

Meaningful Learning Outcomes Of An Educational Innovation Based On Instructional Video In A Colombian School Of Medicine

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Abstract— Actual challenges in Medical Education include the fact that mostly current university students in Latin American countries are digital natives whereas their teachers are digital immigrants, and their methodologies could be unpopular and low adherent among the majority of current students, causing problems such as inappropriate use of mobile devices by turning them into an escape for fun and ignore the purpose of the classroom activities and traditional lecture. Likewise, there is little solid evidence to support the use of Information and Communication Technologies for instruction at the undergraduate Medicine level. **METHODS:** Cohort study with undergraduate students in a Colombian Medicine School (n = 73) where they were randomized to traditional class and webcast, they were evaluated one week after with a similar test at the same time to evaluate knowledge of cardiovascular physiology. **RESULTS:** The group receiving the webcast scored better ($\bar{x} = 3.47$, 90% CI = 3.34 - 3.61, ANOVA, F = 6.56, p = 0.013) than the traditional class. There were no other significant differences. **CONCLUSIONS:** The results show better performance in those who took the class through educational innovation; some thoughts are presented in relation to the possible factors that determined the outcome.

Keywords— Webcast— Learning— Flipped classroom— Undergraduate Medical Education—

I. INTRODUCTION

KNOWLEDGE economy, the establishment of highly competitive societies and globalization have been moving significantly in our emerging countries and these new paradigms have sought their place in education and in turn, they are demanding the evaluation of their impact on learning, which have given rise to new research areas. The ultimate goal with their implementation is to help students to structure dynamic cognitive processes, allowing them to correlate, select, integrate, make connections, and apply the knowledge they acquire and thus enhance their curiosity, which is a great learning's propeller. In the case of the medical career, the development of thinking and learning skills, critical thinking and knowing "what" they learn, "how to" do it, but also "where" (context) are elements that will allow the future Physician confront the information and adequately solve the problems presented in the professional stage [1]. The use of instructional videos on undergraduate medicine programs has been gradually increased, even to the extent that various educational institutions are promoting the use of Web-based, self-motivating learning tools for students. However, the evidence of their impact on learning, it is not robust yet, and

some research results have been contradictory. Apparently, the more attention is given to the best technological and pedagogical aspects, the results will be obtained [3, 4].

There are some successful examples of instructional videos like Khan's Academy, a website ran by professor Shalman Khan in which there are math exercises in the beginning and currently hosts many topics from Basic Sciences to Human Sciences [5].

Another training experience using the Information Technology and Communication (ICT) is the *podcast* which have been used increasingly in the curricula of medical schools [6] and by organizations or medical journals to disseminate scientific content. Examples of this include the New England Journal of Medicine or the John Hopkins Institute, among others. Some notorious advantages of this tool is its ease of use, its accessibility and portability, the free or low cost, making possible the concept of really mobile education by allowing access from anywhere, and has the potential to facilitate learning in those people whose learning style is auditory [7].

Some benefits evidenced by the incorporation of ICT in the classroom are: critical analysis of the sought information and encouraging of decision making, also promotes teamwork and use of platforms to publish content. Currently it is considered that teaching based on the student as an active subject of their learning process (student-centered model) are preferable to those where just as spectators classes (teacher-centered model) as in the second model, the student loses much of the excitement of discovering the science, as it was evidenced in the study of Granger et al [8] with over 2000 students, those who had better score in knowledge of science was found in the groups where a student centered model was practiced. Additionally, TIC based methodologies meets the demand of more flexible systems and accessible education [9].

Given this evidence, it is considered important to know whether these advantages are extrapolated to human physiology training in order to achieve meaningful learning to prepare students better, aiming to their future practices in which they will have to correlate clinical findings of patients with physiological fundamentals and then choose the best interventions available. From this perspective, it is the responsibility of teachers to propose research and experimentation of alternative approaches to traditional teaching which is characterized by the linear transmission of knowledge in classrooms, as this has prevailed in the traditional lecture, used for most of the twentieth century as an effective strategy for knowledge transmission, but, with the evolution of ICT has begun to be used differently from the traditional approach [2].

II. METHODS

In this study, which is part of the research project I34071 approved by the Research Directorate of the Autonomous University of Bucaramanga (UNAB), a cohort of 73 students (28 men, 45 women) belonging to the third semester of the Medicine School (UNAB) were enrolled, they were randomized to one of two groups according to the methodology that will be administered: one, implementation of the webcast to be used independently by students ($n = 30$) and two, attendance to a lecture ($n = 43$), the latter being taken as a control group and this methodology is that students traditionally received; the distribution was skewed because 6 participants assigned to webcast group declined to participate and were included in the group of traditional methodology. The implementation of ICT-based strategy was encouraged by teachers but accomplished by students in their independent work time because they were not required to attend the webcast at one of the computer rooms of the university. The webcast allows students to access information interactively and can go back and forth to select the parts that arose more interest in them or needed strengthening. Webcasts were developed using *present.me* webcast tool that is characterized by providing content under the paradigm of Web 2.0 and allows for cross-platform access and these multimedia resources were inserted using an embed code in a page put up for this purpose within a University's learning management system (LMS) powered by Moodle called TEMA [10]. The topics chosen for implementation activities of this educational innovation were limited to issues of cardiac output and its determinants, a script of presentations and slides used was developed to construct the equivalent teaching materials for both groups, which had the same contents for students attending the classroom as usual and the ICT based innovation; webcasts were made available to those students that were assigned to, at the same date and time the class started in the classroom, students that were assigned to receive webcast instruction were not invited to attend the corresponding classes in the classroom.

In the design of the tools were taken into account the domain requirements, educational psychology, and interface relevant [11]. To accomplish the knowledge assessment, an electronic test was administered in the LMS one week after the instruction or webcast were released, it included 20 questions of various types, scored on a scale of 0 – 5 points. The evaluation was carried out at the same time for all participants, with a single possible attempt by each student; the time to answer the questionnaire was limited to 30 minutes for all participants and on the screen appeared a timer countdown. Averages were analyzed with its standard error (SEM) and relative risks (RR) and corresponding confidence intervals, 90% CI and ANOVA considering a p value <0.05 .

III. RESULTS

The result of the average test score (Figure 1) was slightly better for the group receiving webcast (3.47, 90% CI = 3.34 - 3.61, ANOVA, $F = 6.56$, $p = 0.013$) compared with those who attended the classroom (3.18, 90% CI = 3.07 - 3.30) and found

an increased risk of failing in the assessment of knowledge for those who attended the classroom with the traditional method (RR = 1.421). There were no differences related to sex in groups who failed in assessing whether it was the traditional method (women = 8, male = 9) or webcast (women = 3, male = 3). Where the rating between failing students (17 vs. 6 traditional webcast) was analyzed it was found that the average score in those who used the traditional method was 2.73 (2.67 - 2.78, \pm SEM) compared with those who used the webcast (2.86, 2.80 - 2.92, \pm SEM) but there was no statistically significant difference in the ANOVA test. When analyzing the time required to perform the test, no significant differences between those who passed the assessment (25.49 vs. 25.44 minutes, Traditional vs. Webcast) but the group who failed was 25.36 minutes (24.49 - 26.23, \pm SEM) were found in the traditional method versus 23.59 (22.70 - 24.40, \pm SEM) in the webcast although there were no significant differences in the ANOVA.

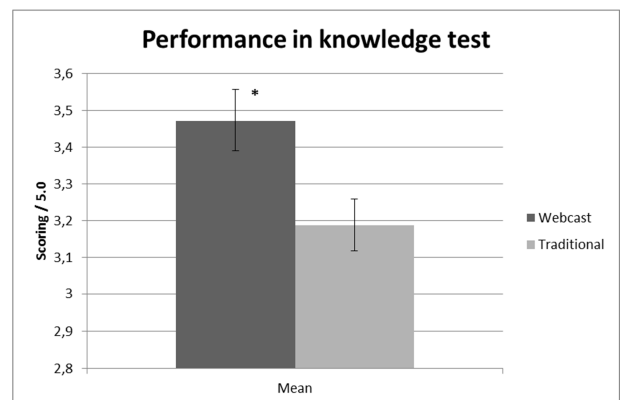


Figure 1. Score of both groups in the meaningful knowledge test. * $p = 0.01$

III. CONCLUSIONS

The increasing incorporation of ICT to classroom activities, largely due to international educational trends that suggest that students can develop certain skills and competencies when technologies are incorporated into the teaching and learning processes [12, 13]. While ICTs are part of the lives of many young university students, its use in the service of education and to improve their learning has become a subject of study and sometimes also subject of prevention by teachers who see tools like cell phones and social networks, among others, as a source of distraction rather than a useful learning environment [14]. The results of this study show that in the undergraduate medical program, webcast offers superior performance over traditional class in terms of meaningful learning and acquisition of knowledge and, its use is recommended as a strategy packed with other activities that allow direct interaction between teacher and students, with a greater orientation towards practice in order to maximize the time of the lectures to acquire competencies like demonstrate or strengthen the know-how. It is possible that the improved performance could be related to factors like the possibility of review teacher's presentation *ad libitum* to clarify mistakes,

student's psychological factors associated to the active role played in the instruction activities and their familiarization with ICTs, the stimulation of curiosity that moved students to seek more information on the Internet, among others that should be explored in another studies possibly based in qualitative or mixed paradigms. Finally, it is recommended to consolidate teaching groups for peer review of the materials aiming to high quality materials that can be managed and encourage professional development (scholarship) for medical educators.



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