly for cancer could help find cancer early when it is easy to treat. This answer was a consensus across race lines. Overall in terms of race, the sample is optimistic regarding the survival rate of people who have developed cancer. For example, 41.8% agreed that 50% of cancer patients do survive at least five years, while 31%, 4%, 18%, 5.3% do survive at least five years 75%, nearly all the time, 25%, less than 25% respectively.

In accordance with the education levels shown in table 2, it is noted that 50-64 year olds are the most opinionated when it comes to the prevention of cancer. They strongly believe that cancer can be cured if detected early enough. Overall, the general consensus amongst the age ranges is that cancer can be cured with 85.6% in optimism and 14.4% disagreeing. One preventive measure to ensure no signs of cancer exist is by routinely being checked during a pelvic exam. Nearly all women who responded (96.8%) to the survey agreed that they have been checked for cervical cancer. The younger age group (18-34) accounted for the most amounts of women who have not been tested. But despite the large number of women being checked for cervical cancer, the majority (4159 out of 4363) also expressed that they have not been tested for genital

warts: 18-34(661 of 4363), 35-49(965 of 4363), 50-64(1294 of 4363) 65-74(649 of 4363), 75+(590 of 4363). Genital warts is not widely associated with a cause for cervical cancer, therefore the responders may have not been tested unless they were concerned for other medical reasons (Dember, 2005). One may feel the need to get checked for genital warts after an unprotected sexual encounter. The awareness of treatments or vaccines in the cure of cervical cancer is high across the age ranges. The data in Table 4 shows the majority (3507 out of 4468) are aware of the vaccines or shots to prevent cervical cancer: 18-34(586 of 4468), 35-49(904 of 4468), 50-64(1149 of 4468) 65-74(512 of 4468), 75+(356 of 4468). However the data show that the 50-64 year olds feel the strongest. The most informed ages were between 50-64, while the oldest (75+) remained split between agree and disagree. 94.8% of persons believe that getting frequent exams for cancer can help discover cancer during the early stages. But it is the 50-64 age range who feels the strongest. In terms of survival rates after being diagnosed with cancer after five years, it is shown that the younger (18-34) and older groups (75+) share similar beliefs. They both believe that there is likely a 50% chance of survival after five years. The other age groups share similar sentiments on the survival amongst cancer patients. But again it is the 50-64 age groups who strongly believe the majority of people who develop cancer will survive at least five years.

Conclusion

Age perceptions, knowledge, and preventive behaviors regarding cervical cancer has been shown for women of age ranges: 18-34, 35-49, 50-64, 65-74, 75+. Amongst these various age ranges, the women came from a diverse background including: Hispanics, Caucasians, Blacks, American Indian, Asian, Hawaiian, Multiple-Races, and Refused, and don't know. The age ranges responded to various questions directly relating to cervical cancer as well as indirectly. Questions were chosen to test the knowledge, perception, and preventive behaviors of the different women age ranges to discover which age range is the most informed.

Out of the various age ranges listed in the research, 50-64 year old women proved to be the most represented out of the five groups. The general makeup of this group seemed to be distributed equally amongst the various background categories. The smoking status of this group held more former smokers than current and more women who have never tried smoking than former smokers. Out of the different ages, 50-64 year old women possessed the most education. They held the most post baccalaureate degrees (189) amongst the other women included in the study. Wealth distribution amongst the group was evenly distributed, ranging from less than \$20,000 to \$75,000 or more. In addition, these women were the most insured in terms of healthcare.

In this study, 50-64 year old women also proved to be the most knowledgeable and took the best preventive measures to ensure their health. They held the strongest belief that cancer can be typically cured if it is detected early. Their high optimism of cancer detection is unified with their strong survival beliefs of individuals who have been diagnosed after five years. Their viewpoint on getting checked regularly for cancer agrees with the majority of the 50-64 year old women responding that they have been checked for cervical cancer. But it does not agree with the answer of being checked for genital warts. This contradiction in answers is intriguing because genital warts are closely associated with cervical cancer. Genital warts are

more often associated with unsafe sexual practices. The information of how genital warts can lead to cancer is not widely spread and discussed, so it is understandable for the majority of women to not have been tested. The strong educational background of these women has placed them in a position to be informed about the vaccines or shots that are available to prevent cervical cancer. These strong sentiments and feelings towards cancer prevention and treatment make 50-64 year old women the most knowledgeable.

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A Sinusoidal Temperature Model for Major Cities in Georgia

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Abstract

One of the periodic natural phenomena in life is temperature patterns. A mathematical model based on periodicity called a sinusoidal temperature model has been formulated to describe and estimate the maximum and minimum temperature characteristics for the major cities in Georgia. The four parameters in the proposed sinusoidal temperature model that are used to predict or estimate temperature patterns are based on a thirty-year monthly means of the maximum and minimum temperature of cities in Georgia obtained from weather.com. The model shows a high level of accuracy in predicting maximum and minimum temperature for major cities in Georgia.

Introduction

Currently the United States and other developed countries invest significant resources monitoring and improving scientific understanding of weather temperature patterns. Given the significant positive and negative impacts of temperature patterns on lives and livestock throughout Georgia, there is a need to formulate a mathematical model that would describe maximum and minimum temperature through a yearly cycle of the cities in Georgia. Weather temperature is a complex phenomena that is periodic in nature and as such we base our model on the periodic functions of sine and cosine. A sinusoidal function is a function which can be expressed in the form:

$$y = D + A * \sin(Bx + C) \quad \text{or} \quad y = D + A * \cos(Bx + C),$$

where the parameters A, B, C , and D are constants (Larson, 2007). We will restrict our model to the sine function only. This paper will take into consideration the work by McCloskey regarding seasonal temperature patterns in Ohio in 1986. Like McCloskey, the basis for the calculation of the parameters for the model is the thirty-year monthly means of maximum and minimum temperature of each of the major cities included in the study. We believe that the thirty-year means will provide us with the necessary sample size to obtain a historical base for comparison of a given year's temperatures, and the model parameters for each city will provide a quantitative way of comparing temperature patterns among the cities in Georgia. A scatter plot of the data for each of the cities clearly revealed a sinusoidal pattern.

Method and Data Set

In this research work we take the following steps to obtain the necessary required parameters for the proposed model: 1) The dataset for a thirty-year period from 1980 to 2010 for the maximum and minimum temperature for each of the major cities in Georgia were obtained from an online website weather.com. 2)

We used excel to compute the thirty-year monthly means for each of the seven cities (as displayed in Figures 1a and 1b), and to draw the scatter plot of the thirty-year monthly means (as shown in Figure 2).

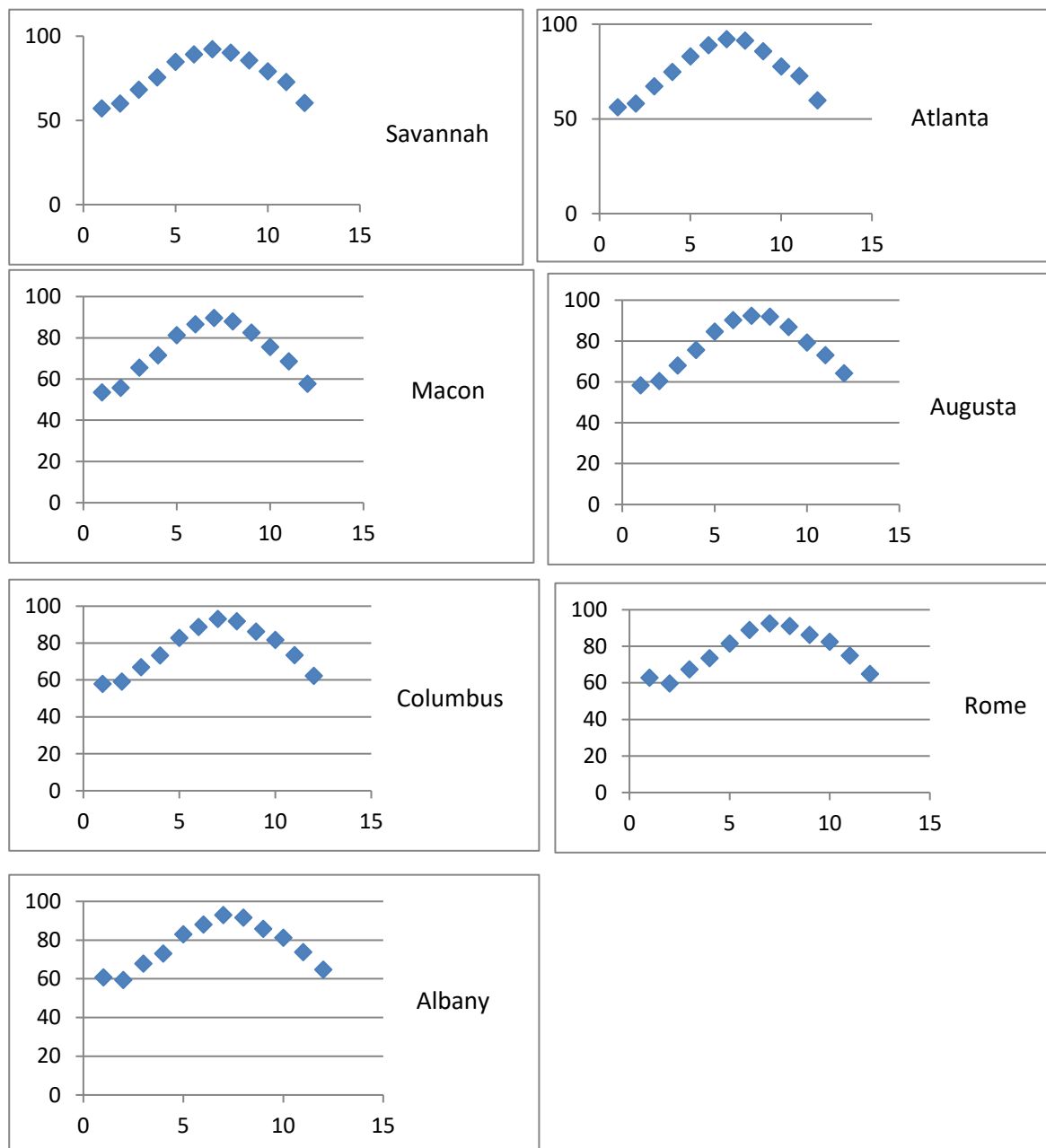
Figure 1a: Table of raw data of thirty-year monthly (maximum) means (from January to December):

Maximum Temperature							
Savanna h	Atlanta	Macon	Augusta	Columbu s	Rome	Albany	
57.20968	56.15484	53.53226	58.26129	57.89032	62.97097	60.81935	
60.12258	58.11613	55.76129	60.4871	59.10645	59.72258	59.48387	
68.30323	67.24839	65.55806	68.03871	66.98065	67.53548	67.86452	
75.64839	74.9	71.50323	75.57097	73.33548	73.51935	73.17742	
84.82581	83	81.35484	84.61613	82.87097	81.53548	83.01935	
89.22903	88.93548	86.55484	90.16774	88.77419	88.98065	88.19032	
92.28387	92.1129	89.63871	92.39677	93.04839	92.66452	93.0129	
90.3129	91.31935	88.06774	91.96452	91.84194	91.26452	91.74839	
85.59032	85.72258	82.60968	86.83871	86.29355	86.39677	85.83548	
79.21935	77.69677	75.57742	79.28387	81.75161	82.57419	81.29032	
72.90645	72.71613	68.70323	73.03548	73.51935	74.96774	73.89677	
60.34194	59.76129	57.75806	64.16452	62.18387	64.95161	64.75806	

Figure 1b: Table of raw data of thirty-year monthly (minimum) means (from January to December):

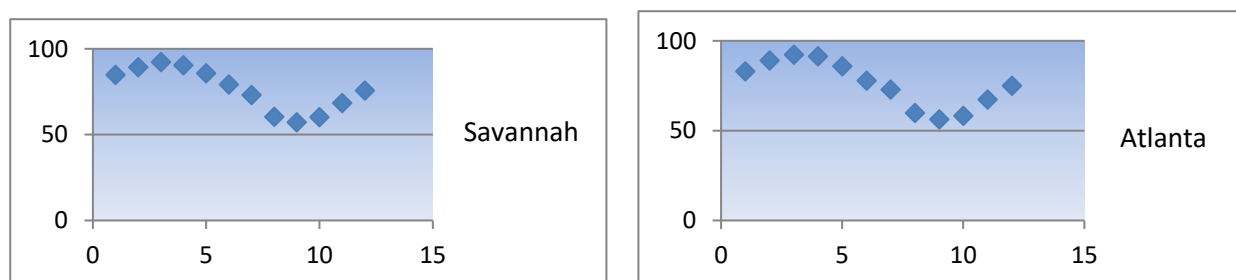
Minimum Temperature							
Savannah	Atlanta	Macon	Augusta	Columbus	Rome	Albany	
38.85806	37.61935	36.97742	39.47692	38.34348	37.60333	43.09667	
40.54194	40.67419	39.00645	43.36538	39.50435	40.95333	41.18	
48.55484	49.87742	48.57419	49.35385	46.7087	51.33	51.23667	
55.77742	53.58065	53.69355	56.56538	54.13043	58.76333	57.20333	
65.76129	64.11935	63.43548	64.46154	63.5	68.89333	66.02667	
72.91613	73.95806	73.49677	74.31154	73.37826	75.74667	76.82	
74.95484	76.13548	76.29355	77.31154	75.97391	78.67333	78.38333	
73.88065	75.79032	74.83871	75.73077	75.96957	78.32333	77.47333	
71.69355	71.36452	72.44516	72.28077	73.77826	73.69333	74.25333	
62.10323	58.53548	59.8129	60.57692	61.36087	62.29333	64.76333	
53.40968	51.32903	50.29032	52.90385	51.52609	53.14333	56.47333	
42.27097	41.02258	39.55484	45.36923	42.19565	43.78	43.56667	

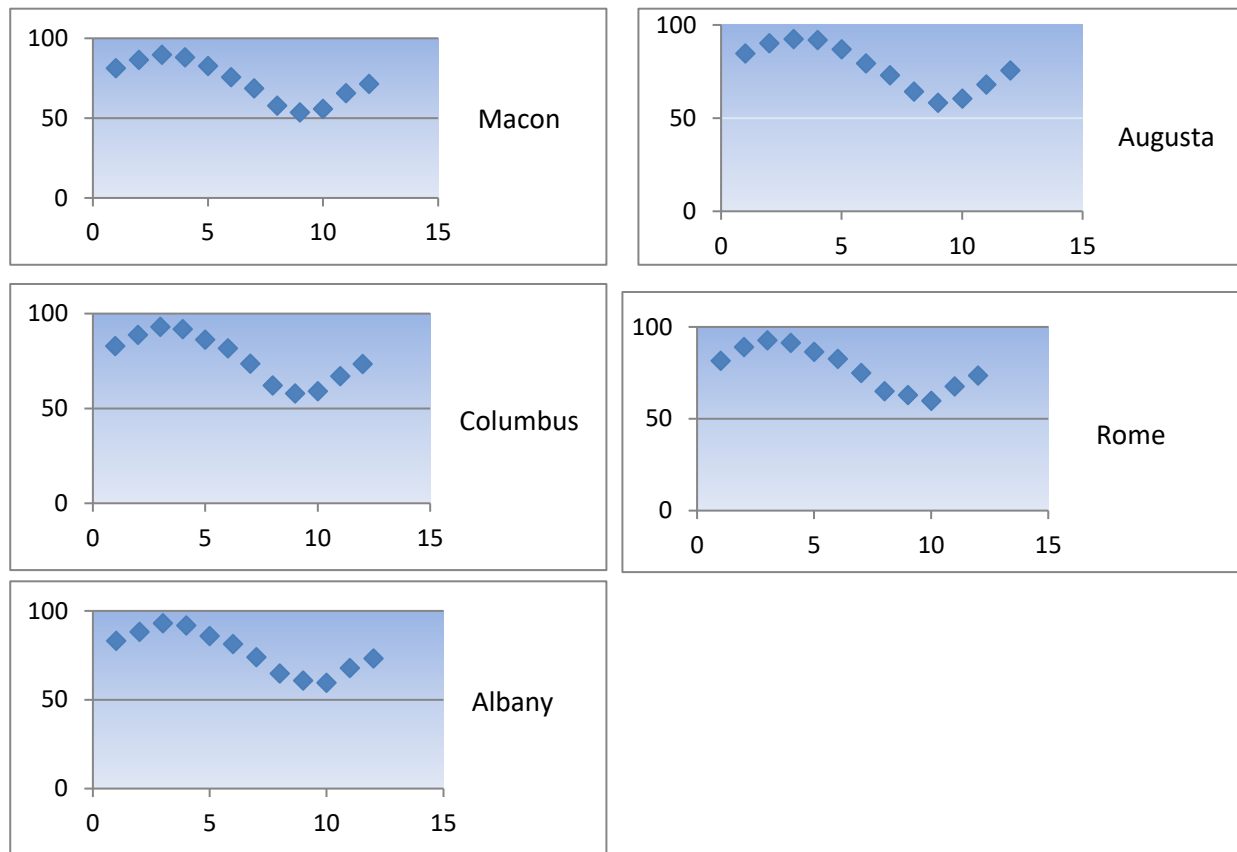
Figure 2: Graphs of raw data of thirty-year monthly means (from January to December)



3) Each of the graphs of the thirty-year monthly means was shifted (horizontal shift) to the right five units (for each city) to match the graph of the periodic function of sine (sinusoidal graph of sine).

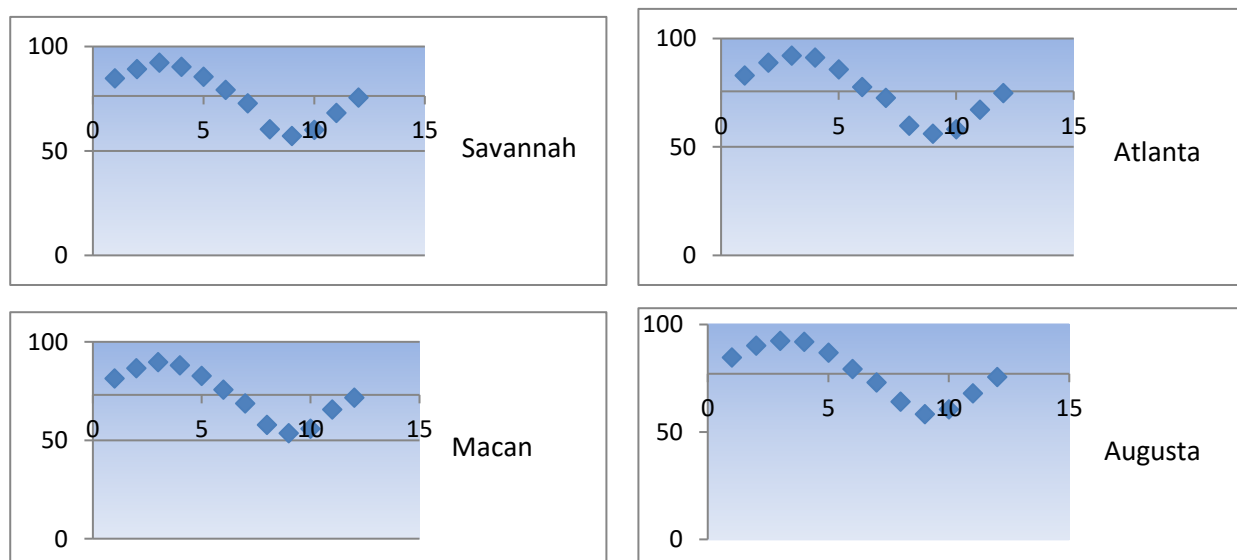
Figure 3: Graphs shifted to the right five units (from May to April)

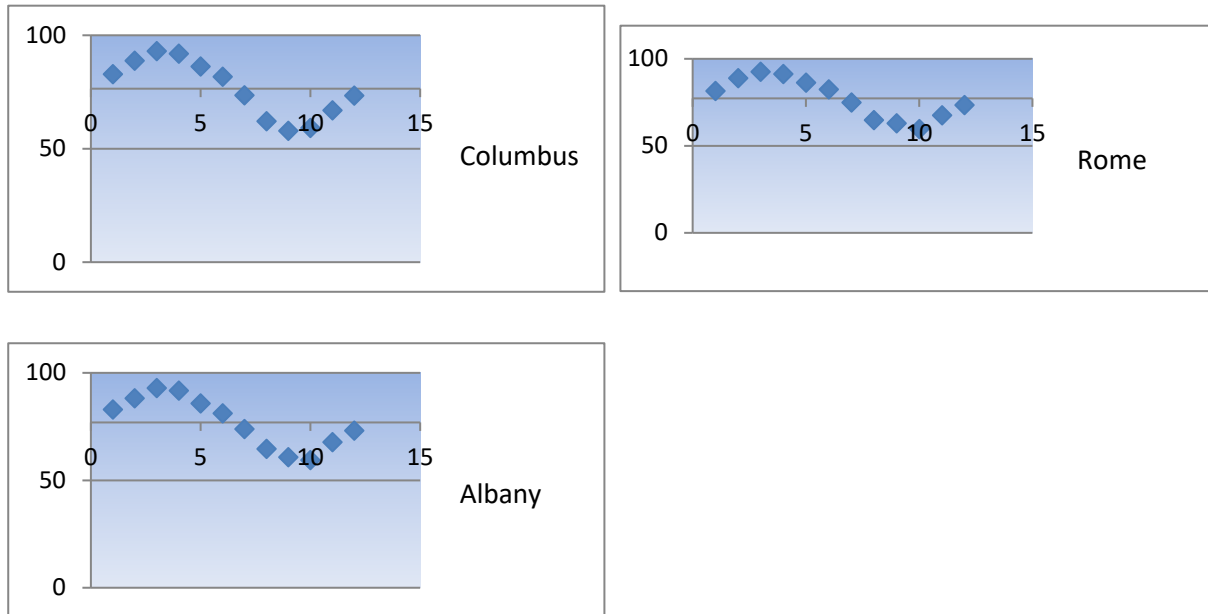




4) Each of the graphs of the thirty-year means was also shifted (vertical shift) upward **D** units to match the periodic functions of sin, where the parameter **D** is the mean yearly temperature for the given city.

Figure 4: Graphs shifted to the right five units, and up between 73-78 units





5) We used algebra to compute the numeric value for the B parameter. This was achieved by using the general formula for computing the period ($P = 12$ months) of the sinusoidal function which is, $P = \frac{2\pi}{B}$. The parameter B for the model was found to be $\frac{\pi}{6}$. We also used algebra to compute the parameter C (the phase shift parameter indicating the beginning of the temperature cycle) as follows:

$$\begin{aligned}
 T &= D + A * \sin(Bx + C) \\
 &= D + A * \sin\left[B\left(x + \frac{C}{B}\right)\right] \\
 &= D + A * \sin\left[\frac{\pi}{6}(x - 5)\right] \\
 &= D + A * \sin\left(\frac{\pi x}{6} - 2.62\right)
 \end{aligned}$$

Calculations on the thirty-year monthly means temperature (T) were used to establish the parameters in the temperature model:

$$T = D + A * \sin\left(\frac{\pi x}{6} - 2.62\right)$$

where x is an integer code 1 to 12 to represent each month throughout the year (1 representing January, 2 for February, and so on). The parameter D is the mean yearly temperature for the given city, and the parameter B is the amplitude for the temperature variation for a given city and can be computed using the formula,

$$A = \frac{|\text{maximum temperature} - \text{minimum temperature}|}{2}.$$

The following table provides the value of the remaining unknown parameters in the sinusoidal model:

Figure 5: Model parameters for major cities in Georgia:

	Maximum Temperature		Minimum Temperature						
City	Amplitude (A)	Vertical Shift (D)	Mean	S.Dev.		Amplitude (A)	Vertical Shift (D)	Mean	S.Dev.
Savannah	17.54	76.3328	76.3328	12.59		18.05	58.39355	58.39355	13.68
Atlanta	17.98	75.64032	75.64032	13.05		19.26	57.83387	57.83387	14.30
Macon	18.05	73.05161	73.05161	12.94		18.64	57.36828	57.36828	14.79
Augusta	17.07	77.06882	77.06882	12.36		19.14	59.57715	59.57715	13.50
Columbus	17.58	76.4664	76.4664	12.75		18.45	60.91801	60.91801	14.57
Rome	16.47	77.25699	77.25699	11.59		20.53	60.26639	60.26639	14.94
Albany	16.76	76.92473	76.92473	11.90		18.60	60.8736	60.8736	14.09

It is clear from the data in the above table that the major cities in Georgia have (almost) identical temperature patterns. The standard deviation is used as a measure of accuracy of the temperature model. For the maximum temperatures, the standard deviations ranged from 11.59 to 13.05 degrees Fahrenheit, while the minimum temperature ranged from 13.50 to 14.94 degrees Fahrenheit.

Results and Testing the Accuracy of the Model:

The accuracy of the model found in the previous section must be tested. This can be achieved by taking random data (months or dates) from any given year for the purpose of testing them for accuracy. The randomly selected month or date will be substituted for the variable x in the model for a given city. The degree of accuracy is measured by the percentage error as displayed in the table below:

Date	x-value	City	Model Estimated High Temperature	Actual High Temperature	Percentage Error
7/01/11	7.032258065	Savannah	91.65	91	0.7%
05/05/05	5.161290323	Atlanta	77.12	71.1	8%
10/22/97	10.70967742	Augusta	61.71	57	8%
12/12/88	12.38709677	Rome	63.12	66	4.3%
09/28/08	9.933333333	Albany	85.83	86	0.2%
07/06/11	7.193548387	Savannah	92.32	92	0.3%

It can be seen clearly that the estimated value is very close to the actual value. Furthermore the difference of the estimated and actual value as well as the error never exceeds 10%.

Conclusion

The proposed sinusoidal temperature model provides an excellent fit for the mean monthly temperatures for major cities throughout the state of Georgia. The model is also an important tool for the analysis of temperature variation from many different perspectives. The fact that yearly means and temperature amplitudes vary very, very slightly throughout Georgia is an indication of how identical the weather temperature patterns are throughout the state. The model can also be used to compare the temperature patterns among cities in the study.

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Educational Leadership and Supervision's Administration for Successful Schools: The Examination of The Theory of Developmental Supervision

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Abstract

The purpose of this paper is to conduct an empirical observation of SuperVision, a new name for a new strategy of educational leadership, as well as to utilize the theory of developmental supervision. Glickman, Gordon, and Gordon (2001) state that the definition of SuperVision is identical to leadership for the improvement of instruction. Education leaders view that supervision is essential for successful schools. They also believe that it is crucial to improve supervisory behaviors of school leaders. Therefore, the researcher uses clinical supervision as its method to examine its practices of utilizing the theory of developmental supervision. The findings of this study are: developmental supervision may improve teachers' instruction; the supervisory behaviors may improve teachers' ability of problem solving and decision making; and the supervisor may facilitate teachers as life-long learners.

Keywords: Educational Leadership, Educational Administration, Supervision, developmental supervision, clinical supervision

1. Introduction

Of concern is improving the practice of teachers and the quality of classroom life. Thus a key fourth question must be considered. Given what is (descriptive science), what ought to be (normative science), and what events mean (interpretive science), what should supervisors and teachers "do" (practice)? Theories of practice are ultimately concerned with action taken to improve a present situation and in our case the beneficiaries would be teachers and students. (Sergiovanni, 1982, p. 78)

The need for supervision can be identified as a critical component of a successful school district. As Michael G. Fullan (1993) says, neither top-down nor bottom-up strategies for educational reform work. In other words, achieving a successful school improvement is an empowered process, which not only requires a clear vision but also requires a collective effort. Therefore, when planning to use the developmental supervision to improve teachers' instruction, school leaders should focus on what is the need of stakeholders in the school district and how to share the vision for the community.

The purpose of this paper is to conduct an empirical observation of SuperVision, a new name for a novel strategy of educational leadership, as well as to utilize the theory of developmental supervision. This paper is organized into several sections. First, the author presents what is developmental supervision. Second, a case study of the supervision, using clinical supervision to direct assist to teachers, is discussed. Then, a developmental supervision plan is created following the clinical supervision. The author notes its theoretical foundations, such as adult learning theories, effective professional development, and effective teaching strategies, for this developmental supervision plan. Based on those findings and discussions, this paper will be able to be followed by other researches and as reference for practical applications.

2. Review of the Related Literature

2.1 What is Developmental Supervision?

Definition: Glickman, Gordon and Gordon (2001) state that the definition of SuperVision is identical to leadership for the improvement of instruction. They define the term supervisor will refer to any person involved with supervision, not to a particular title or position. Moreover, according to their work, developmental supervision thus is “developmental” in two ways. First, the entry-level supervisory approach is matched with the teacher’s current developmental levels and the immediate situation. Second, supervisory behaviors are gradually modified to promote and accommodate long-range teacher development toward higher levels of reflection and problem solving ability.

Three Phases: There are three phases of developmental supervision (Glickman et al., 2001).

- (1) Phase 1: Choosing the Best Approach. In phase 1, the supervisor diagnoses the teacher’s developmental levels, expertise, commitment, and educational situation, and selects the interpersonal approach that creates the best supervisory match.
- (2) Phase 2: Applying the Chosen Approach. In phase 2, the supervisor uses the selected interpersonal approach to assist the teacher in instructional problem solving.
- (3) Phase 3: Fostering Teacher Development. In phase 3, the supervisor changes his or her interpersonal behavior in the direction of less supervisor control and more teacher control. Such a change in supervisory approach occurs only after the teacher has shown readiness to assume more decision-making responsibility.

Interpersonal skills: According to developmental supervision, the supervisory behavior continuum and the clustering of interpersonal behaviors divided into *directive control*, *directive informational*, *collaborative*, and *nondirective approaches* (Glickman et al., 2001).

- (1) The belief behind *directive control behaviors* is that supervisor knows better than the teacher what needs to be done to improve instruction, and it will end with the supervisor making the final decisions for the teacher. *Directive control behaviors* are useful in limited circumstances when teachers possess little expertise, involvement, or interest with respect to an instructional problem and time is short.

- (2) *Directive informational supervision* is used to direct teachers to consider and choose from clearly delineated alternative actions and it is useful when the expertise, confidence, credibility of the supervisor clearly outweigh the teacher's own information, experience, and capabilities.
- (3) *Collaborative supervision* is premised on participation by equals in making instructional decisions and its outcome is a mutual plan of action. It is appropriate when teachers and supervisors have similar levels of expertise, involvement, and concern with a problem.
- (4) When individuals and groups of teachers are functioning at high developmental levels and possess greater expertise, commitment, and responsibility for a particular decision than the supervisor does, then a *nondirective approach* is appropriate. Supervisors can use *nondirective behaviors* in helping teachers determine their own plans and the purpose of nondirective supervision is to provide an active sounding board for thoughtful professionals.

The effectiveness of different supervisory behaviors and approaches is dependent on characteristics of individuals and groups of teachers. The supervisor bases his or her initial supervisory approach on the teacher's level of development, expertise, and commitment and the nature of the situation. In developmental supervision, the supervisors move from more to less control and toward more decision-making responsibility on the part of the teachers.

2.2 Tasks of SuperVision

When addressing about the tasks of supervision that can bring about improved instruction, it must address how to direct assist to teachers. In this paper, clinical supervision will be use as direct assistance to teachers. How do the supervisors integrate clinical supervision and developmental supervision? Glickman et al. (2001) consider that directive information, collaborative, and nondirective supervisory approaches are all consistent with the clinical model. For instance, in a preconference, the supervisor using nondirective behaviors can ask the teacher to choose the focus of the observation, and enable the teacher as he or she chooses or creates an observation system that the supervisor would feel comfortable using. Moreover, Glickman et al. (2001) posit, "in the postconference, the supervisor would clarify, encourage, and reflect as the teacher designed his or her own improvement plan" (p. 321).

2.3 Direct Assistance to Teachers: Clinical Supervision

Glickman et al. (2001) addressed clinical supervision is both a concept and structure. Goldhammer, Anderson, and Krajewski (1993) analyzed nine characteristics of clinical supervision as a concept:

- (a) It is a technology for improving instruction.
- (b) It is a deliberate intervention into the instructional process.
- (c) It is goal-oriented, combining the school needs with the personal growth needs of those who work within the school.
- (d) It assumes a professional working relationship between teacher(s) and supervisor(s).
- (e) It requires a high degree of mutual trust, as reflected in understanding, support, and commitment to growth.

- (f) It is systematic, although it requires a flexible and continuously changing methodology.
- (g) It creates a productive (i.e., healthy) tension for bridging the gap between the real and the ideal.
- (h) It assumes that the supervisor knows a great deal about the analysis of instruction and learning and also about productive human interaction.
- (i) It requires both pre-service training (for supervisors), especially in observation techniques, and continuous in-service reflection on effective approaches (p. 52-53).

Glickman et al. (2001) notes the structure of clinical supervision can be simplified into five steps: (a) preconference with teacher, (b) observation of classroom, (c) analyzing and interpreting observation and determining conference approach, (d) postconference with teacher, and (e) critique of previous four steps (p. 316).

3. Methodology

The purpose of this article is to conduct an empirical observation of the developmental supervision, as well as to utilize the theory of developmental supervision. This study is designed to show how a clinical supervision might establish successfully. The author developed an empirical research of this study, as described below.

3.1 Pre-Observation Conference

On March 16th, the researcher met with Mr. X (teacher code of this study) who is the teacher to be observed in the Big Sky high school (school code of this study). According to Glickman et al. (2001) illustrated the structure of clinical supervision, the supervisor sits with the teacher and determined several points at the preference. The pre-observation conference is concluded as follow:

- (a) The reason and purpose for the observation: Mr. X understood the primary reason for the researcher is to complete the clinical supervision assignment. In addition, the researcher told him that the purpose of this assignment is to put students in a real school setting to experience the process associated with clinical supervision. Besides, the researcher provided some questions for Mr. X, such as can the researcher tape during the process of clinical supervision, and shall the researcher talk with his principal about this clinical supervision? Mr. X said that he would like to tell his principal about this activity for the researcher and he does not mind if the researcher is taping the activity.
- (b) The focus of the observation: As this is the first clinical supervision to Mr. X's class, the researcher will focus on a general observation such as general instructional procedures, general communication, general professional expectations, and general classroom management.
- (c) The method and form of observation to be used: the researcher will use qualitative and quantitative observations for this clinical supervision. In terms of qualitative observation method, the researcher choose to use *detached open-ended narrative* which is to occur when supervisor steps into a classroom and records every person, event, or thing that attracts his or her attention (Glickman et al., 2001, p. 263). In terms of quantitative observation method, the researcher choose to use both of categorical frequency instrument and visual diagramming.

- (d) The time of observation: The researcher will observe Mr. X's *Street Law* class (class code of this study), which starts at 9:00 A.M. and ends at 11:00 A.M. on March 23th.
- (e) The time for postconference: The researcher does not choose to do the postconference for this clinical supervision activity based upon the respect to Mr. X.

Notes from the pre-observation conference:

The researcher believes that Mr. X is functioning at high developmental levels. First of all, Mr. X has a master degree of secondary school leadership and is a teacher with over thirty years teaching experiences. Secondly, he is coaching two student teachers in this semester. In addition, the researcher experienced the preconference with Mr. X and considered that he possesses the knowledge and expertise about his teaching as well as full responsibility for making decisions. Moreover, according to the handout provided by Mr. X, the researcher thinks he addressed a clear expectation as well as the rules to his class. In brief, Mr. X is functioning at high developmental levels and possesses greater expertise, commitment, and responsibility for a particular decision than the researcher does.

3.2 Observation

The researcher observes Mr. X's *Street Law* class, which starts at 9:00 A.M. and ends at 11:00 A.M. on March 23th. Observation notes are recorded in a way of using detached open-ended narrative.

3.3 Analysis

According to the researcher's notes and the observation of Mr. X's class, the analysis is to organize as Figure 1.

Figure 1 Worksheet for analysis and interpretation of data

A. Analysis: (Write the major findings of your observation. Write down only what has been taken directly from your observation.)

1. Instructional procedures

- The teacher used video for twice
- The teacher lectured to the whole class on today's topic since the beginning of the class for 15 minutes
- The teacher used the overhead and one slide
- The teacher explained what was the video going to show before playing the video program
- The teacher's slide was to show the objectives of the topic for students
- The teacher's slide was too small to see for me.
- Students wrote down the objectives of the slide
- The teacher was using the computer and left the classroom during the students were watching the video

2. Communication

- The teacher asked over 10 questions
- The teacher received over 25 different students answers
- The teacher asked 10 different students to read the textbook for the class
- The teacher used face language (such as smile) and body language (such as nod) and verbal as well
- The teacher said, “pay attention, class” when students were talking to each other without listening his lecture
- The teacher walked away from the podium when he was asking students several questions

3. Professional expectations

- Student 12 (student code of this study) and student 17 were talking with each other for three times and passing notes back and forth
- Student 7 and student 12 were late to attend the class
- The teacher left the classroom when the video show was playing.
- Student 11 worked on her paper when watching the video
- Student 12 told the teacher and left the classroom before 11:00

4. Classroom management

- A student 1 came into the classroom and used the pencil sharpener and made loud noise
- A student 30 came into the classroom and talked with the teacher, then she and the teacher left the classroom together
- Mr. A came into the classroom and he and student 1 left the classroom together.
- The teacher turned the light off when using the slide
- The teacher didn't turn on the light when not using the slide
- The front door opened and there were people talking there
- The desks and chairs were arranged in rows facing forward

B. Interpretations: (Write below what you believe is desirable or not desirable about the major findings.)

1. Instructional procedures

- The teacher used well instructional techniques that promote students learning
 - The teacher tough to the instructional objectives
 - The teacher used a good lesson plan
 - The teacher should use bigger size of the word on his slide
 - At least two students were not interested in the video and the teacher didn't notice that because he didn't watch the video with the students
-

2. Communication

- The teacher encouraged students to answer questions
- The teacher used verbal and nonverbal language to interact with students
- There was no small group discussion

3. Professional expectations

- Most students arrived on time and left class at 11:00
- The teacher worked on computer rather than working with students

4. Classroom management

- The teacher created a safe learning environment
 - The teacher didn't create a learning environment without the interruptions
 - The teacher didn't involve in the class when using the video
 - The light was not good enough for students' healthy
-

3.4 Postconference

The researcher does not choose to do the postconference for this clinical supervision activity based upon the respect to Mr. X. However, the researcher provides the note of the post-observation that is to conclude this experience of the observation and the postconference plan.

Notes of the Post-Observation

After the observation of Mr. X's class, the researcher decided to choose the nondirective approach at the postconference with the teacher. Because: (a) the teacher is functioning at high developmental levels, (b) the teacher possesses most of the knowledge expertise about the issue, (c) the teacher has full responsibility for carrying out the decision, and (d) the teacher is committed to solving the problem.

According to Glickman et Al. (2001) nondirective behaviors with individuals, the supervisory behavior continuum is: listening, reflecting, clarifying, encouraging, reflecting, problem solving, presenting, standardizing, and reflecting. For the researcher, first of all, the researcher will listen to the teacher's reflection about his class. Secondly, the researcher will follow his statement and emphasize on the problem as he address is, and provide him the problem he does not mention. Continuing, the researcher will work with the teacher and encourage him to think of possible actions as well as a decision of his plan. Finally, the researcher will restate the teacher's plan and make a note to clarify what the teacher is going to do. Figure 2 is a plan for this instructional improvement.

Figure 2 Plan for instructional improvement

Postconference Date	<u>April 7</u>	Observed Teacher	<u>Mr.X</u>
Time	<u>9:30-10:30 A.M.</u>	Peer Supervisor	<u>Miss Wu</u>
Objective to be worked on:			
• I will improve student-to-student interaction in small groups discussion.			

-
- I will improve the students learning environment such as closing the front door, turn on the light appropriately.

Activities to be undertaken to achieve objectives:

- Practice using the small group discussion
- Practice noticing to close the front door.
- Practice recognizing it is time to turn on the light for students

Resources needed:

- Observe students performance
- Attend a workshop on “cooperating learning-small group discussion”

Time and date for next preconference:

- At 10:30 A.M., on June 30th
-

3.5 Critique

The researcher’s reflective thoughts on this experience and what would do differently next time:

- (a) The preconference with the teacher is critical important. At the preconference, the researcher had a good time for communicating with the teacher. Moreover, both the teacher and the researcher can understand and also be understood by each other. In other words, it is very important to avoid misunderstanding and conflicts.
- (b) The supervisor should know the teacher well before he or she does the clinical supervision. It may be better if the researcher did not meet with the teacher for the first time in the preference. If supervisors know the observed teacher very well, it is no doubt that the supervisors will make good decision during the process of the clinical supervision.
- (c) The observation of a class period is great. For the researcher, this experience of clinical supervision was wonderful, because the supervisor can experience the real school setting and faced the teacher and students. And it was great to have opportunity as well as time for the observation. The researcher thinks that it is useful to do the actual observation for a complete class period, not only 10 minutes of a class period.
- (d) It is a good way to record the teaching on tape if the teacher agreed. For the supervisor, it is not easy to receive all the activities which were happening in the classroom. In other words, if the teacher does not mind if the supervisor records the observation on tape, the researcher will suggests to do it.
- (e) It is formal to utilize paper form to communicate with the teacher. For example, give the teacher a notice of intent to observe and a notice of preconference or post-observation conference.

4. Findings and Discussions

4.1 Developmental Supervision Plan

Developmental supervision plan is to create for helping the teachers to improve their instruction after the clinical supervision. The supervisor builds the developmental supervision plan base upon the goal of

supervisory behaviors are gradually modified to promote and accommodate long-range teacher development toward higher levels of reflection and problem solving ability.

The components of the professional development plan for this clinical supervision are as following:

- The teacher as an adult.
- The teacher had his/her own concern and need (at high developmental level)
- The teacher identified an individual instructional problem (learning environment, small groups discussion)
- The teacher studied the current research relating to this topic
- The teacher selected the information that may be useful
- The teacher developed a strategy for classroom implementing (cooperative learning)
- The teacher created a checklist of planned teacher behaviors
- The teacher videotaped himself/herself implementing improvement teaching strategies
- The teacher watched her/his own videotapes and analyzed it by herself/himself or discussed with others teacher
- The teacher compared her/his actual behaviors to the checklist of anticipated behaviors
- Peer coaching. The teacher focused on the month's instructional problem and worked with a coaching cycle consisting of a preconference, observation and postconference
- Group discussion. A monthly group meeting in which the teachers can share and discussed what had worked and not worked, reflect on what they had learned and determine another instructional problem for the following month
- Clinical supervision observation cycle
- Time and date for next preconference: At 10:30 A.M., on June 30th

Therefore, the goal of the developmental supervision plan that is designed after the clinical supervision is to improve teachers' instruction for students.

4.2 Developmental Supervision Plan and Theoretical Foundations

4.2.1 Adult Learning Theories and Professional Development

For developmental supervision to be meaningful to teachers and to lead to teacher renewal and instructional improvement, it must include the knowledge of adult learning theories and professional development. First, teachers as adult learners should be helped to link learning about instructional innovations to their past experiences, and to allow them ample time to integrate innovations gradually into their teaching repertoire. According to the theories of adult learning such as fluid and crystallized intelligence, Gardner's multiple intelligences, and Knowles's theory of andragogy, teachers as adult learners need to provide specific knowledge for improving instruction. Second, teachers as agents in professional development should consider their needs and concerns. Consideration for both the individual and group characteristics can help make professional development more relevant to the participant. It is a mutual purpose to help teachers become life-long learners facilitating developmental supervision to success.

The theoretical foundations that supported this developmental supervision plan comprised three parts: adult learning theories, effective professional development, and effective teaching strategies.

4.2.2 Adult Learning Theories

According to the developmental supervision plan, adult learning theories provided a theoretical foundation for the components of the professional development plan for this clinical supervision, such as the teacher had his/her own concern and need, the teacher identified an individual problem, the teacher studied and selected useful information, etc. In other words, teachers are as adult learners. Knowles' (1980, 1984) *the theory of andragogy* has five assumptions of adult learning:

- Adults have a psychological need to be self-directing.
- Adults bring an expansive reservoir of experience that can and should be tapped in the learning situation.
- Adults' readiness to learn is influenced by a solve real-life problems often related to adult developmental tasks.
- Adults are performance centered in their orientation to learning-wanting to make immediate application of knowledge.
- Adult learning is primarily intrinsically motivated.

First of all, the developmental supervision plan is to view the teacher as an adult learner. Secondly, the teacher is functioning at high developmental level, possesses most of the knowledge expertise about the issue, has full responsibility for carrying out the decision, and is committed to solving the problem. Therefore, it is the teacher's readiness to learn and to be self-directing. Studies report to (Knowles, 1980, 1984; Mezirow, 1981, 1990; Brookfield, 1986) support the notion of the supervisor facilitating teacher growth toward empowerment and self-direction.

4.2.3 Effective Professional Development

After the experience of clinical supervision, the researcher refers to Ponticell's (1995) site-based professional development program and designed a developmental supervision plan for the teacher in the school. In addition, the components of the professional development plan for this clinical supervision emphasize the teachers' needs and concerns, as well as involvement of the teachers in planning, implementing, and evaluating the professional development programs.

The findings of Ponticell's (1995) study showed site-based program had increased collegiality, improved self-analysis of teaching, enabled teachers to learn new ways of collaboratively observing and discussing each other's teaching, and fostered learning and experimenting with new teaching strategies. The purpose of the developmental supervision plan is to help teachers improve their teaching strategies and ultimately improve students learning. This developmental supervision plan is to create as a cycle of monthly professional development activities including the following (Glickman, et. al., 2001, p. 363-372):

- The teacher identified an instructional problem, studied the current research relating to this problem, chose the information that may be useful, developed a strategy for classroom implementing, and created a checklist of planned teacher behaviors.

- The teacher videotaped himself/herself implementing improvement teaching strategies, watched her/his own videotapes and analyzed it by herself/himself or discussed with others teacher, and compared her/his actual behaviors to the checklist of anticipated behaviors.
- Peer coaching. The teacher focused on the month's instructional problem and worked with a coaching cycle consisting of a preconference, observation and postconference.
- Group discussion. A monthly group meeting in which the teachers can share and discussed what had worked and not worked, reflect on what they had learned and determine another instructional problem for the following month.

Researches (Corcoran, 1995; Guskey, 1994; Hawley and Valli, 1996; Joyce, Colhoun, and Hopkins, 1999; Loucks-Horsley, et. al., 1987; Orlich, 1989; U.S. Department of Education, 1996; Wood and Thompson, 1993) on the characteristics of successful professional development programs had shown that it is crucial to involve the teacher in planning, implementing, and evaluating the programs.

4.2.4 Effective Teaching Strategies

The researcher found that *Qualities of Effective Teachers* by James H. Stronge as a beneficial book for the professional development plan for this clinical supervision. On the one hand, this book can serve as a resource and reference tool for educators. On the other hand, it provides a systematical research findings and recommended practices. In order to achieve the goal of improving students learning, one of the principles to the success of development supervision plan is to improve teaching strategies. Therefore, the context in this book provides a theoretical foundation related to effective teaching strategies.

For instance, according to the memo of the developmental supervision plan, the teacher will increase student-to-student interaction in small groups discussion and improve the students learning environment as well. Stronge (2002) found that the furniture arrangement and classroom displays often reveal how the teacher uses the space. He said that positive quality for the teachers is to encourage interactions in the classroom and also to use a variety of activities and strategies to engage students. He suggests that it is a red flag of ineffective teaching to arrange desks and chairs in rows facing forward (without regrouping). Besides, Caplow and Kardash (1995) characterized collaborative learning as a process in which "knowledge is not transferred from expert to learner, but created and located in the learning environment" (p. 209). Also, others such as Burron, James, and Ambrosio (1993) and Ossont (1993) envisioned cooperative learning as strategy to help students improve intellectual and social skills.

In brief, development supervision contributes to next clinical supervision cycle. Therefore, it is vital to build the evaluating process for the developmental supervision plan. The professional development programs for teachers may result in improving teacher reflection and higher-order thought, more openness, less anxiety and burnout, greater teacher autonomy and efficacy, improved teaching behaviors and better student learning and achievement. According to a study of teachers and administrators in New York state (Tetenbaum and Mulkeen, 1987, p. 11), the primary criticisms of professional development programs are that the activities are "one-shot deals" and that there is "no integration with a comprehensive plan to achieve school goals." Guskey (2002) suggests educators to use five critical levels of evaluation: (a) participants' reactions, (b) participants' learning, (c) organization support and change, (d) participant's use of new

knowledge and skills, and (e) student learning outcomes. These five levels can help educators to improve the school's professional program. On the other hand, these criticisms can be avoided.

5. Conclusion

The vision of developmental supervision is to improve classroom and school instruction by enabling teachers as life-long learner to become more adaptive, more thoughtful, and more cohesive in their work. The long-term goal of developmental supervision is teacher development toward a point at which teachers, facilitated by supervisors, can assume full responsibility for instructional improvement; moreover, the ultimate goal of developmental supervision is to improve students learning. Therefore, using developmental supervision to improve teachers' instruction, it is to bring schools to be successful.

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VIOLENCE AGAINST WOMEN AND GIRLS - *Providing Therapy for Gender Based Violence Survivors*

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Abstract

The purpose of the study was to highlight the factors associated with violence against women and girls and how they can benefit from therapy. The study was guided by the following objectives: to establish the factors associated with the occurrence of violence, determining the effectiveness of therapy in dealing with survivors of violence, exploring factors influencing or blocking effectiveness of therapy. A cross sectional research design was used in which questionnaires, an interviewing guide, focus group discussion and psychological assessment scale were used to collect study data. A sample of 75 women and girls was purposively selected from health facilities, counselling centres, chief camps, police station, NGOs and CBOs within Kibra Constituency. All respondents were females aged 18 years and above. The findings showed that all the respondents (100%) had been exposed to violence. The respondents who reported physical abuse were 30%, sexual abuse was reported by 10%, psychological and emotional abuse was reported by 16%, financial coercion was reported by 15%, neglect of children and duty by 13%, and verbal assault was reported by 16%. Further, the results showed that the most common victims of violence are expectant mothers and children who are under the care of irresponsible persons. The most reported people to perpetrate violence were cited to be men. The responses given by the respondents as factors that trigger violence are: Previous assaults (61%), cultural expectations (61%), alcohol abuse and other drugs (49%), poor communication skills (49%), poor problem solving skills (49%), perpetrator outstretched demands on resources (49%), infidelity (37%), unemployment (37%), peer pressure (37%), frustration emanating from blocked goals (24%), childlessness (24%) and personality traits (12%). Violence against women and girls impact negatively on their lives. The most common negative impact mentioned are depression by 75 respondents, children suffering cited by 65 respondents, family disintegration cited by 56 respondents, non-productivity, physical injury, and anxiety respectively cited by 46 respondents. The survivors of violence have knowledge of where they can access help in order to cope with the consequences of violence. Of the 75 respondents, 75 of them said that counselling is very helpful. Perseverance is another coping mechanism mentioned by 75 respondents. Separation and keeping quiet are strategies mentioned by 65 respondents. Going to hospital is another support and help available mentioned by 56 respondents. The respondents who opted for spiritual intervention were 47 while those who opted to start a business for sustainability were 38. Those who preferred sharing with significant others as a coping mechanism were 28. Last but not least, 18 women indicated that support groups are helpful in dealing with violence. The

study recommended that women and girls should be empowered financially and policies put into place to curb violence. The government and other stakeholders should partner to support women and girls to overcome violence in the society.

Key words: Violence, Victim and perpetrator, Anxiety, Depression, Cognitive behaviour therapy, Coping mechanism

1.0 Introduction

This paper intends to highlight the factors associated with violence against women and girls. It also attempts to show the effectiveness of Cognitive Behavioral Therapy. It is based on a research that was carried out as an intervention within Ki-bra Constituency, Nairobi County. Therapy is important for empowering and healing women and girls exposed to domestic violence (Craighead, 1994 & Dutton, 1992). Effectiveness of CBT in women exposed to violence is the authors' concern because counselling and psychotherapy have been practiced over the years in Africa and other parts of the world yet the phenomenon of violence is on the increase, as reported in social media and other modes of communication. Violence against women and girls is a widespread problem where women have been alleged to develop Psychological Disorders (PD) mainly anxiety and depression after exposure to violence (Briere & Jordan, 2004). Hence, this makes them unable to take care of their families effectively or to contribute efficiently to the social economic development of wherever they are.

The bigger picture of violence against women and girls is their experiences of domestic violence. Domestic violence is on the increase in Kenya and other parts of the world (Makayoto, et al, 2012). Daily reports on the media are clear indicators of this fact as well. The author has intervention strategies to reduce domestic violence and its consequences, using CBT. Psychotherapy and other forms of treatment have been used by professionals in trying to reduce the disease burden even though the problem is on the increase, affecting many lives.

It is necessary to define some terms which have been used in this paper. These terms are violence, Cognitive Behavioral Therapy (CBT), Depression and Anxiety. As a noun, violence is bad action committed by one person against another or household against another. For example, relatives who have a conflict or are disagreeing at family level or neighboured who could be biological brothers fighting, wife beating, sexual abuse or child neglect (Ellsberg, 2006). The National Research Council defines violence as a behaviour by individuals that intentionally threaten, attempt, or inflict physical harm on others (National Research Council, 2013).

Further on, CBT consists of several techniques dealing with the mind, the body, and the behavioural patterns of an individual. This approach believes that abnormality stems from faulty cognitions about oneself, others, and the world around them (Beck, 2011). The faulty thinking may be through cognitive deficiencies or cognitive distortions (processing information inaccurately). These cognitions cause distortions in the way we see things. If our mental representations are inaccurate or our ways of reasoning are inadequate then our emotions and behaviour may become disordered. The CBT therapists teach clients how to identify distorted cognitions through a process of evaluation. The clients learn to discriminate

between their own thoughts and reality. They learn about the influence cognitions have on their feelings, and they are taught to recognize, observe and monitor their own thoughts and behavioural patterns (Craighead, 1994).

Another term worth defining is depression, which is a common mental health disorder, reported often in health care settings (Katon & Schulberg, 1992). It is a low or high mood disorder characterized by symptoms such withdrawal and hyper-activity. Major depressive disorder was recognized by the World Health Organization (WHO) in 2001 as the fourth leading cause of disability and premature deaths in the world (Licinio & Wong, 1999). According to the International Classification of Diseases (1992) depressed mood, loss of interest or pleasure, reduced energy and lack of concentration are the key symptoms of depression. Additionally, it can cause disturbance of sleep, appetite, low self-confidence, negative - view of one's self, feelings of guilt and thoughts of suicide, or even ending one's life (DSM - 5, 2013).

Finally, anxiety, which is commonly known to be a state of apprehensiveness. Generally, everyone feels anxious from time to time, but stressful situations such as meeting tight deadlines or important social obligations, or fear of the unknown, often make us nervous or fearful. Experiencing mild anxiety may help a person become more alert and focused on facing challenging or threatening circumstances. Of importance, is individuals who experience extreme fear and worry that does not subside. These may be suffering from an anxiety disorder, which may interfere with the individuals' daily functioning. In other words, frequency and intensity of anxiety can be overwhelming and interfere with daily activities. Fortunately, the majority of people with an anxiety disorder improve considerably by getting effective psychological treatment (DSM-5). Symptoms of Anxiety are such as: Feelings of panic, fear, and uneasiness; Problems sleeping; Cold or sweaty hands and/or feet; Shortness of breath; Heart palpitations; An inability to be still and calm; Dry mouth; Numbness of emotions and/or tingling in the hands or feet; Nausea; Muscle tension and Dizziness (DSM-5). Research has demonstrated that psychotherapy using techniques of CBT is highly effective in treating anxiety disorders (Beck, 2011).

1.1 Problem Statement

Violence against women and girls (VAWG) is on the increase in the world and the contemporary society (Black, 2011). For example, there are some secular songs regularly aired on TV, radios, You-tube that sound demeaning to women and girls. The secular world takes them as if they have the best message and nothing questionable about the image they portray about a woman. A case in point is particularly one Kikuyu song's relic that depicts the intricacy of violence against women and girls. It states that a young girl has to be married off to a man not necessarily of her choice, very early or as fast as possible because if she is allowed to grow older or become more mature, she will be grabbed by the "sponsors". "*Jei... ndukahikie narua, gitumi weterera kaigane, kahurio ni sponsor...*" That means: My brother Jei... You better marry her faster, as fast as you can because if you let her mature she will be grabbed by the sponsor..." The society dances to the tune of such a song, nobody seems to pause and wonder why our girls have to be treated that way. For our society to condone that kind of treatment or the thought of it, is an indicator of lack of protection and consideration for the future mother, woman of substance in the community.

In the researcher's view, this is covert violence against women and girls, whereby they are disrespected. One thing leads to another, rape dates are common, forced marriages, forced sexual relationships are seen in marriages, and the list goes on. Women and girls have been given no chance to make decisions about their lives. Therefore, the girls are discussed in *bad light*, and controlled from within their homesteads. Women and girls have been exposed to many occasions of embarrassment without much consideration. This predisposes women to easy frequent sexual abuse and other forms of violence. Violence against women and girls can be likened to a *bush fire* that spreads far and wide burning everything if not controlled or if no measures are taken.

Men have been exposed to violence though with lesser known incidents compared to women and girls. In the recent past a number of cases have been reported of men having been violated by women. This could be a reaction of the survivors of violence, trying to conquer where they were conquered (Dutton & Goodman, 2005). The prior victim of violence develops into a perpetrator of violence, simply because the brain has registered that phenomenon, sent it into the unconscious level of the mind, where it rests and only to emerge and observed as a response to a similar scenario. Women who were violated when they were young tend to victimise other people, either of the same or opposite gender. They are capable of repeating what they were done or observed being done to them or other persons. Domestic violence is about conquering where the human systems are stressed, appraised negatively, poor self-esteem and concept, as well as desire to overpower others (Flury & Riecher-Rossler, 2010). There are known factors that could be confounding therapy. One could ask or seek out the factors related to the problem, and this way we can change the trend of the phenomenon.

1.2 Objectives of the study

- 1) To establish the factors associated with the occurrence of domestic violence
- 2) To determine the effectiveness of therapy in dealing with domestic violence survivors
- 3) To explore factors influencing or blocking effectiveness of therapy

2.0 Theoretical framework

Cognitive Behavior Therapy is one of many applicable methods for producing belief and behavior change (Craighead, 1994). It is a psychological treatment intended to change maladaptive ways of thinking, and thereby bring about improvement in psychological disorders among people (Colledge, 2002). Being a highly eclectic it helps to deal with the development, maintenance and alterations of behavior. In addition, CBT is a combination or a "pulling together" of any and all methods, strategies, and techniques that work to help people successfully overcome their particular emotional problems (Briere & Scott, 2006 & 1996). According to Craighead (1994) CBT's primary purpose is to help people carry out intended behaviors without influencing their intentions, and it is more useful on face-to-face interaction than in community-level interventions. The cognitive part of the therapy refers to learning and thinking, and it is the part of therapy that can be "taught" to the person (Kendal & Kriss, 1983). The person then needs to take what has been taught, practice it at home, or every day. Through means of repetition, the person gets that new "learning" down into the brain over and over again so that it becomes automatic or habitual. This is

essentially the same process as that of school or college teaching and learning, where one is taught some new information or skills, and learns them. When one has learned them well enough through repetition, this affects the memory processes and allows one's brain to begin thinking, acting, and feeling differently. This exercise requires persistence, practice, and patience. When a person sticks with this therapy, without giving up, noticeable progress begins to occur (Stefan, Anu, Imke, Alice & Angela Fang, 2012; & Beck, 1967). This approach to therapy postulates that abnormality stems from faulty cognitions about others, the world and about oneself. This faulty thinking may be through cognitive deficiencies or cognitive distortions, which means processing information inaccurately, consequently causing distortions in the way the individual sees things.

Albert Ellis (1957, 1962) suggested that distortions are through irrational thinking. He proposed that each of us has a unique set of assumptions about ourselves and our world that serve to guide us through life and determine our reactions to the various situations we encounter. Unfortunately, some people's assumptions are largely irrational which lead them to act and react in ways that are inappropriate. This in return prejudices their chances of happiness and success in relationships in life. Additionally, Albert Ellis referred to these predispositions as basic irrational assumptions where by some people irrationally assume that they are failures, will constantly seek approval, and repeatedly feel rejected. All their interactions are affected by the basic irrational assumptions because they do not get enough compliments (Beck, 1967).

Albert Ellis (1957) developed an approach known as the ABC Technique of Irrational Beliefs. According to Albert there are three steps of the process by which a person can develop irrational beliefs. First, A - Activating Event or objective situation: This is an event that ultimately leads to some type of high emotional response or negative dysfunctional thinking of the victim. Second, B - Beliefs: In this step the client recognizes and writes down the negative thoughts that occurred to them. Third, C - Consequence: This is the negative or distressing feelings and dysfunctional behaviors that follow. The negative thoughts of the second step are seen as the connecting bridge between the situation and the distressing feelings. The third level C is explained by describing emotions or negative thoughts that the person thinks are caused by A. This could be anger, sorrow, anxiety, and so on. Ellis believes that it is not the activating event (A) that causes negative emotional and behavioural consequences (C), but rather that a person interprets these events unrealistically and therefore has an irrational belief system (B) that helps cause the consequences (C).

The occurrence of domestic violence is as a result of the interpretations of the experiences people give to what they go through in life as a result of strained activities. This manifest itself through behaviours, negative thoughts and feelings. When domestic violence occurs it impacts negatively on to the victims.

Therefore, CBT is a strategy for addressing domestic violence consequences because it equips the victims with coping mechanisms (See fig 1)

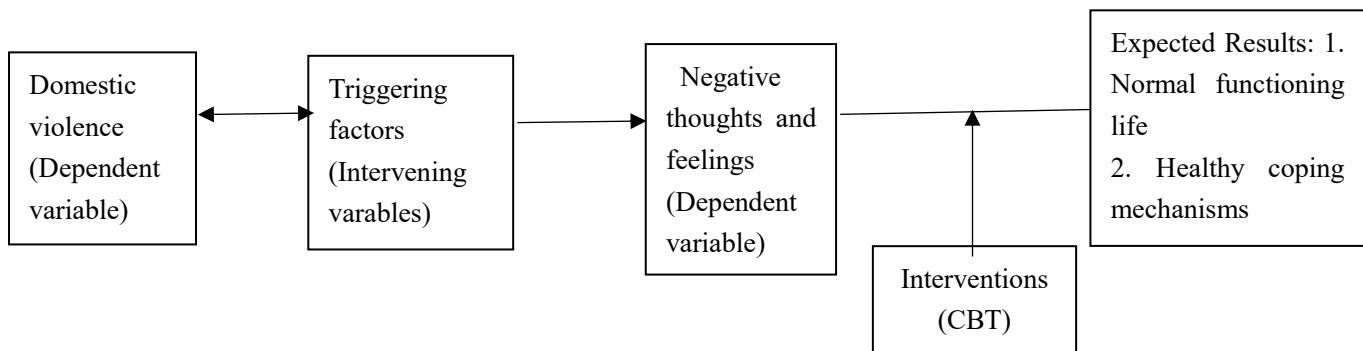


Figure 1: Occurrence of Domestic Violence and Intervention strategy using CBT

3.0 Methodology

The methodology used to arrive at the results of this paper was through the use of cross sectional survey using a questionnaire; interviews; focus groups discussions and psychological assessment scales, in order to determine the prevalence of domestic violence, the levels of domestic violence, and the psychological disturbances in women and girls 18 years and above. A sample of 75 women and girls exposed to DV, was purposively selected from within Kibra Constituency in Nairobi County. The choice of the surveillance systems selected to provide the best estimates for domestic violence are health facilities, chief camps, police stations, Rescue centres, Trauma counselling facilities, children departments and NGOs. These were purposively selected to arrive at the evidence based results. The findings of the study were analysed using SPSS and presented through tables, pie charts and columns.

4.0 Research findings

4.1 Introduction

It is known that the society has domestic violence, a problem of human conflicts and dysfunctional families where a lot of abuse and trauma is going on, either reported or unreported. The survivors of DV suffer quietly until noticed to display abnormal behaviours (Schneider, 1990-1991). Women and children in families and elsewhere, suffer DV within their settings as they go about their daily activities and raising their children. These children grow up into adults who display fears, anxiety and depression, among other abnormal behavioural patterns, stemming from the maladjustment (Friedman & Goldman, 2011). Furthermore, it has been confirmed that in most cases children who have been exposed to domestic violence oftenly become perpetrators later in life (Dutton, 2007). What we don't know is what to do to stop DV, because we would have done so by now. The fact remains, we would have succeeded in stopping the problem before it starts, but instead it is on the increase. The phenomenon of domestic violence remains unknown because it is covert, as it is rarely reported or not reported at all. Most of the families and individuals do not know or accept that they are going through domestic violence. It is also not clearly defined how some of the violent behavioral patterns pass across generations, which are either learned or genetically motivated or inherited.

4.2 Assessing Domestic violence

4.2.1 How to measure DV

Domestic Violence is fashioned with ethical considerations unique to this topic of interest. This is because participants keep away a lot of information to do with their experiences on domestic violence. The researchers are controlled by the ethical considerations whereby the participants are encouraged to share as much as they are comfortable to disclose. This involves confidentiality that is promised by the researchers during consent signing. The participants were encouraged to share on matters related to their abusive relationships freely without fear. They were encouraged to raise above the stigma that they were experiencing in order for the therapy to be effective. This was carried out through assurance of confidentiality. However, they were seen to have fear of the perpetrators due to the threats they had gone through, and especially when they, victim, were living in the same environment with the perpetrators (Oram, Trevillion, Feder, & Howard, 2013).

4.2.2 Possible Risk Factors for domestic violence

- a) **Gender:** both male and female are affected due to the mere fact of being of the gender, and having been in environment that was abusive as children.
- b) **Ethnicity and stereotyping:** Domestic Violence is a universal problem and hence people who intermarry from different races and ethnic groups are seen to experience abuse in their relationships out of partiality or discrimination.
- c) **Socio-Economic Status:** Both affluent and poor or low income are affected. Some husbands refuse their wives to go to work in order to control them using money while depriving them financial support (Jewkes, Levin & Penna, 2002).
- d) **Age:** Domestic violence is experienced by both the young and the elderly, that means anybody can experience it in their given environment.
- e) **Alcohol and other drugs:** This is mostly associated with domestic violence where men are the most affected as they are seen to spend a lot of time in alcohol dens, only to go home drunk and disorderly. They spend money on drugs and become intoxicated.
- f) **Pregnancy:** Highly related or remembered as the most vulnerable condition: some did family planning secretly avoiding conflicts with the husband (Taillieu & Brownridge, 2010).
- g) **Psychiatric problems:** Abnormal behaviours and deviants are related to violence (Friedman, Loue, & Goldman, 2011).
- h) **Personality traits:** Abnormal behavioural patterns of personality are risk factors to domestic violence (Kylee, Howard, Roxanne & Louise, 2012; Dutton, 2007).

4.3 Facts and Outcomes on Domestic Violence

Findings from the field indicate that DV is pain inflicting behaviour towards loved ones, members of the same family which involves spousal abuse, sexual violence, child abuse, and sibling-rivalry, dating friends, among others (Flury, & Riecher-Rossler, 2010). In this section we will briefly highlight the facts and outcomes on domestic violence which has been done by examining the most people who are affected by

domestic violence, looking at the people who are mostly perpetrators, the various forms of domestic violence within the community, the behavioural pattern of both the victims and perpetrators, the triggers of domestic violence, the negative impact of domestic violence, the coping mechanisms in dealing with domestic violence and the support available in addressing the domestic violence.

4.3.1 Definition of Domestic Violence

Domestic violence is characterized by all sorts of maltreatment. Maltreatment is a behavior towards another person, which is outside the norms of conduct, and entails a substantial risk of causing physical, psychological and emotional harm (Black, 2011). These forms of maltreatment are also referred to as assaults. The assaults reported by the victims are: Physical assault, Sexual assault, psychological and emotional abuse, financial coercion, verbal assault and neglect. These have been briefly highlighted below.

- 1) **Physical abuse:** this was reported by 30% of the respondents. They defined physical assault to be when the perpetrator slap, hitting with a fist, kick, hit against the wall, shove, strangle, burn, stab or use other crude objects to inflict pain on the victim's body.
- 2) **Sexual abuse:** occurs when one of the partner is forced into sexual activity when they are not ready or they are prevented from using birth control measures. Sexual abuse was reported by 10% of the respondents. Sexual assault also includes fondling and exposure to indecent acts to family member who are of not age or willing.
- 3) **Psychological and Emotional abuse:** was mentioned by 16% of the respondents. They saw it to be when one partner humiliates the other, tries to isolate the other partner for example by taking side, living the victim alone without informing him/her the whereabouts. Occurs also when one of the victim is followed, stalked and not allowed to be independent. Victims can be traumatized when the perpetrator involve children in their abuse, use children to spy on them or obstructing the victim from having visitations to the children in school.
- 4) **Financial coercion:** it was cited by 15% of the respondents who said that it occurs when the victims are not involved in decision making on money expenditure. It is a situation where the perpetrator decides how finances are to be managed in a household. In addition, financial coercion occurs when one partner mishandles family finances or leaves little or no money for expenditure. Lastly, financial coercion is experienced when one of the partners attempts to use money and other goodies to control the other partner.
- 5) **Neglect of children and duty:** 13% of the respondents cited that negligence occurs of children and family duties occurs when the perpetrator does not play the expected roles of providing for the needs of the family such as food, clothing, medical, education among others. Furthermore, neglect can manifest when the vulnerable especially the one who are disabled and marginalized members of the family are not attended to in the right manner. In addition, when the perpetrator abandons the family or tries to sabotage the parenting skills of the other partner it harms the family wellbeing.
- 6) **Verbal assault:** 16% of the respondents mentioned verbal abuse to occur when one of the partner uses insults, put-downs and name calling among others, which are inappropriate and

intimidating to the other partner. Sometimes verbal assault can include the tone, pitch, and other non-verbal gesture and body language. (see the fig. 2 below)

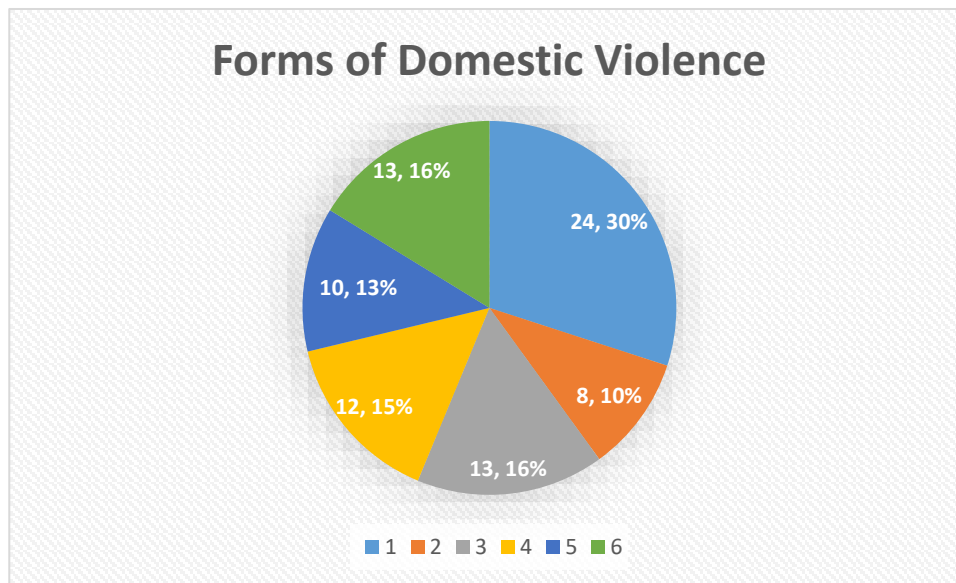


Figure 2: Forms of Domestic Violence

4.3.1 People most affected by Domestic Violence

So far, we have established that women and children are the most affected and vulnerable to domestic violence (Briere, 1992). It has been found that victims' level of education attainment and occupation remained significant predictors of domestic violence (Kishor & Johnson, 2004). However, domestic violence cut across education and social economic levels. Both the highly educated and the lowly educated experience domestic violence. The facts show that domestic violence affects also both the rich and the poor regardless of their levels of household income (Garcia-Moreno, Henrica, Mary, Lori, & Charlotte, 2006). (See table 1 below)

	Most likely to be victims of domestic violence	Respondents
1	Women especially expectant mothers	34
2	Children who are under the care of irresponsible persons	20
4	Mentally challenged and disabled members of the family	9
5	Elderly people especially women with nobody to take care of them	14
6	Men	6

Table 2: most likely to be victims of domestic violence

4.3.2 Most likely to be perpetrators

Most of the perpetrators are:

- a) Husbands who assault their partners
- b) Step-fathers
- c) Step-mothers

- d) Uncles
- e) Aunts
- f) Siblings
- g) Mother in laws

Mostly, domestic violence starts when there is a misunderstanding between the spouses for example how they dress or prepare meals. This eventually leads to a quarrel which triggers physical assault, psychological and emotional abuse as well as verbal assault. Domestic violence start when marriages are unstable. This happens when there is poor communication skills and problem solving skills. Furthermore, the victims are blackmailed and threatened by the perpetrator that favours will be withdrawn from them, such as school fees and other basic things, in case they do not abide to the abusive demands of the perpetrator. This is normally when the victims are financially vulnerable, and dependent on the perpetrator.

4.3.3 Triggers/causes of domestic violence

Domestic violence is triggered or caused by various factor such as, previous abuses and assaults experienced by the perpetrators (61%). Perpetrators who had been abused either by their cruel parents or trusted family members or had witnessed their parent abusing their mothers, consequently they suppressed these experiences or became numbed, hence they became insensitive to abuse.

Secondly cultural expectations are causes of conflicts in the families (61%). This is because of the distribution of roles, whereby the women are expected to do most of the chores in the family such as cooking, washing, taking care of animals etc. while the husband is expected to be the breadwinner. Therefore, in the case when the husband is irresponsible and neglects the expected gender roles, which are taken over by the wife, violence has been seen to occur because the husband wants to assert himself as the head of the family. Furthermore, there is a misconception by some men who think that when they slap their wives or call them names and put-downs, it is a sign of dominance and control.

Thirdly, perpetrators who are into substance abuse such as alcohol and other drugs (49%) develop impaired thinking, loss of inhibitions, become addicted and dependent on these drugs. This leads them to mistreat their partners because of lack of self-control. In addition, the perpetrators who are into binge drinking, have not only neglected their responsibilities but also taken and sold items from the house such as TV, radio, cell phones, furniture, bicycles, cooking pots, farm produce and misusing the household income so that they can maintain their drinking habits.

Fourthly, stress triggers and causes domestic violence when the perpetrator resources are overstretched by the demands (49%) and feels limited to those needs of the family in terms of finance, time, and work experiences. When this happens the perpetrators are quick to react negatively and getting irritated by the smallest actions of their partners

Poor problem solving skills is another factor which triggers domestic violence (49%). As human beings, we experience various challenges in relationships and in our daily lives. However, what matters is how the two parties are able to solve the issues which they experience. Partners who have poor problem solving skills could be as a result of negative attitude towards each other, misinterpretations of the partners' behaviour, irrational thinking and generally poor communication skills.

Poor communication skills is (49%) trigger of domestic violence in families especially when one of the partner fails to communicate effectively to the other. For example, when one of the partners has poor listening skills, is impatient, as well as having poor understanding of the issue at hand. Misinterpretations occurs during conversations, which eventually leads to a response which was not expected or appropriate. Furthermore, an arrogant tone of voice which is demeaning, the body language and nonverbal expressions, which are inappropriate, and the timing of the conversation are catalysts for poor communication skills. Infidelity triggers (37%) of domestic violence between the perpetrator and the victim when one of them is not faithful in the relationship. When the victims get to know about infidelity behaviours and ask their partners about the same, violence erupts. The victim could have checked the contacts which the perpetrator was making with other women/men on phone, email, or the victim was given an alert by neighbours about the illicit relationship the perpetrator was having. In addition, there are cases when the perpetrator is unfaithful and suspects the victim to be guilty of the same. Therefore, they stalk and control them in an appropriate manner.

Unemployment has been seen to trigger domestic violence (37%) especially in the event that a perpetrator loses the job and remains unemployed, while the victim is still employed there is often an antagonism between the partners. The reason cited for this phenomena is that the perpetrators feel they are no longer in charge of the family as 'breadwinners' and so they become abusive to their spouses as a way of asserting themselves. This is also common in relationships where particularly the wife is earning better than the husband. Moving on further, when the victim is not financially empowered and dependent on the perpetrator, the mere statement of asking for money sparks quarrels and disagreement. Even when they are given the money, they are expected to account how they used it. In the event that they are not able to account for each and every penny or used the money in another way, they are assaulted physically, psychologically and verbally.

Peer pressure is (37%) trigger of domestic violence especially when perpetrators share with their peers in places such as work place, social gatherings, and shopping centres, on how they are treated by their spouses at home, as well as how they assault their spouse when they don't meet their demands. Some of them learn that the only way to assert themselves, is to exercise high level of control and demand against their partner. Furthermore, the perpetrator could be evaluating the current relationship and their financial status in comparison with their peers who seemingly are doing better than them. Consequently, they blame their partners for their stagnation.

Frustrations emanating from blocked goals are known to be (24%) trigger of domestic violence. This is especially in cases where the perpetrator comes from work feeling unhappy about their bosses. They vent out their frustration onto their family members. Frustrations also from failed relationships are known to trigger domestic violence.

The problem of being childless (24%) can be as a result of health limitations from either of the partner, rejection of either of the spouses or family lineage, limited financial resources, career pursuit, body figure and beauty pursuit especially by models and celebrities among other reasons. Childlessness is also an African cultural concern due to beliefs and values about family continuity. Due to this cultural expectation, couples should beget children of their own and raise them up. In the event when they do not meet the

expectation, mother in laws and other family members put pressure on the couples, sometimes without knowing the reason for their childlessness. As a result, couples blame each other for their predicament and that may result to domestic violence.

Last but not least, domestic violence may arise from personality traits (12%) challenges of the perpetrators who are born and prone to violent behaviour. For example, there are cases where some parent sexually molest their own daughters. These perpetrators are paedophiliacs a condition which could have been as a result of either past experience or genetic disorders. On the same vein, some temperamental states of personality predispose some people to losing their self-control. The latter has been cited to be a trigger of domestic violence. (See the table below)

Triggers of violence	Responses	Percentage (%)
Infidelity	28	37
Drinking Alcohol & Drug Abuse	37	49
Unemployment	28	37
Frustrations	18	24
Overstretched (stress)	37	49
Poor Problem Solving Skills	37	49
Poor Communication Skills	37	49
Previous Abuses And Assaults	46	61
Childlessness	18	28
Cultural Expectations	46	61
Peer Pressure	28	37
Personality Traits	9	12

Table 3: causes/ triggers of domestic violence

4.3.4 Behavioral patterns and occupational characteristics of perpetrators and victims

Perpetrators have characteristics and behavioural patterns which define them to be that way. They are overly controlling as they never give in to their partner's views, as they want their views and opinions to be followed to the letter. They threaten their spouses and children, so that they can have their way without being answerable to anybody. This can be attributed to a phenomenon observed in most of the Kenyan communities which are patriarchal, while the women and children are marginalized. Generally, perpetrators are uncaring, drug addicts, neglecting, malingerers and irresponsible people. They leave their roles of bringing up their children and provision for basic necessities such as school fees and food to their spouses. They are manipulative, crafty and cunning people, especially to their spouses. They openly apologize to their spouses especially when they have abused them and children, to prevent the victims from taking an action against them for their unacceptable behaviour. In addition, perpetrators are intimidating, unfriendly, negatively aggressive, rough mannered, and very insulting especially as an escape route for their ill behaviours, such that they become irreproachable.

Victims of domestic violence on the other hand are people who have been abused on several occasions and for a lengthy period of time by the perpetrators, to the extent that they internalize the abuses done to them

to be normal. Consequently, this affects their psychological wellbeing which may lead to a feeling of worthlessness and low self-esteem. They blame themselves as to be the ones who caused the assault, probably for what they did or not do to their partners. In other words, they have the thinking that the perpetrator was justified to abuse them. Victims of domestic violence are seen to be displaying feelings of helplessness and are resigned. This is because they have given up the fight for their rights and do not take any step to emancipate themselves from the abusive environment. They have made a choice to remain in abusive relationships because they are dependent on the perpetrator.

Commonly, victims of domestic violence are seen to be ignorant and people who keep quite or silent even if they are experiencing domestic violence. Some victims do not know that verbal abuse, use of children to control the partner, psychological and emotional abuse are forms of domestic violence. The types of violence they are familiar with, are physical assault, sexual assault and economic coercion. This is because these assaults are physically felt as being exercised to them in comparison to the first category of assaults which are indirect or somehow passive. Victims of domestic violence are known to be poorly paid and unemployed. Majority of the victims of domestic violence are housewives, casual labourers, operate small businesses; run groceries, Salonist, run food shops, employed as house-helps to mention a few. These forms of occupations demand long hours of work yet the payment is little and consequently leading to financial constraint.

4.3.5 The negative impact of domestic violence

Domestic violence leads to depression among the people who are affected (Roberts, Lawrence, & Williams, 1998). The loss of the victim's valuable relationship, time, children, finance and what they have contributed into that family, cannot be recovered. Therefore, the victim sinks into depression which manifest itself in symptoms such as feeling worthlessness and helplessness, loss of sleep, loss of appetite or too much, disinterest in activities they initially enjoyed doing and overall forgetting to take care of their body. This phenomena, affect children directly which lead them to experience suffering and pain. Furthermore, family members who are in an abusive environment also experience psychological disturbances of anxiety. Anxiety manifests itself in ways like, panic attacks impulsive behaviour, obsession, apprehensiveness, compulsiveness, and gastro-intestinal disturbances such as ulcers

Domestic violence expose children to suffer physical abuse when one parent vents their anger onto the children through beating or hitting them with crude objects, burning them with hot things, starving, throwing them on wall, deprived of their privileges to mention a few. Secondly, children experience psychological and emotional abuse when they witness their father or mother humiliating one another or insulting each other in their presence. Children experience domestic violence when they are assaulted sexually by their parents, older siblings, or other relatives who have taken advantage of their vulnerability. Lastly, some children experience psychological trauma when they are humiliated and verbally insulted by family members when they turn home with poor academic performance to give an example. Furthermore, children have poor academic performance in school due to lack of concentration in class as a result of the experiences they have gone through or seen their parent experiencing at home. Lastly, there is a long term

effect of domestic violence on children, who later when they grow may become perpetrators, if they never received therapy.

Families disintegrate when there is violence going on within the household and not resolved in time before it erupts to serious consequences. For example, violence can start with a minor quarrel or argument on something such as poor preparation of meals or getting home late. Due to lack of proper communication skills and problem solving skills, they are not able to keep together. Other issues leading to family disintegration include infidelity, abuse of alcohol and other drugs, irresponsible behaviour of one the spouses, child sexual abuse, to mention a few. In addition, when one of the spouse is a workaholic, the family is negatively affected. This is because they do not have quality time with their family and time to bond together. These bad behavioural patterns within the family lead the couples to report each other to parents, chief, police, legal firms and courts, and eventually they separate, break-up, or finally divorce.

Another negative effect of domestic violence is non-productivity. This comes as a result of the people going through domestic violence developing psychological disturbances, consequently making the body system fail to coordinate in the normal way. For example, when somebody is stressed, depressed, or anxious, this affects their physical energy, psychological and emotional well-being. They suffer blood pressure, loss of appetite for food, insomnia, headaches, they are temperamental and uncooperative at work. Due to this, some of these people end up losing their jobs, resorting to alcoholism and drugs, which leads them to being unreliable people in the society. Excessive use of alcohol and other drugs, make someone to become psychotic. All the above mentioned factors make people become non-productive members of the family and society in general. This further on challenges the family-income generating capacity, leading to poverty.

Another negative impact of domestic violence is physical injuries are experienced by family members especially when there is physical fight between them. When a heated disagreement occurs, some perpetrators slap, hit, kick, stab, strangle, choke, throw objects, knocking somebody against the wall, use boiling-hot liquids, spraying and splashing inflammatory liquids such as acid and paraffin to mention a few. The victims are hurt severely by such actions which leads to severe body harm such as broken bones, disfigured faces, burns, painful deep cuts, scars, amputations, brain contusion and concussion, nervous system injuries to give a few. In addition, serious cases of domestic violence result to homicide, deaths of a spouse or children and suicide.

Both key informants and the FGDs were in agreement that domestic violence has a negative impacts on the affected people in the family. From the research, the most negatively affected are women and children. This is because they are vulnerable, marginalized, not empowered, cannot defend themselves adequately, and so the perpetrators find it easy to assault them. (See the figure below).

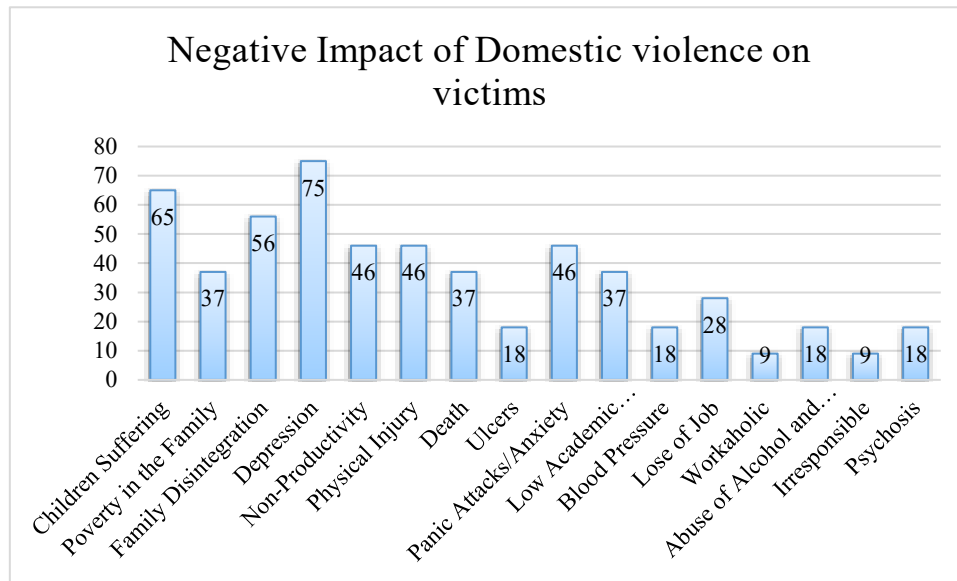


Figure 3: Negative impacts of Domestic violence on victims

4.3.6 The coping mechanisms for victims of domestic violence

According to the research findings, counselling plays a big role in addressing the issues of domestic violence. The victims who are aware that they are experiencing domestic violence, seek help before the condition worsens. It is worth noting that there are two categories of victims of domestic violence in terms of when they seek counselling services. The first category are those victims who know what they are going through, and seek help from counselling facilities in time. On the other hand, there are victims who are referred to the counsellor after going first for medical treatment. This category of victims delay to take immediate action on the onset of domestic violence and consequently suffer severely. They take longer to recover because most of them report to counselling facilities with cases of physical and sexual assault. Furthermore, the victims of domestic violence utilize support group to deal with the negative experiences in the families. Support groups are helpful to victims because the victims get encouraged when they discover they are not alone. Secondly, the victims have an opportunity to listen on what other have experienced in their lives, and how they are coping. Lastly, the victims also learn coping skills and other alternatives available for them in dealing with domestic violence.

Victims of domestic violence cope with it through perseverance. They persevere as they hope that the situation will get better. Secondly, the victims think they have no better way of living. They have the assumption that they are insecure and dependent on the perpetrator such that, in the event they left the current family set-up, they will find it difficult to settle down elsewhere and consequently being inconvenienced. Another reason given for perseverance is the social status quo which the perpetrator and the victim have in the society that they find it hard to separate or get out of the abusive relationship. Some victims opt to remain in the abusive environment because of the inputs they have invested in the family and in the relationship especially in terms finance resources and duration of living together. Other victims persevere because of the children especially when they are very young and therefore, do not want the children to be affected in case they opt to separate.

Other victims of domestic violence cope with it by keeping quite. They do not want to talk about their bad experiences in the family with anybody not even the closest family members for various reason. Some of the reasons cited include avoiding embarrassment. This is due to the nature of abuse that happened in the family such as incest. Other victims opted to remain silent to preserve the image of the family because they were afraid of gossips within the community. They also fear to confront the perpetrator because of the consequences which they may face such as being slapped, verbally abused, humiliation, and financial deprivations among others. Other victims keep quite assuming that it is the best way to prevent worsening the situation of abuse.

Separation is opted by the victims of domestic violence as a coping strategy. Separation can be categorized to be either short term or long term. Short term separation is when the victims opt to take a temporally escape from the perpetrator so as to allow time for adjustment or dialogue with support systems available such parent, chiefs, or looking for counselling services to mention a few. On the other hand, victims may opt for long term separation in the event when the domestic violence escalated to levels which are life threatening or causing them severe harm.

Another coping mechanism available for victims is going to the hospital or health facilities to receive medical attention for self-assurance. This does not only happen when the victims have major assault such as sexual or physical body injuries, but also when they have other complains which are of psychological dimension such as headaches, stomach upset, rapid heart rates, dizziness, feeling fatigue, and backache among others.

Other victims seek divine intervention by going for prayers. The victims seek divine intervention through their religious leader by asking them to pray for them so that the bad situation at home can be alleviated. Other victims join spiritual groups for overnight prayer and fasting sessions to avert the bad experiences they are going through. Lastly, some victims invited prayer groups and religious leaders to their homes to carry out some religious rituals and prayers to cleanse the homestead and convert the perpetrators to change for better.

Victims of domestic violence make efforts to search for jobs so that they can empower and emancipate themselves from dependency on the perpetrator. By so doing, they are making effort to avoid the perpetrator from taking advantage because are vulnerable. In addition, the victims see the need to improve themselves financially because they are no longer dependent on the perpetrator. This is because they have to carry on with the responsibilities of bringing up the children single handed without the help of the perpetrator. Furthermore, victims with low education make effort to save money and start up a business and be self-reliant. This coping mechanism is an indicator that the victim can make a decision to start a new life on their own.

Both the key informants and the FGDs findings on the coping mechanisms for women facing domestic violence are a carbon copy. The best coping mechanisms cited by the majority of the participants are counselling and separation, as the most helpful. Counselling is meaningful and helpful to victims because they are healed and able to resume their normal life and feel less hurt by the ordeal they went through. Those women who go through therapy and make a choice to leave the environment of abuse, acknowledge separation to be the best option to take in order to keep away from the perpetrators. (See table 2 below)

Victims of domestic violence coping mechanisms	Responses
Separation	65
Keeping Quite	65
Perseverance	75
Prayer	47
Counselling	75
Support Group	18
Starting Business/New Jobs	38
Going to Hospital	56
Sharing with Significant others	28

Table 4: Coping mechanisms for victims of domestic violence

4.3.7 The available support for the victims of domestic violence

There are several places where victims of domestic violence can be assisted when abuse occurs. One of such places cited by the participant is Non-Governmental Organisations (NGOs). Some of these NGOs are operating within the community to deal with the issues affecting the community. Secondly, the victims of domestic violence have easy access to Health Facilities within the locality where they can get medical assistance as well as counselling services. Furthermore, the hospital bills are waived by the government of Kenya for victims who have been assaulted. Another help available for victims of domestic violence is the chief's camp where they go to seek assistance when in crisis. The chief visits and the monitors the site of the violence and tries to intervene. Neighbours are also a support system available for the victim of domestic violence. This is because, immediately they hear a cry for help from the victim, they rush to the place and intervene on the situation. Victims of domestic violence are also assisted by the police officers when they report the abuse. The perpetrators are booked and an arrest is made. Furthermore, the police officers facilitate the victims to advance the matter to the court of law. Another support available for the victim of domestic violence is the intervention by the family members. They attempt to have a dialogue between the perpetrator and the victims to find a solution for the misdeeds that have taken place with the family. Lastly, children of women exposed to domestic violence, can take to shelter homes to keep them away from the perpetrators. There are also vocational training centres available within the community which offer skills to the victims of domestic violence to empower them to be self-reliant. Objective two: Determining the effectiveness of therapy in dealing with domestic violence survivors:

CBT as applied to the clients who got therapy, was seen to reduce the levels of anxiety and depressions gradually, depending on how the clients were using the coping skills they acquired during the session which they received on weekly basis. The survivors of domestic violence who received therapy consistently show the levels of anxiety and depression gradually went down. Those survivors who were not consistent the levels of anxiety and depression remained very high all through. The latter group continued having issues with the perpetrators because they had no coping mechanisms, as compared to the survivors who were regularly attending therapy and had learnt coping mechanisms. Therapy is seen to work when clients report that they are no longer prone to being victims of abuse as they have learnt problem solving skills as well

as proper communication skills. Furthermore, the survivors during therapy learnt to be on their own, being self-reliant, and eventually got skills and motivation to start their own business and be independent, so as not to ask for money from perpetrators.

5.0 Conclusion, summary and recommendations

5.1 Conclusion

From the field what came out is that there are various types of domestic violence as seen also in the literature review. These include physical assault, sexual assault, psychological and emotional assault, economical/financial coercion, verbal abuse and neglect abuse were high. Majority of the respondents cited women and children to be the ones who affected mostly by domestic violence. Most of the perpetrators are the men who often molest women, young girls and boys. Domestic violence is triggered by various factors within the society which can be avoided if there is proper coping skills. Where there is no intervention, domestic violence has severe negative impact on to the victims. The consequences of these impacts are fatal sometimes leading to cases of death, homicide, or psychological trauma and from social economic point of view, some families are disintegrated and end up into sheer poverty. From the research, the victims of domestic violence who have learnt coping skills through Cognitive behavior Therapy, are empowered to deal with future occurrence of domestic violence.

5.2 Summary

5.2.1 Establishing the factors associated with occurrences of domestic violence

From the research study, several factors contribute to occurrence of domestic violence such as the level of education, marital status household income, cultural expectations, previous abuses, stress, use of alcohol and other drugs, infidelity, financial problems, poor problem solving skills and poor communication skills. To begin, with women with no or little education did not seek for help from health facilities unless their case was severe. Such women went to the hospital when they had been severely hurt by their partners. The study found that domestic violence cut across the academic achievement. In other words, it affects both the learned and those with little or no education at all. On the contrary, women who were well informed in terms of education that is, the secondary and university level went to health facilities seeking for help immediately when they sighted signs of domestic violence and when they started experiencing symptoms of depression.

Marital status was seen to be associated with domestic violence depending on if the client is single, married, separated, cohabiting, divorced or widowed. The study shows that those women who are married and staying with their husbands are the ones who face domestic violence more than the other marital statuses which justifies the definition of domestic violence. Women who were single faced domestic violence especially from their ex-boyfriends who were still following them, stalking and terrorising them. Separated women faced challenges too because the children were asking about their dad hence they were torn apart whether to go back to the same person who had victimized them or to sojourn with life as if that man never crossed their path. Women who were cohabiting faced similar assaults like those women who were married although for them, they lived in constant fear of what will happen the next day. Divorced women reported

to have faced domestic violence from their partners especially when it came to the family inheritance and the custodian of the children.

The finding shows that domestic violence cut across all levels of economic status. Domestic violence does not know if you have high income or low income. The research found out that those who had high income some of them were separated or divorced and had children, their household income suffered stress because they tried to take care of their children. Furthermore, those women who earned higher salaries than their husband faced domestic violence especially in the case where the husband had lost the job or was doing shoddy jobs such as motorbike riders, casual labourers to mention a few. These men wanted to assert themselves and the only way to do this was to inflict pain to their wives. Low income earners had high issues of domestic violence because they struggle to make heads meet in their daily chores. It was noticed that domestic violence was prevalent among the housewives who stayed at home to look after their children while the husband was out there looking for daily bread. These women were ill-treated by their partners who saw them as a burden and desperate women who stayed with their husbands because they could not sustain themselves.

Moving on further, cultural expectations are causes of conflicts in the families. This is because of the distribution of roles, whereby the women are expected to do most of the chores in the family such as cooking, washing, taking care of animals etc. while the husband is expected to be the breadwinner. Therefore, in the case when the husband is irresponsible and neglects the expected gender roles, which are taken over by the wife, violence has been seen to occur because the husband wants to assert himself as the head of the family. Furthermore, there is a misconception by some men who think that when they slap their wives or call them names and put-downs, it is a sign of dominance and control.

Alcohol and other drugs, are factors which often trigger domestic violence. This is because the perpetrators develop impaired thinking, loss of inhibitions, become addicted and dependent on these drugs. This leads them to mistreat their partners because of lack of self-control. In addition, the perpetrators who are into binge drinking, have not only neglected their responsibilities but also taken and sold items from the house such as TV, radio, cell phones, furniture, bicycles, cooking pots, farm produce and misusing the household income so that they can maintain their drinking habits.

Stress triggers and causes of domestic violence especially when the perpetrator is overstretched by the demands and feel limited to those needs of the family in terms of finance, time, and work experiences, they are quick to react negatively and be irritated by the smallest actions their partners did or did not do to them, which eventually erupts as violence in the family.

Poor problem solving skills is another factor which trigger domestic violence. On the case of partners who have poor problem solving skills it is as a result of negative attitude towards each other, misinterpretations of the partners' behaviour and irrational thinking. Communication skills is closely related to problem solving skills, as it is a tool of solving problems. For example, when one of the partners has poor listening skills, impatient, as well as having poor understanding of the issue at hand. Misinterpretations occurs during the conversations, which eventually lead to a response which is not expected or appropriate, this leads to domestic violence. In addition, the tone of voice which is arrogant or demeaning, the body language and

nonverbal expressions which are not appropriate, as well as the timing of the conversation, are catalysts for poor communication skills.

From the research findings, infidelity is a trigger of domestic violence, especially when the victim inquires about the recent discoveries/ knowing that the perpetrator is unfaithful. The victim could have checked the contacts which the perpetrator was making with other women/men on phone, email, or the victim was given an alert by neighbours about the illicit relationship the perpetrator was having. Therefore, when the victim ask about this issue, the perpetrator becomes violent. In addition, the perpetrator who is unfaithful suspects the victim is also unfaithful, therefore, they stalk and control them inappropriately.

The last but not the least factor associated with domestic violence is financial issues. Often when the victim is not financially empowered and dependent to the perpetrator, the mere statement of asking for money sparks quarrels and disagreement. Even when they are given the money, they are expected to account how they used it. In the event that they are not able to account for each and every penny or used the money in another way, they are assaulted physically, psychologically and verbally abused.

5.2.3 Exploring factors influencing or blocking effectiveness of therapy

From the research findings, there are several factors which were identified as preventing therapy from working on the survivors of domestic violence. Firstly, the victims of domestic of violence do not immediately recognize the indicators of violence and interpret them appropriately on time and take quick actions to seek therapy before violence escalate into a worse situation. Therefore, when such victims of domestic violence go to seek therapy, the levels of stress, anxiety, depression, and other psychological disturbances are high making therapy difficult and extending the duration for therapy much longer.

Secondly, some of the victims have poor skills of internalizing the psycho-education they are given during therapy. Therefore, despite the effort of the counsellor to equip the victims with coping skills, some victims do not practice what they were taught by the therapist. This as well, make therapy a challenge to such victims who eventually take longer time to recover.

Thirdly, some clients despite the willingness to go for therapy, they lack financial support. The availability of funds could facilitate their ability to attend the session for therapy as required. Furthermore, lack of funds needed to cater for counselling fee by a professional counsellors, and other expenses which may be incurred. These financial constraints hinders the victims from attending therapy sessions regularly or they give up from seeking therapy all together.

Fourthly, therapy is not effective when the victim still remains in the same abusive environment during and after therapy. This is because the perpetrator will most likely continue abusing the victim. This will affect the efficacy of therapy working on time for the victim. A situation which forces many victims to opt for separation and divorce.

Other factors which interfere with therapy could be unfinished business, use of alcohol and other drugs and personality traits. Unfinished business could be when the victim and the perpetrator are struggling for example, with court cases on separation and divorce. These delays how therapy work fast and best to victim. The victims who had resulted to alcohol and other drugs without first going for rehabilitation program, the

therapy from the counsellor attending on domestic violence is delayed or does not work at all, because the victim need to be rehabilitated first on drug addiction.

Lastly, researcher found that many behavioral disorders, such as schizophrenia, clinical depression or bipolar disorder have a genetic basis, but that doesn't mean everyone who inherits the gene develops the illness. Children with one parent with schizophrenia also develop schizophrenic symptoms, which means restructuring the personality is difficult and most often takes long period of therapy. Sometimes it is difficult to attend to victims of domestic violence who have such kinds of personality disorders making therapy very difficult.

However, the effectiveness of therapy is facilitated by factors such as: Extra-therapeutic Client Factors which include the client's personal strengths, weaknesses and other characteristics including beliefs and attitudes; and also factors in the client's environment that help. Secondly the therapist effort to identify and talk about strengths while helping client to deal with weaknesses. Thirdly the therapist should tailor solutions to client's beliefs and values. Fourthly the therapeutic relationship marked with the core conditions of empathy, warmth, acceptance which are perceived by client. In this case the therapist should be warm and empathic and address issues the client wants to deal with that is, work with the client's goals rather than those of the therapist's theoretical model. Fifthly, the Realistic hope on the part of the victim of domestic violence about the success and the possibility of improvement of their situation they are going through. Therefore, therapy will be effective when the therapist communicates hopefulness about what can be achieved. Lastly, the model of counselling contributes to the effectiveness of therapy for the victims facing domestic violence. It is important for the therapist to use the right approach for the particular client and situation. The approach should be tailored to the client's needs, beliefs and strengths. (Morawetz, 2006). Therefore, this means that the therapists should be willing to change their usual approach or model to suit the needs of the client on the day of each therapy. Where group support is necessary or individual counselling is effective, it should be the therapist to choose appropriately for the victim experiencing domestic violence.

5.3 Recommendations

1. There is a need for preventive, protective, and redress mechanisms to guard against violence against women and girls from various forms of domestic violence, in Kenya and other parts of the world.
2. There is need to create awareness to the society on the effects of domestic violence and how it can be prevented through effective lifeskills and coping mechanisms.
3. Therapists should be empowered financially by the Government and other stakeholders to attend to survivors of domestic violence without charging the survivors for services provided.
4. The government of Kenya, County government, NGO's, and CBOs, should come up with economic empowerment policies to support women and girls faced with domestic violence to enable them to be self-reliant.
5. There is need for more research in this field of violence against women and girls, to find out what should be done to prevent the situation from increasing. This is due to the changes seen in

the society today as a result of technology, social media, and the changing gender roles and cultural expectations.

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Textual Enhancement, Input Processing and Presentation-Practice-Production in College English Grammar Teaching in China

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Abstract

Based on the input processing theory and output hypothesis in Second Language Acquisition, and employing quantitative and qualitative methods, this study investigates the effects of Textual Enhancement (TE), Input Processing Instruction (PI) and Presentation-Practice-Production (3P), and tries to compare the initial learning and retention effect on the acquisition of unreal conditionals in Chinese college English classrooms. The research findings are as follows: 1) Both PI and 3P are effective. TE is effective in initial learning but falls short for retention effect. There is significant difference between the TE, PI and 3P groups. 2) In initial learning, 3P has the best effect based on learners' mean score, followed by PI and TE, but there is no significant difference between PI and 3P. There is significant difference between 3P and TE, PI and 3P. 3) With regard to the retention effect, 3P and PI work better than TE. And there is no significant difference between 3P and PI. The research findings indicate that explicit explanation about language structures plays an effective and necessary role in English learning in the Chinese context. English teachers are suggested to involve the learners with grammar through meaningful activities such as structured input activities.

Key words: College English; Grammar Instruction; Textual Enhancement; Input Processing Instruction; Presentation-Practice-Production

1. Introduction

Grammar teaching has always been controversial in second language acquisition. Meanwhile different grammar teaching methods were brought into China, such as Grammar Translation Method, audio-lingual method, immersion, etc. In the late 20th century, communicative language teaching was brought into China and so many researchers and English teachers became crazy about it. Therefore, grammar teaching was downplayed due to their overemphasis on comprehensible input. So researchers and English teachers began to think about the grammatical accuracy in communicative classes.

Krashen (1982) put forward “comprehensible input hypothesis” and used “i” to refer to the students' current language ability and the next state is “i+1”. Students move from “i” to “i+1” only by understanding a large amount of natural comprehensible input. Some researchers hold different opinions. Ellis (1994) argued that formal instruction is helpful for students to acquire second language. An increasing number of empirical studies have proved the positive effects of explicit grammar instruction (e.g., Long, 1991; Ellis, 2001; Doughty and Williams, 1998). In recent years, it has been widely acknowledged that formal instruction plays an important role in grammar acquisition, especially for second language learners (Ellis, 2002). The primary concern has now shifted to finding out more effective methods of formal instruction.

Schmidt (1990) believed that only when the learners consciously notice the form in input while comprehending the meaning can they acquire the language. On the basis of Noticing Hypothesis,

Sharwood-Smith (1993: 165) put forward the term “enhanced input” and argued that meaning-based activities in the target language alone might not enable learners to find relevant input language features, thus it will be helpful to employ some techniques of input enhancement to make them salient and invite noticing.

While VanPatten began to explore how instruction promoted learning, he argued that if we know how learners process input, the instruction can be aimed at improving processing efficiency (Nie, 2012: 10). VanPatten’s Input Processing Theory tries to combine formal instruction about grammar and inappropriate processing strategies with structured input activities consisting of referential and affective activities. These structured input activities are designed to help learners to make connections between form and meaning. In recent years, some researchers started to compare the learning effects of traditional grammar teaching and input processing teaching.

But in real English grammar classes, most English teachers follow three steps: presentation, practice and production. In the first step, the teacher shows the language points or sentence structures in order to assist students in mastering the declarative knowledge, thus help them have an overview of the grammar structures. Practicing what they have learned can deepen the understanding of the declarative knowledge and promote the transition from declarative knowledge to procedural knowledge. In production, the students may try to express what they want by using what they’ve learned. This 3P teaching method is the most widely studied and applied in the second and foreign language teaching. The main problem lies in the gap between it and real communication.

Up to now, most researches focused only on the input processing or comparing the effects of traditional teaching and input processing. Few researchers paid attention to input enhancement, a rather implicit way of teaching grammar. But enhanced input is easy to carry out in reading classes and has turned out to be effective in vocabulary acquisition. So the comparative study on input enhancement, input processing and 3P would provide teachers and students with new ways to look at grammar teaching.

2. Literature Review

This section first introduces Sharwood-Smith’s Input Enhancement (IE), VanPatten’s Input Processing Instruction (PI) and the 3P teaching method. Then, previous empirical studies of the effects of IE, PI and 3P will be reviewed.

2.1 Enhanced Input

Researchers and English teachers have been thinking about better ways to teach English grammar. Long (1998: 15) first put forward “Focus on Form” (FOF), i.e., drawing students’ attention to linguistic elements such as words, collocations and grammatical structures while focusing on meaning. During this process, “noticing” plays an important role. Cognitive psychologists think “noticing” is necessary to turn “input” into “intake”. Schmidt (1990) first proposed the noticing hypothesis, which suggests that second language learners could not begin to acquire a language feature until they had become aware of it in the input. Sharwood-Smith (1993) argued that meaning-based activities in the target language alone might not enable learners to acquire relevant input features, thus employing some form of input enhancement to make input salient and encourage noticing is necessary.

Sharwood-Smith (1991) first coined the term “Input Enhancement”, which refers to teachers’ attempts to make the target structures in L2 input more salient to draw learners’ attention to these language features so that it can be easily acquired. Sharwood-Smith argued that teaching of language form not only includes metalinguistic explanation of language rules and recitation but also some other implicit ways to draw

students' attention, such as textual enhancement.

Textual enhancement, also known as written or visual input enhancement, is one of the most implicit input enhancement techniques. Its main characteristic is to draw learner's attention to linguistic features by modifying the physical appearance of written texts. The target structures are usually in bold, underlined, italicized, or written in capital letters. The hypothesis is on the assumption that these techniques would lead the learners to noticing the specific features as they read the texts. This thesis focuses on "textual enhancement" as a form of "input enhancement".

2.2 Input Processing Theory and Input Processing Instruction

In the 1990s, VanPatten put forward the input processing model. In his opinion, processing refers to making connections between form and meaning. In other words, making form-meaning/function connections in real communication is what processing pursues. See Figure 1 for the model.

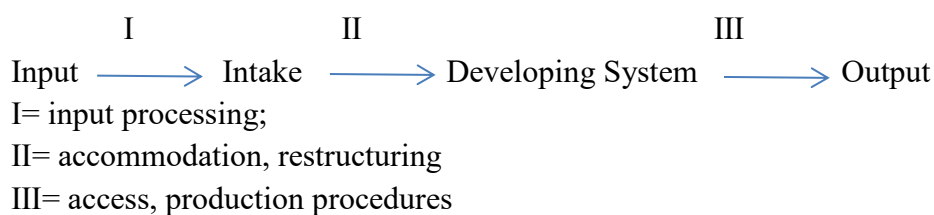


Figure 1. Processes in L2 Acquisition (VanPatten and Caderino, 1993a: 228)

VanPatten describes his model as follows: input gives the data; input processing makes data available for acquisition; other mental mechanisms classify and restore the data into the system which is always along with restructure and generation, and makes learners communicators and, again, may help them become better processors of input.

Based on the above model, VanPatten proposed another grammar instruction method-Input Processing Instruction, which is a psycholinguistic motivated focus on form that is an adjunct to communicative language teaching and/or to comprehension-based approaches (VanPatten, 1996: 10). The aim of Input Processing Instruction is to alter the inappropriate strategies for making form-meaning connections that learners take to the task of acquisition".

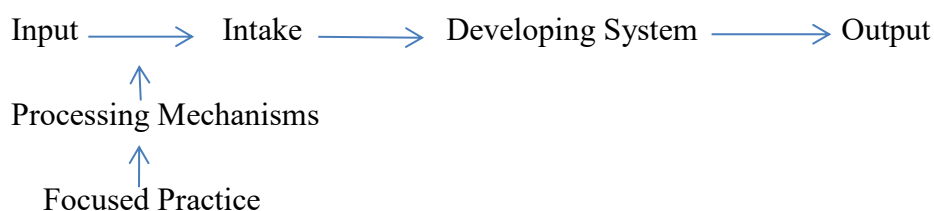


Figure 2. Input Processing Instruction (based on VanPatten, 1996)

The model in Figure 2 focuses on the process of conversion from input to intake. Learners are guided to abandon their default processing strategies for more optimal ones so that they would make better form-meaning connections (Wong, 2004). VanPatten (1996) further explained the three components of processing instruction.

Processing Instruction consists of three main components: the first component is the explicit information about the target language form in their native language. The second component is the information about

processing strategies, which may exert negative effects on learners choosing incorrect form-meaning mappings. The third component of Processing Instruction, Structured Input (SI), consists of referential and affective activities which are delicately designed to push learners to actively process the target form and try to connect the form to its function.

2.3 Output Hypothesis and 3P Teaching Method

The 3P grammar teaching method is based on Swain's Output Hypothesis. This section reviews the Output Hypothesis and the 3P grammar teaching method.

Krashen's input hypothesis was challenged by Swain who advocates the Comprehensible Output Hypothesis that learners should be given more opportunities to engage in language production. See Figure 3 for the model.

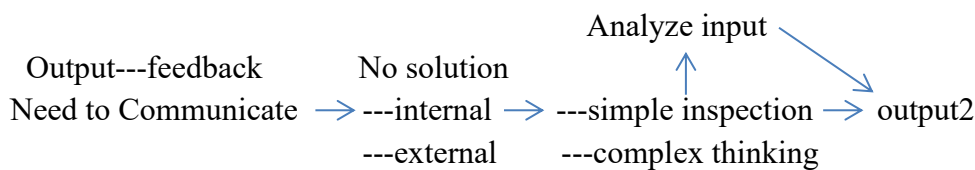


Figure 3. Output and L2 learning (from Swain, 1995)

Figure 3 shows that as the learner enters the stage of language production, he or she may notice the deviant forms in his output from the feedback. Here the feedback includes internal and external feedback. Internal feedback refers to learners' own reflection on their language use while external feedback refers to the correction from others, such as teachers and classmates. Then he begins to think about and reflect his deviant form by simple inspection and complex thinking. After this, if the learner still cannot come up with the correct form, then he/she would refer to the input to look for the relevant information. After that, the learner would reconstruct the form and produce a new output.

The 3P teaching method pays more attention to learners' output. VanPatten (2000: 45) defined traditional teaching method as "explanation plus output practices that move learners from mechanical to communicative skills". The process of traditional grammar teaching was explained by VanPatten (see Figure 4).

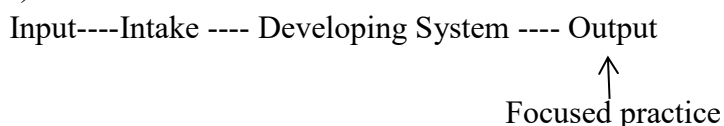


Figure 4. Traditional Grammar Instruction (VanPatten, 1993; 1996)

Figure 4 shows that different from Input Processing Instruction which puts focused practice between input and intake, traditional approach puts focused practice between developing system and output. The 3P teaching method requires learners to do exercise after presentation and explanation (Ellis, 2006).

The 3P Instruction consists of presentation, practice, and production. Presentation begins with explicit explanation of the target grammatical form followed by the examples of the usage of the target form. In the stage of practice, learners do drills and controlled practice and perform in a virtual scene. The stage of production is to build skills. In 3P teaching classes, learners produce the target language based on his or her grammar knowledge not impelled by the real communicative needs. It is still teacher-centered, ignoring students' initiative and students' real communication needs. However, the 3P grammar teaching method is widely used in English classes in China.

2.4 Previous Studies of EI, PI and 3P

Previous studies of EI, PI and 3P will be reviewed in this section. First, let's have a look at studies of EI. Shook (1994), Alanen (1995), Wong (2002) and Jahan and Kormos (2015) examined whether textual enhancement is useful to attract students' attention and promote language acquisition. Shook (1994) studied the acquisition of Spanish present perfect and relative pronoun by English-speaking college freshmen and sophomores in regular and intensive classes aged from 18 to 19. The results indicate that the Textual Enhancement group performed better. Jourdenais et al. (1995) and Doughty (1998) also got the same conclusion. White (1998) examined the acquisition of possessive determiners by French-speaking learners in intensive ESL classes aged 11 to 12. She found that learners made more progress when they were given a simple rule and then worked together to find the correct form to complete stories that had blanks to which the possessive determiners belonged. Izumi (2002) conducted the same experiment to adult EFL students from different language backgrounds to test the learning effect of the relative clause in English, and found that the students in the TE condition did notice the target form, but failed to acquire the target form correctly. Overstreet's (1998) study with fifty adults also found no positive effects of TE on learning preterit and imperfect in Spanish. Wong (2003) examined how TE affects the acquisition of past participle agreement in relative clause in French and found that students in the TE condition showed no special performance on error correction task. Leow's three studies (1997, 2001; Leow et al., 2003) did not show positive effects of TE on grammar learning.

In China, researches on Textual Enhancement mainly focus on four aspects: acquisition of vocabulary, acquisition of grammar in reading, a comparison of different techniques of input enhancement, and the relationship between attention and textual enhancement. Wang (2011) carried out a study on textual enhancement on the acquisition of passive voice by senior high school students and proved the positive effect of textual enhancement. Wang (2013) conducted an empirical study about textual enhancement on the acquisition of unreal conditionals and found that textual enhancement can draw learners' attention to the target structures and can promote grammar acquisition in a short term, while textual enhancement with explicit explanation had the best learning effect. Pan (2015) tried to compare the effect of textual enhancement and output in facilitating the noticing and acquisition of subjunctive mood and found that textual enhancement was effective to draw students' attention to the target language structure but cannot promote the acquisition of the target structure. From the above, we can see that enhanced input, a way to raise learners' attention to language form, has attracted many scholars. Early studies not only elaborated the necessities of enhanced input in theory, but also provided various kinds of methods in practice. Scholars have conducted empirical studies to demonstrate and compare different ways of enhanced input, but the research findings are sparse, still holding doubt about the effectiveness of enhanced input. Therefore, further studies on the effects of enhanced input on learners' development of interlanguage are needed. Furthermore, the effects of enhanced input on College English Grammar learning in China have not been studied.

Next, let's have a look at studies of PI vs 3P.

VanPatten and Cadierno (1993a) compared Input Processing Instruction and output-based traditional grammar instruction. After that, a lot of studies have sprung up and tried to find out the effects of Input Processing Instruction compared with traditional or meaningful output-based instruction. VanPatten and Cadierno (1993b) examined the effect of Input Processing Instruction and Meaningful Output-based Instruction on the acquisition of direct object pronouns in Spanish. The results showed that Input Processing Instruction is more effective than Meaningful Output-based Instruction on grammar acquisition. VanPatten and Wong (2004) replicated the study of VanPatten and Cadierno (1993b) and tried to examine the effect of Input Processing Instruction and Meaningful Output-based Instruction on grammar acquisition. The

results confirmed the findings of VanPatten and Cadierno (1993b). Farley (2001a) examined the effects of processing instruction and meaning-based output instruction on the acquisition of the Spanish subjunctive of doubt. Results revealed that the former had an overall better effect than the latter on learners' interpretation and production of the present tense Spanish subjunctive. Benati (2001) investigated the possible effects of two types of form-focused instruction, i.e., processing instruction and output-based grammar instruction, on the acquisition of a specific feature of the Italian future tense. The results showed that processing instruction was effective on the learning of Italian verbal morphology, and was better than output-based instruction for L2 beginners. Benati (2005) investigated the effects of processing instruction, traditional instruction and meaning-based output instruction on the acquisition of the English past simple tense. The results showed that processing instruction had positive effects on the processing and acquisition of the target feature.

Other studies showed no significant difference between PI and TI, e.g., Farley (2001b), Buck (2006), Lee and Benati (2007a, 2007b), Qin (2008), Keating & Farley (2008) and Toth (2006). Although dozens of studies have been conducted to compare the learning effects of PI and TI in the past twenty years in western countries, there were no conclusive findings.

Chinese scholars also studied the learning effects of PI and TI. Wu (2008) compared the effects of PI and TI treatment using subjunctive as the target language structure. The results indicate that PI is better than TI in comprehension and output of target language structure, although TI can also promote learners' comprehension and production. The study of PI and 3P on the acquisition of relative clause by Wang (2009) involved 60 college students majoring in business English. The results showed that the two instructions can benefit the acquisition of relative clause. PI worked better than TI in comprehension, while TI outperformed PI in production. TI can help learners transform declarative knowledge to procedural knowledge whereas the effects of PI are not so significant. Wang (2015) carried out a comparative study of 3P and PI in acquiring the English subjunctive mood and found that: firstly, PI is superior to 3P in promoting comprehension. Secondly, the effect of 3P remains longer than that of PI in production. Thirdly, 3P may promote comprehension and production.

Based on the above, dozens of studies on TE, PI and 3P have been conducted, examining the acquisition of at least 10 structures in at least 5 languages. Almost all of these studies have provided data on learning outcomes through both interpretation and production tests. The designs are various: some have compared PI with a form of instruction that includes practice in production (variably labeled TI), meaningful output-based instruction, communicative output, or dictogloss); others have compared PI with EI or PI with affective activities.

There were only a few studies on College English grammar teaching and learning in China. And few researchers carried out studies to compare the effects of TE, PI and 3P. Also, few studies pay attention to both the initial learning and retention effect of grammar acquisition. The present study compares the effects of TE, PI and 3P in College English grammar teaching in China, which, to a certain degree, fills the gap.

3. Research Methodology

This section introduces research questions, participants, the target structure, experiment procedures, treatment and materials, testing instruments, scoring and data analysis.

3.1 Research Questions

This study is guided by the following research questions: 1) Do TE, PI and 3P facilitate the acquisition of

unreal conditionals by Chinese college EFL learners? 2) In the initial learning, which (TE, PI or 3P) has the best effect on the target structure? 3) Which (TE, PI or 3P) has the best retention effect on the target structure?

3.2 Participants

The participants are from a university in Nanjing. Their age ranges from 20 to 24 with the same first language background. The students are from three intact classes, i.e., Class A (35 students), Class B (32 students), and Class C (34 students). Class A received TE treatment; Class B received PI instruction; Class C received 3P grammar teaching. The three classes had the same teaching process and were taught by the author as the English teacher.

3.3 Experiment Procedures

The present study is quasi-experimental with a pre-test, treatment, immediate post-test and delayed post-test design. First, the participants were asked to take the pre-test one week before the treatment in order that all the participants of the study were initially homogeneous with regard to their knowledge of unreal conditionals. Afterwards, the students in the three different groups received their corresponding teaching methods about the same language structure so that they could have a better understanding of unreal conditionals. The instructions were delivered during the regular class time, and lasted for 40 minutes for each group. In the TE group, the learners were provided with two reading materials involving bold and underlined unreal conditional structures along with some related reading comprehension tasks. There was no explicit rule explanation. The PI group received explicit rule explanation about inappropriate learning strategies that students easily commit and structured input activities including the referential and affective tasks. The teaching of 3P group followed the pattern of presentation, practice and production. At the end of the treatment, the immediate post-tests were adopted in the three groups in order to assess initial learning effects of the treatments on the participants' unreal conditionals knowledge development and explore the possible differences among them. One week later delayed post-tests were administered to examine the retention of the target structure in learners' mind. The immediate and delayed post-tests lasted for 30 minutes. All data were collected over a period of one month.

4. Research Results and Discussion

153 students in the three classes participated in the study. First, students who scored more than 50% of the full score in the pre-test were excluded. Descriptive statistics and One-way ANOVA were carried out on the pre-test score to prove that there were no significant differences among the three groups. In other words, students in the three groups have similar academic level. After the selection by pre-test, 101 students in total were involved in the treatment, post-tests and delayed post-tests. The research results are reported in the following sections according to the research questions. SPSS19 was used to calculate descriptive statistics. One-way ANOVA and Post Hoc Analysis were carried out to reveal the differences in the immediate post-test and delayed post-test.

4.1 Research Results

Table 1 shows the mean scores of the three groups which demonstrated that there were no significant differences of the mean scores among the three groups in the pre-tests.

Table 1. Mean scores of the three groups in the pre-test

Groups	N	Mean	SD
TE	35	15.03	2.606
PI	32	14.81	3.01
3P	34	15.03	2.691

In order to show differences among three groups before the treatment, One-way ANOVA was carried out on the pre-test scores of three groups, See Table 2 for the results.

Table 2. One-way ANOVA for pre-test scores

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	6.096	2	3.048	.345	.711
Within Groups	282.875	32	8.840		
Total	288.971	34			

Table 2 demonstrates that there were no significant differences among the groups before the treatment ($F(2, 32) = .345$, $p > .05 = .711$). Therefore, it proves the homogeneity of the students' simple unreal conditionals background knowledge.

4.1.1 The Overall Learning Effects of TE, PI and 3P

In order to answer the first research question which investigates the short and long term effects of TE, PI and 3P grammar teaching method on the learners' grammar acquisition, paired-samples T-Test was used to compare the differences of students' academic scores among pre-test, post-test and delayed post-test for each teaching method. For 3P and PI, the differences before and after the treatment were significant ($p = .000 < .05$); but there was no significant improvement in the TE condition. That is to say, the students in the 3P and PI groups had better performance than those in the TE group ($p = .000 < .05$) in both immediate and delayed post-tests. PI and 3P were proved effective on the acquisition of unreal conditionals in both short and long terms. As for TE, students really made progress in the short term, but there was no significant progress in the long term.

First, the researcher used three paired-samples T-tests to compare the students' performance on the pre-test, immediate post-test and delayed post-test of the TE group. See Table 3 for the results.

Table 3. Paired Samples Test for the TE Group

TE Group	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Pre-test-Immediate	-3.171	3.249	.549	-5.774	34	.000
Immediate-Delayed	1.857	2.499	.422	4.397	34	.000
Pre-test-Delayed	-1.314	3.848	.650	-2.020	34	.51

Table 3 shows that the TE group's mean score in the post-test ($M = 18.20$, $SD = 2.826$) is much higher than that in the pre-test ($M = 15.03$, $SD = 2.606$). There is significant difference between post-test and pre-test

($p=.000<.05$). In other words, after reading two passages with bold and underlined target structures, the students acquire some knowledge about the use of the target structure by self-observation without formal instruction. One week after the TE treatment, the students were asked to take the delayed post-test to examine the retention effect. The mean score is 16.34, which is lower than the immediate post-test but slightly higher than the pre-test. There is no significant difference between pre-test and delayed post-test ($p=.51>.05$), which indicates that learners in the TE group neither improved nor declined. But there was a slight increase on the mean score from pre-test to the delayed post-test. In sum, there was a statistically significant increase in grammar scores between pre-test ($M=15.03$, $SD=2.606$) and Immediate post-test ($M=18.20$, $SD=2.826$), $t(34)=-5.774$, $p<.05$ (two-tailed) and between immediate and delayed post-tests ($M=16.34$, $SD=3.124$), $t(34)=4.397$, $p<.05$ (two-tailed). There was no significant difference from pre-test to delayed post-test in the TE group ($t(34)=-2.020$, $p=.51>.05$).

Tables 4 and 5 show the results of the PI and 3P groups.

Table 4. Paired Samples Test for the PI Group

PI Group	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Pre-test-Immediate	-9.344	3.033	.536	-17.426	31	.000
Immediate-Delayed	2.469	2.527	.447	5.526	31	.000
Pre-test-Delayed	-6.875	3.900	.689	-9.972	31	.000

Table 5. Paired Samples Test for the 3P Group

3P Group	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Pre-test-Immediate	-10.206	3.875	.665	-15.357	33	.000
Immediate-Delayed	2.971	4.152	.712	4.172	33	.000
Pre-test-Delayed	-7.235	4.171	.715	-10.115	33	.000

Tables 4 and 5 show significant progress the students in the PI and 3P groups made on the learning of the target language structure. The differences between the pre-tests and the immediate post-tests and also pre-tests and delayed post-tests means of the 3P and PI groups are significant at the 0.000 level ($p<.05$). There was a big increase in grammar scores of the PI group from pre-test ($M=14.81$, $SD=3.01$) to the immediate post-test ($M=24.16$, $SD=2.864$), $t(31)=-17.426$, $p<.0005$ (two-tailed), and to the delayed post-test ($M=21.69$, $SD=3.031$), $t(31)=-9.972$, $p<.0005$ (two-tailed). There was also a significant increase in grammar scores of the 3P group from pre-test ($M=15.03$, $SD=2.691$) to immediate post-test ($M=25.24$, $SD=2.934$), $t(33)=4.172$, $p=.000<.05$ (two-tailed), and to delayed post-test ($M=22.26$, $SD=3.387$), $t(33)=-10.115$.

In the PI and 3P groups, although the learners forgot some grammatical points they had learned in the delayed post-test, the statistically significant difference between their pre-test and delayed post-test scores prove that both had durable effects. In other words, PI and 3P teaching methods demonstrate their long term effect.

In sum, the statistical results show the effectiveness of the TE approach in improving learners' knowledge of grammar in a short term but not in a long term, while the PI and 3P teaching methods are effective in

both short and long terms.

4.1.2 Initial Learning Effect of TE, PI and 3P

In order to answer the second research question “in the initial learning, of the three instructions, which has the best effect on the target structure?”, One-way ANOVA and Post hoc Analysis were used to compare the immediate post-test results of the TE, PI and 3P groups. See Tables 6 and 7 for the figures.

Table 6. One-way ANOVA on the Immediate Post-test

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	989.113	2	494.557	59.840	.000
Within Groups	809.936	98	8.265		
Total	1799.050	100			

Table 7. Post Hoc Test for Three Groups

Group	Mean difference(I-J)	Std Error	Sig	95% Confidence interval	
				Lower Bound	Upper Bound
3P	-7.035*	.692	.000	-8.72	-5.35
PI	-5.956*	.703	.000	-7.67	-4.24
TE	7.035*	.692	.000	5.35	8.72
PI	1.079	.708	.392	-.65	2.80
TE	5.956*	.703	.000	4.24	7.67
3P	-1.079	.708	.392	-2.80	.65

Tables 6 and 7 show that there was significant difference between TE and 3P group, TE and PI group in the immediate post-test but no significant difference between 3P and PI group in the immediate post-test. Students in the PI and 3P groups outperformed those in the TE group on the grammar scores in the immediate post-test. Both the 3P and PI groups had significant gains on grammar scores. The mean score of the 3P group ($M=25.24$, $SD=2.934$) was slightly higher than that of the PI group ($M=24.16$, $SD=2.864$). But paired samples Test proved that there was no significant difference between the 3P and PI groups in the immediate post-tests. In other words, the PI group performed as well as the 3P group on the immediate post-test. That is to say, for initial learning effect, PI and 3P were better than TE.

4.1.3 Retention Learning Effect of TE, PI and 3P

In order to answer the third research question “of the three methods, which has the best retention effect on the target structure?”, One-way ANOVA and Post hoc Analysis were used to compare the delayed post-test results of the TE, PI and 3P groups. See Tables 8 and 9 for the figures.

Table 8. One-way ANOVA on the Delayed Post-test

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	733.533	2	366.766	36.110	.000
Within Groups	995.378	98	10.157		
Total	1728.911	100			

Table 9. Post Hoc Test for the Three Groups

Group	Mean difference(I-J)	Std Error	Sig	95% Confidence interval	
				Lower Bound	Upper Bound
3P	-5.922	.767	.000	-7.79	-4.05
PI	-5.345	.779	.000	-7.24	-3.45
TE	5.922	.767	.000	4.05	7.79
PI	.577	.785	1.000	-1.33	2.49
TE	5.345	.779	.000	3.45	7.24
3P	-.577	.785	1.000	-2.49	1.33

Tables 8 and 9 show that the mean score of the TE group on the delayed post-test was 16.34; for 3P group, it was 22.26; for PI group, it was 21.69. The results indicate that the 3P and PI groups' scores were significantly higher than the TE group. However, a significant difference was not observed between the 3P and PI groups. In other words, students in the 3P and PI groups performed better than those in the TE group on the learning of the target structure. It proved that PI and 3P were better than TE in the effect of retention learning.

4.2 Discussion

Based on the results, learners in the PI and 3P groups largely benefit from the treatments in the experiments. There was evident increase on learners' scores from pre-test ($M=15.03$) to the immediate post-test ($M=24.16$) and to the delayed post-test ($M=21.69$) in the PI group. This is also the case for the 3P group, from pre-test ($M=15.03$) to the immediate test ($M=24.16$) and to the delayed post-test ($M=21.69$). As for TE, there was significant difference between the pre-test and post-test whereas the difference between pre-test and delayed post-test was not significant. In other words, TE is effective in a short term, but not in a long term.

Compared with the PI and 3P groups, the TE group shows a significant difference, i.e., lower than the PI and 3P groups. The findings show that TE can promote learners' acquisition of grammar but plays a very limited role, especially compared with 3P and PI.

The findings of TE collaborate with White (1998), which proved the ineffectiveness of textual enhancement grammar teaching in the ESL/EFL learning context. The findings also support a number of studies which claimed TE had no facilitative effects on grammar learning (e.g., Izumi, 2002; Leow, 2001; Leow et al. 2003; Overstreet, 2002; Wong, 2003). It can be predicted that although textual enhancement could make the target structure salient and attract the learners' attention, it was not salient enough to ensure learners'

acquisition of the target structure. That is to say, textual enhancement just increases the chances of learners' notice of the target structures, but cannot guarantee learners' intake.

However, it is worth mentioning that there was significant difference between the pre-test ($M=15.03$) and the immediate post-test ($M=18.20$) in the TE group. To some degree, the findings are in line with some other studies (Alanen, 1995; Shook, 1994; Doughty and Williams, 1998; Ellis, 2001) which claimed TE's positive effect on grammar acquisition. The results of the present study also respond to Schmidt's (2001) claim that noticing is necessary and effective in language learning.

It is delicate to compare the present study with previous studies, for many factors were involved in these studies. These factors include types of enhanced input, characteristics of target forms, testing instruments, and duration of the treatments, etc. Moreover, important differences can also be found in learners, such as age, language aptitude, learning strategies, previous learning experience, mother tongue, and learner familiarity and readiness for the TE treatment. Some researchers explored the effects of textual enhancement as an independent variable with no other intervening variables (e.g. Jourdenais, 1998, Leow, 2001), while some studies investigated textual enhancement in combination with other variables. The combination with other factors may affect the results of TE treatment. One important difference between the present study and previous ones is that the participants in the present study had a very short period of exposure to the enhanced input. And the teacher did not give students hints to pay attention to the target form, so students' attention to the target form and acquisition were spontaneous without negative effects on their reading comprehension. However, many of the previous studies offered a long period of exposure to the enhanced target forms. Doughty's (1991) study of enhanced input on English relative clauses which proved TE treatment's positive effect on the acquisition of the target form lasted for ten working days. Shook (1994) and Alanen (1995) also confirmed some positive effects of TE on the acquisition of the target language structure. It might be that the lengthier and more intensive treatment would draw the students' attention, hence, strengthen their learning of the target forms, which was not possible for the short-term treatment in the present study. Another difference is the distinctive learning experience of the participants with the target forms and the way of grammar teaching they are used to. The present study does not witness any meaningful effects of TE.

First, the participants had little knowledge about the target language form. Due to the difficulty of the target form, learners seldom meet them in their study. Even when they meet the target form, teachers just translate the sentences for them without detailed explanation. Especially, after the selection of pre-test, the target structures were entirely or relatively new to the students. As Jourdenais (1998: 52) put it, "the implicit nature of the enhancement ... was more likely to be beneficial to learners who already had some initial awareness of the forms and their use". However, in some previous studies, the participants may have learned the target structure before the TE treatment. Even though their prior knowledge of the target forms was not stable, it would be much easier for those participants to recognize and pay more attention to the target structures, hence acquire them.

Second, it was the first time for the participants to come into contact with textual enhancement, so they had no idea about this new technique. Interviews with the learners show that most of them were not aware of textual enhancement and just mistook it for normal reading classes. Only a few top students can notice different unreal conditionals, but it was still difficult for them to figure out in what situation could they use which rule. Average and weak students had difficulties in inducting the grammatical rules by reading.

Textual enhancement, as an implicit teaching method, just provides learners with correct samples of the usage of a certain grammatical rule, so students are lack of judgement about the wrong form. White (1998) found that learners made more progress when they were given a simple rule together with TE treatment. Izumi (2002) found that output tasks were beneficial for learners' grammar acquisition.

Some other factors also constrain the interpretation of the results. First, the lack of a control group is the most obvious one. A control group receiving the same reading materials and tasks without visual salience of the target forms can make it easy to estimate the real effects of the TE treatment.

Significant increase of the mean scores of the target structure from pre-test ($M=15.03$) to the immediate post-test ($M=24.16$) and the delayed post-test ($M=21.69$) happened in the PI group and the 3P group (from pre-test ($M=15.03$) to the immediate post-test ($M=24.16$) and the delayed post-test ($M=21.69$)). There was no significant difference between the PI and 3P groups in the immediate and delayed post-test.

First, the results of the present study confirm the effectiveness of Input Processing Instruction on grammar acquisition, which is in line with the studies of VanPatten (2003) and his colleague (VanPatten and Cadierno 1993a, 1993b). Three components of PI play a vital role. Explicit information (EI) provides the learners with the features and rules of the target form. More importantly, the relationship between form and meaning is overtly explained in EI, especially for some complex language structures. Furthermore, PI adds information about processing strategies which aims to alter learners' default processing strategies. Finally, PI's third component, structured input (SI), consists of activities that are purposefully designed to push learners to actively process the target form and connect the form to its function in the meaning-based input. Referential activities include a series of sentences or phrases and learners have to make the correct choice between different meanings by focusing on the key distinctive features. Affective activity requires learners to express their feelings or opinions towards the content containing the target structures. These elements contribute to the successful learning of the target structures.

The outcomes of comparing the effects between PI and 3P are varied. Some researchers (Farley 2001a; Benati 2005, 2009; VanPatten and Uludag 2012) reported an advantage for the PI group over the 3P or TI group in the post-test of the acquisition of the target language structures. However, other studies (e.g., Buck 2006; Lee and Benati 2007a) yielded no significant difference between PI and TI. Lee (2004) summarized the research results of Input Processing Instruction since 1993 and concluded that: sometimes traditional grammar teaching and meaning-based teaching can perform as well as the Input Processing Instruction. There is a strong tendency for studies with a significant advantage for the PI in comprehension not to show a significant difference in production or TI performing better than PI in production. In the present study, there was no significant difference between the PI and 3P groups.

In view of the differences between the present study and previous studies, some factors can be taken into account, such as the age and aptitude of the learners, specific instruction of the treatments, and the nature of the target structure.

The first factor is the complexity of the target structure, unreal conditionals, and explicit information in PI. Farley (2004) studied the suitability of PI for a structure of higher complexity, targeting the Spanish subjunctive. The results showed that both the PI and SI groups made significant gains, while the PI group made greater gains. This suggests a possible positive effect of explicit information for relatively complex structures and may help referential activities to make form-meaning connection. Previous studies show that explicit information (EI) can be beneficial to grammar acquisition when it is provided regularly, especially with structures of greater complexity, such as the subjunctive. And the gains from the explicit information are more stable and more likely to be found not only in the immediate post-test but also the delayed post-test. For easier structures (such as OVS), the SI or other forms of practice may be enough to make successful rule induction for most students. Under the negative transfer of mother tongue and the Primacy of Meaning Principle, even college students easily make mistakes on the acquisition of meaning and form of unreal conditionals. In addition, incorrect processing strategies would negatively affect learners' noticing, processing and application of the language form (VanPatten, 2002). In this study, Input Processing Instruction gave explicit information about the inappropriate processing strategies that may occur and

helped the students figure out the differences between “if” real conditionals and unreal conditionals, hence truly understand the form, use and function of the unreal conditionals (Wong, 2010). By this way, learners can notice the form while understanding the meaning of the target language structure, and, therefore, are more likely to build or enhance the form-meaning connection (VanPatten, 1996).

There was significant grammar score increase from pre-test to the immediate post-test and to the delayed post-test in the 3P group. It proved that the 3P grammar teaching method is effective. The mean score of 3P group in the immediate and delayed post-test was slightly higher than that of PI group, but the difference between the two groups were not significant. In contrast to PI, which doesn't push learners to produce the target language structure, students in the 3P group involved in production tasks, which might enable them to realize their linguistic problems and direct their attention to their errors about the target structure. The output-based 3P grammar teaching method may promote learners' cognitive processes which may help them to enhance the connection between what they have known and the new linguistic knowledge. The lack of advantage of output-based 3P grammar instruction in several studies may be due to the result of the non-communicative, drill-like practice they provided.

Conclusion

The present study investigates the effectiveness of Textual Enhancement (TE), Input Processing Instruction (PI) and 3P grammar instruction on the learning and acquisition of unreal conditionals. The major findings are as follows: 1) Both PI and 3P are effective. The output-based 3P grammar teaching method works better than PI on the mean score but without any significant difference. TE treatment is effective in initial learning but falls short for retention effect. And there is significant difference between TE and the other two groups. Compared with PI and 3P, TE is not that effective. 2) In initial learning, 3P has the best effect based on learners' mean score, followed by PI and TE, but there is no significant difference between PI and 3P. There is significant difference between 3P and TE, and PI and 3P. PI helps learners to make connections between form and meaning through explicit explanation of grammatical rules and processing strategies and structured input activities. 3) With regard to the retention effect, 3P and PI work better than TE. And there is no significant difference between 3P and PI.

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