

EFFECT OF INSTRUCTIONAL MULTIMEDIA METHODS ON LEARNING OUTCOMES AMONG NURSING STUDENTS IN SELECTED TOPIC OF HEALTH ASSESSMENT

Lamia Mohamed Nabil Ismail

Lecturer of Nursing Education, Faculty of Nursing, Cairo University, Egypt

©2018

International Academic Journal of Health, Medicine and Nursing (IAJHMN) | ISSN 2523-5508

Received: 2nd August 2018

Accepted: 18th August 2018

Full Length Research

Available Online at:

http://www.iajournals.org/articles/iajhmn_v1_i2_11_29.pdf

Citation: Ismail, L. M. N. (2018). Effect of instructional multimedia methods on learning outcomes among nursing students in selected topic of health assessment. *International Academic Journal of Health, Medicine and Nursing*, 1(2), 11-29

ABSTRACT

Instructional methodologies are educational approaches in use for information sharing and learning. While instructional methodologies provide the guidance for information delivery, imparting knowledge to students involves using different instructional methods to achieve the best possible results. The main aim of this study was to examine the effects of instructional multimedia methods on learning outcomes among nursing students in selected topic of health assessment. The following research hypothesis was formulated to fulfill the aim: the study group who will receive the instructional multimedia methods will show higher improvement level on learning outcomes. A quasi-experimental research design was utilized. The research was conducted at Faculty of Nursing; Cairo University. A convenience sample of 185 was drawn from nursing students in 2nd level of baccalaureate nursing programs in faculty of nursing at Cairo University. Three tools were used for data collection: a) student's preliminary informational variables; b) students' knowledge assessment sheet, and c) students' performance observational checklist. Results showed that the mostly of study sample (99.5%) had unsatisfactory knowledge with mean score (4.79 ± 2.33) in pretest. After self-paced instruction, student's knowledge improved but still unsatisfactory with mean

score (10.04 ± 3.01). In the final with combination methods between self-paced instruction and traditional lecture method, the majority of students (84.9%) had satisfactory knowledge with mean score (13.74 ± 2.32); with significance difference. Also, in relation to students' performance revealed that mean score of performance had significant differences between live demonstration and combination of two methods (live demonstration and video based method). The current study results contribute to the body of evidence that all of these instructional methods were effective because integration between more than two methods are important and effective in knowledge acquisition and performance. Therefore, educational stakeholders must formulate policies regarding choice of instructional method that has the most positive impact on the time and financial resource of the health institution. The study recommends that it is better to use and tune a "blended learning environment" that integrates the strengths of multimedia instruction methods into nursing education to provide the most efficient and effective instruction and overcome the deficiency of limited skills and resources.

Key Words: *multimedia instruction methods, learning outcomes, health assessment, self-paced instruction, mobile based video, lecture, live demonstration*

INTRODUCTION

Education is a process to bring certain positive behavioral changes in the learner. There are three important active ingredients for education - objectives, teaching-learning activities and evaluation. The educational objectives tell the teacher what is expected from the learner at the

end of the learning process. [1] Learning objectives are divided into three major components (knowledge, attitude, performance) and training the nurses in all components is necessary. There is a relationship between knowledge and performance, for instance, one with a limited knowledge might be unable to perform or behave professionally. Finally, teacher evaluate how well the learner use the process in succeeding to achieve learning objectives. Teaching involves all such activities and processes, which help the learners to facilitate the learning capability by acquiring skills in thinking, feeling and doing. [2]

One of the big challenges in nursing education programs is providing an effective learning method for nursing students in order to update knowledge and improve performance. However, despite new learning methods, which are based on problem-solving and using the internet and computers, the lecture method still remains one of the popular methods. [2, 3] In the last decades, traditional learning approaches with the advent of modern technologies of communication and information, such as multimedia, has undergone major changes. Traditional education classes are no more effective because they are tied to a particular place, time and cannot provide an appropriate context for learning. [4] Nurse educators have traditionally relied on a teacher-centered lecture instructional model where the instructor is the content expert, while the student's nurse enrolees are the passive learners [5, 6]. Nursing educators strive to make the students' educational experience engaging and meaningful, using the best available teaching and learning evidence [7].

One of the educational methods is a multimedia method. Multimedia means communicating and transferring topics and concepts with the use of several media such as speech, music, images, text, animation and interactive and user-friendly interfaces environments. This tool is effective in better learning because it is interesting, cost-effective, low size, and engages various senses. Teachers in nursing education programs utilize instructional multimedia methods to facilitate knowledge and performance skill acquisition in the vast diversity of students. [8] Advantages of instructional multimedia include increased availability and repetition of instructional content, improved ability of students to learn at their own pace, increased student control of material, less demand on instructor time, and the provision of an alternative approach to describe complex topics or three-dimensional relationships. Much of the health education research concerning instructional multimedia has focused on both cognitive and psychomotor performance. [9]

Nursing education programs aim to facilitate the development of competent, safe, caring student nurses who can adapt to and influence the ever-changing practice environment. Effective performance of practical skills is important across a range of health professions. The acquisition and mastery of practical manual skills are important for nursing students to ensure effective assessment and treatment of patients. [10] Learning practical skills requires practice and this can be enhanced in several ways. Interactive multimedia is one tool shown to increase success in meeting the needs of various learners. According to educator surveys, educational television and video: reinforces reading and lecture aids in the development of a common base of knowledge among students, enhances student comprehension and discussion, provides greater

accommodation of diverse learning styles, increases student motivation and intense interest, and promotes teacher effectiveness.[11]

Traditional practical skills in nursing curricula have been taught based on live demonstration only, followed by practice and feedback with time constraints. Traditional practical skills is effective to promote skill learning because it allows the learner to observe details of the skill and also the learner has some control over the practice conditions, such as the length and order of practice. This leaves students to revise the skill outside class time based on memory or on handwritten, potentially inaccurate notes. [12] Thus this method of practical skills may not be optimal. Effective education of practical skills can alter nursing student's behavior, positively influence patient outcomes, and reduce the risk of patient harm. From a motor learning perspective, repeated rehearsal of manual skills, feedback is needed for competent and safe performance of these techniques. Besides the use of textbooks, many other resources can be utilized as adjuncts to teach nursing skills like multimedia such as DVDs and videos. Therefore, to provide the most effective, high quality instruction, integrating video clips in multimedia lecture presentations may increase students' perception of important information and motivation for learning. Because of that, students can better understand, remember the key points and provide 24/7 access to practical skills [13]

Health assessment course is a fundamental component of the patient assessment conducted by health professionals especially nurses. It is taught across the health professions using a variety of formats. Traditional health professions education programs offer all courses and training in-person and, teach health assessment face-to-face. [14, 15] Nurse educators are in a position to develop innovative learning materials that will motivate students to remediate common health assessment concepts that will allow them to competently assesses the patients in the clinical setting to meet the needs and improve the care of patients and improve student outcomes in relation to health assessment performance [16, 17]

Thus, the use of instructional multimedia to provide instruction in the health assessment with nurses student is growing in popularity; however, the outcomes associated with this method of instruction are not well documented. So, the instructional multimedia methods described in the current study was designed to improve student's knowledge and performance through practice and feedback without increasing lab, classroom, or instructor time. Therefore, the focus of the current study were to examine the effects of instructional multimedia methods on learning outcomes among nursing students in selected topic of health assessment. Learning outcomes are including: a) Knowledge acquisition in terms of change in the level of students' knowledge as a result of combination of multimedia instructional methods as self-paced instruction with lecture; and b) Psychomotor performance as result of combination of multimedia instructional methods as live demonstration with mobile / CD video based.

SIGNIFICANCE OF THE STUDY

Health assessment skills among nursing students have been shown to be not having enough of a specified quality or ingredient. It appears that traditional practical methods for teaching health assessment skills (eg, lecture, demonstration, peer-to-peer practice, and practice with both standardized and actual patients) are not producing competency. [18] According to Dale's Cone of Experience Model that people retain only 20% of what they hear; 50% of what they see and hear; and 90% of what do as they perform the task with integrated methods. [4, 19] In this case, it is essential to precede multi-sensory instruction in order to satisfy more learning styles and enhance students' learning outcomes. [20] Therefore, it is an important issue for modern teaching strategies development that teachers could apply multimedia and information equipment to teaching activities to eliminate defects in traditional instruction and enhance the learning effect. Learning psychologists usually suggest that teaching materials should be presented with various methods so that students with different learning styles could acquire knowledge through distinct senses.[19]

The nurse educator recognizes that instruction must accommodate multiple learning styles. The elimination of lecture-style instruction engages students in a two-way flow of information. New research validates that student-centered education promotes retention far better than traditional methods. [21] Technology allows students to maximize learning time by completing coursework before coming to class. Many courses use the flipped classroom style of learning where students work in a way that fits their learning style to review content and come to class prepared to engage in meaningful discussions around a topic.[7] Active participation in learning experience can empower nursing students to fulfill their learning needs and prepare them to lead in health care. [22] So, the aims of nursing education principally center on improving the quality of teaching. One way to enhance nursing education is using multimedia instruction methods. [23] Nursing educator uses a lot of various approaches to achieve this aim [24]. In order to expand the capacities and improve educational outcomes, it is crucial to develop and adopt new models of theoretical knowledge and clinical education for nurses. [25] Through innovative teaching and learning approaches that address a variety of learning styles, the instructor actively engages students.[26]

The health assessment is a cornerstone of the first part of clinical skills because the inaccurate performance of health assessment can place patients at risk who may be insufficiently diagnosed and/or misdiagnosed. Therefore, it is imperative for nurse educator to develop the most effective teaching model to train nursing students in the health assessment practical skills. The researcher believes that it is imperative for nursing faculty to evaluate and assess the quality, efficiency, and consistency of health assessment instruction in order to develop more advanced teaching methods to teach students. Ultimately, the researcher hopes that this study can create more discussions on the multimedia instructional method in the education of this course and other practical courses in the future.

MATERIALS AND METHODS

Definition of Terms

Multimedia Instructional Methods: appeared in the 1990s and was defined as:“an integration of multiple media elements (audio, video, graphics, text, animation etc.) into one synergetic and symbiotic whole that results in more benefits for the end user than any one of the media element can provide individually to foster meaningful learning”. [27, 28]

Self-paced instruction (SPI): “is any kind of instruction that proceeds based on learner response. The content itself can be curriculum, corporate training, technical tutorials, or any other subject that does not require the immediate response of an instructor. Self-paced instruction is constructed in such a way that the learner proceeds from one topic or segment to the next at his own speed”. This type of instruction is becoming increasingly popular as the education world shifts to multimedia instruction methods [29, 30].

Aim of this study: was to examine the effects of instructional multimedia methods on learning outcomes among nursing students in selected topic of health assessment; including: a) Knowledge acquisition in terms of change in the level of students’ knowledge as a result of multimedia instructional methods as self-paced instruction with lecture; and b) Psychomotor performance as result of combination of multimedia instructional methods as live demonstration with mobile / CD video based.

Research Hypotheses

Main Hypothesis: The study group who will receive the instructional multimedia methods will show higher improvement level on learning outcomes.

Sub hypothesis 1: Post participation, the study group will have higher knowledge level (as measured by pretest and posttest).

Sub hypothesis 2: Post participation, the study group will have higher performance level (as measured by post observational checklist).

Research Design

A quasi-experimental study design was utilized. A quasi-experiment is an empirical interventional study used to estimate the causal impact of an intervention on its target population. [31] One-group quasi-experimental Pre-Test / Post-Test research design was used to achieve the aim of the current study. This design is a method for assessing the effect of an intervention by comparing scores on a variable before and after an intervention implementing multimedia instructional method. [32]

Setting

The current study was conducted at Faculty of Nursing; Cairo University. It was established in 1963, the main purpose of establishing to start the study of nursing at the university level in order

to graduate a qualified professional nurse who is competent and capable to work among the health care team at different health and educational organizations in the community.

Subjects

A convenience sample of 185 from a total of 290 completed the intervention, from both gender was drawn from nursing students in 2nd level of baccalaureate nursing programs in faculty of nursing at Cairo University in academic year 2017/2018 (63.8 % of original cohort). Researchers selected the student who met the following inclusion criteria: Nursing students were 2nd year, passed a total of 31 credits, newly enrolled in health assessment course, accomplish the prerequisite courses as anatomy and physiology, and students who didn't receive any related educational program.

Sample Size

The sample size formulas provide the number of responses that need to be obtained. To calculate the sample size of the nursing students, the study used the Yamane's formula (1967) [33]. Although the minimum numbers of 168 students were required by power analysis, the researcher will aim to obtain 185 students (add 10% to the sample size) in this study to compensate for persons that the researcher is unable to contact or to continue the intervention or nonresponse rate was expected to be lost from the students.

Tools

Student's Preliminary Informational Variables: This questionnaire covered the demographic characteristics of students such as: level, age, sex and residence. Students' knowledge assessment sheet: this part was developed by the researcher after reviewing the recent and relevant literature review. As regard structure and function; health history, physical examination technique, normal and abnormal findings, and documentation of the thorax and lungs assessment. In this part, the questions are formulated to gather data about the students' knowledge, it consisted of 20 items as 10 multiple choice questions, 5 questions match and 5 questions true and false covering theoretical content of thorax and lungs assessment. Scoring system: classified as follows: the correct answer was given 1 point and incorrect answer was given zero. The total score for questionnaire ranged from zero to 20 and the assessment was done by calculating the mean scores and standard deviations. Score less than 60% was considered unsatisfactory and the score equal or more than 60% considered satisfactory. This questionnaire was validated based on content validation and by use of nursing textbooks and the viewpoints of nursing experts.

Students' Performance Observational Checklists: consists of 30 steps to assess nurses' practice based on thorax and lungs assessment criteria which adopted from Innes, Dover and Fairhurst (2018).[34, 35] Each item was checked by direct observation by the researcher for the following criteria of availability (completely done, incompletely done and never done). Scoring system: classified as follows; complete done step was given a score of 2 grades, incompletely

done step was given a score of 1 grade and not done was given a score of 0. A total score for the checklist was ranged from 0 to 60 and assessment was done by evaluating mean scores and standard deviations. The passing for this observational checklist was 36 out of 60 which indicated that the student comprehended the minimum about the thorax and lungs assessment. The score less than 36 (60%) considered unsatisfactory and the score equal or more than 60% considered satisfactory.

Self- Paced Instruction (SPI): Developed by the researcher regarding thorax and lungs assessment as a topic in health assessment course to cover the following content: intended learning outcomes, structure and function; health history, physical examination technique, normal and abnormal findings, health promotion concepts related to respiratory system, observational checklist and documentation of the thorax and lungs assessment. Also, It includes the instructions for students, self-administrated evaluation questions after each part, learning resources (essential references, recommended books and reference material (journals, reports, etc), attached list of electronic materials and websites. Validity and reliability: Study tools were designed and adopted by the researcher after extensive literature review and submitted to a panel of five reviewers and experts in medical surgical nursing and nursing education departments. Modifications of tools were done according to panel judgment on clarity of sentences, appropriateness of content and sequence of items. The experts' agreed on the content of the self-paced instructional method and then the final forms were developed. Regarding reliability, the reliability coefficients' alpha in pre-post exam questions was 0.72.

Procedure

The current study was conducted through the following two phases:

Preparation Phase: This phase was concerned with obtaining permissions to carry out the study. Then, specific needs/ problems of the students with health assessment were identified, as well assessment of the environmental facilities was done. An extensive literature review was carried out by searching the internet and national database, in addition to developing data collection instruments (pre-test and post-test, observational checklist). The researcher prepared the self-paced instruction, mobile / CD video based and teaching aids. After that, contact with experts in the education field to explore different aspects of the research area and problem. Through which the study design, sample size, inclusion criteria, tools for data collection were selected and developed. Face and content validity of the study tools were tested by a panel of experts in the field of medical-surgical nursing and education department. Developing a preliminary draft of the study intervention was done at the beginning of June 2017 for four months.

Implementation Phase: In which a pilot study and the pre-intervention of student's baseline profile included assessment of the student's preliminary informational variables of the study sample was done using the student's preliminary informational variables before utilizing any of the multimedia instructional methods. After that, the multimedia instructional methods were

implemented in relation to knowledge acquisition and psychomotor performance. This implementation phase started at the beginning of October 2017 for three continuous weeks.

1. **Regarding knowledge acquisition:** Pretest questionnaire was distributed before starting the self-paced instruction materials dispensed, and the students were allowed 30 minutes to complete the test under proctored settings. Then, a brief explanation was given regarding how to proceed with the contents of the self-paced instruction. In addition, students were asked to read carefully the provided self-paced instructions independently as a matter of self study and they had the opportunity to ask any question regarding the provided materials. One week after the packet was dispensed, the first post-test was distributed and the students were allowed 30 minutes to complete the test. After that, the students taught the content of self-paced instruction 2 hours by traditional methods (lecture) using power point presentation. The lecture covered the same intended learning outcomes and content of self-paced instruction. The second post-test was distributed after finishing from lecture and the students were allowed 30 minutes to complete the second post-test.
2. **In relation to psychomotor performance:** At this phase, the researcher divided the students into 8 groups, each group 23 or 24 students. The Practical Return Demonstration (PRD) was done by the researcher in the nursing laboratory on volunteer student for 30 minutes with each group. Then, All nursing students in each group followed up with a return demonstration using an observational checklist separately on the lab under supervision from clinical instructors. For two consecutive days after PRD, the researcher finished evaluating the performance of each student individually on volunteer peer (live demonstration post-test using an observational checklist). After finishing live demonstration post-test, the video was distributed to be available to all study group using their mobile devices or CD room for some students. Another one week after the thorax and lungs live demonstration and the release of the video based, all student attended a 2 credit hour lab practice to complete posttest observational checklist (live demonstration and video-based post-test), again the researcher evaluate the performance of each student separately according to the developed observational checklist. Each student who finished the evaluation session has been given a feedback regarding the practice.

Pilot Study

Once permission was granted to proceed with the proposed study, a pilot study was conducted on 10% of the sample in the same selected study setting to estimate the needed time for data collection to judge the feasibility, objectivity, test the ability of the tool to elicit the desired information and also, to test appropriateness, content, wording and order. The needed modification was done and the subjects of the pilot study were excluded from the actual research subject.

Protection of Human Rights: An official permission to conduct the study was taken from the authoritative personal in the faculty. The researcher informed the study group about the aim of the current study in order to obtain their acceptance to share in this study. The researcher emphasized that participation in the study is entirely voluntary; anonymity and confidentiality are assured through coding the data. Informed verbal consent was obtained from each subject for their participation and the right to withdraw from the study at any time was also communicated to all of them. Also the researchers informed the study group that pretest/posttest scores were used only for purposes of the study and were not part of the course grade. The subjects were assured that the data will not be reused in another research without his acceptance.

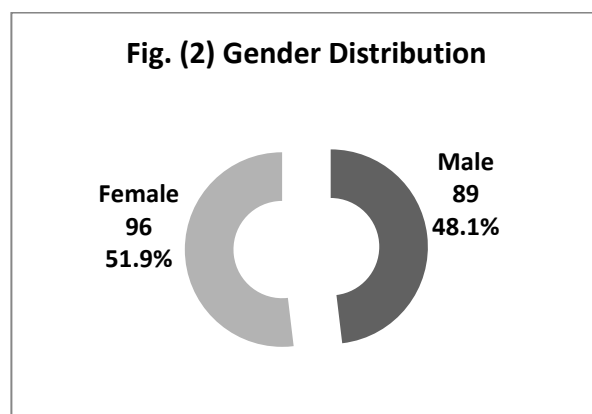
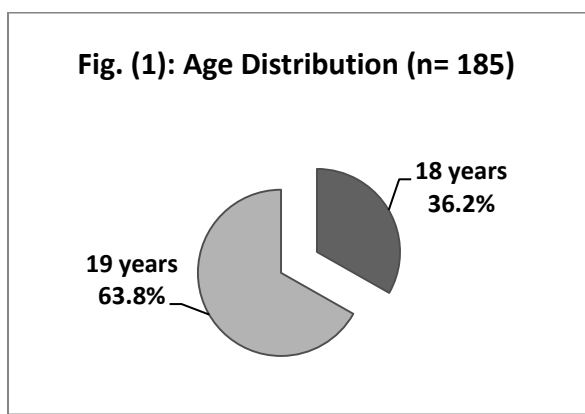
Statistical analysis: Data entry and statistical analysis were done using SPSS program version 20; then tabulated. Relevant statistical analysis was used to test the obtained data. Descriptive and inferential statistics were done such as mean and standard deviations; frequency; percentage and independent t-test. Pearson correlation analysis to test statistical significance of some variables and to test effectiveness of the intervention. Statistical significance was considered at $p\text{-value} \leq 0.05$.

RESEARCH RESULTS

The analyzed data are presented in the following order: (I) The first section shows Student's preliminary informational variables (Fig. 1-2); (II) The second section present variables related to knowledge acquisition (table 1); (III) The third section present variables related to psychomotor performance (table 2).

Student's Preliminary Informational Variables (PPIV)

The target population of this research study was students at the 2nd level in the faculty of nursing at Cairo University. For this study, a total of 185 study subjects were sampled with the mean age ($18.64 \pm .481$) (fig. 1). The male to female ratio was 1:1 with 89 male students (48.1%) and 96 female students (51.9%) (Fig. 2) and residing in urban (63.2%).



Knowledge Acquisition

Results of student’s knowledge evaluation showed that (99.5%) of study sample in pretest had unsatisfactory knowledge with the mean score with (4.79 ± 2.33). Regarding 1st posttest, (41.6%) had satisfactory knowledge with the mean score with (10.04 ± 3.01). In relation to 2nd posttest, (84.9%) had satisfactory knowledge with the mean score with (13.74 ± 2.32). Results of paired t-test in each group revealed that mean score of knowledge had significant differences in the pre-test and 1st posttest; pretest and 2nd posttest, and 1st posttest and 2nd posttest (p: .000).

Table 1: Mean total score of knowledge regarding thorax and lungs multimedia instructional methods implementation (n = 185)

Students’ Knowledge	Pre-test		1 st Post –test		2 nd Post-test	
	No	%	No	%	No	%
Satisfactory	1	0.5	77	41.6	157	84.9
Unsatisfactory	184	99.5	108	57.4	28	15.1
Mean ± SD	4.79 ± 2.33		10.04 ± 3.01		13.74 ± 2.32	
Pre-test and 1 st post-test	5.800 (.000) (S*)					
Pre-test and 2 nd post-test	31.461 (.000) (S*)					
1 st Post-test and 2 nd post-test	62.681 (.000) (S*)					

* Significant at the $p \leq 0.05$ probability level, S = Significance

Psychomotor Performance

Results of student’s performance evaluation showed that (62.2%) of study sample after live demonstration only had satisfactory performance with mean score with (39.91 ± 9.49). Regarding to combination between two methods (live demonstration and video based), (81.1%) had satisfactory performance with mean score with(42.54 ± 8.65). Results of paired t-test in each group revealed that mean score of performance had significant differences in live demonstration and combination of two methods (p : .000).

Table 2: Mean total score of psychomotor performance regarding thorax and lungs multimedia instructional methods implementation (n = 185)

Students’ Performance	Live demonstration post-test		Live demonstration with video based post-test	
	No	%	No	%
Satisfactory	115	62.2	150	81.1
Unsatisfactory	70	37.8	35	18.9
Mean ± SD	39.91 ± 9.49		42.54 ± 8.65	
Range	24 - 60		26 - 60	
p-value	16.649 (.000)*			

* Significant at the $p \leq 0.05$ probability level, S = Significance

DISCUSSION

Nowadays world live in the age of the explosion of information technology, which makes it difficult to gather or refuge all information during the lecture time or even formal education time as well, so it is logical to think about methods to accommodate the explosion of information and save the time for discussion of applications, clinical context, problem-solving, group working, analyze text, investigate the result, and / or challenging topics. One of the suitable methods to achieve that goal is multimedia instructional methods, which makes the overlap between the formal education time and home time, to maximize the benefits from each, moreover, transfer the students from the conceptual level to practicing and evaluation level. Also, transfer the traditional learning classroom from teacher-centered to student-centered. [36, 37] So, people learn more effectively from multimedia, or words and pictures together, than words alone. However, multimedia design principles as guiding concepts to enhance learning from multimedia presentations. [38]

Therefore, the aim of this current study was to examine the effect of instructional multimedia methods on learning outcomes among nursing students in selected topic of health assessment. Results of the current study will be discussed within the following frame: (a) Knowledge acquisition; (b) Psychomotor performance; and (c) The research hypothesis.

Knowledge Acquisition

Nurse educators have traditionally relied on a teacher-centered lecture instructional model where the teacher is the content expert, while the student's nurse enrolls are the passive learners [5]. In spite of the traditional lecture method of instructing students has ceased to be the sole manner of equipping students with the necessary knowledge.[39] So, many studies have sought to explore instructional teaching methods to optimize knowledge acquisition for student's nurses, none have concluded which is the best technique [6] Therefore, the aim of this research study was to determine if there was a difference in knowledge acquisition of student's nurse enrolled in a short-term professional development learning experience using one method alone such as self-paced instruction methods or integrated two different instructional methodologies such as self-paced instruction and traditional lecture in teaching thorax and lung assessment.

The current study revealed increased mean 1st and 2nd posttest knowledge scores as compared to pretest scores of the study sample. The group who received a combination of multimedia instructional methods of self-paced instruction and traditional lecture showed higher mean posttest knowledge scores followed in rank by the group who taught using self-paced alone. Findings of the current study were contradicted by those of a study done by many researchers who compared between lecture, video, and self-guided instruction in paramedic pediatric airway management. The researchers found that all methods were effective but the lecture was most effective. [39, 40] Another researchers concluded that the whole time of traditional lectures is spent on teaching the concepts without practicing or evaluation; it is a big problem. Moreover, the traditional lectures may seem boring to the technical 21st -century students. Therefore, the

researchers recommended that evolution in knowledge and communication technology occurred, nursing education must keep up with it and continued to advance modern learning methods. [36,37]

The development of student-centered learning in the academic setting may lend scientific placement, especially in the hospital setting. Student-centered learning focuses on the needs, abilities, interests and, learning styles of the students; the teacher acts only as a facilitator of learning. A student-centered learning environment is primarily focused on the active role of the student; this environment makes the student responsible for their own learning. [5] Adult learners have higher knowledge acquisition and retention when exposed to active student-centered learning participation methodologies. Also, self-paced instruction can support knowledge acquisition. Nursing students are able to learn effectively with self-study techniques.[40] So, the current study revealed that use of combination methods of instruction as traditional lecture with self-paced instructional methods as effective ways of delivering information and skill regarding chest and thorax assessment.

Psychomotor Performance

Clinical education in Egypt is currently challenged by increasing student numbers, changing healthcare practices and service pressures, all of which limit the time clinicians can devote to teaching. Therefore, there are strong imperatives to optimize the effectiveness and efficiency of the way students develop clinical expertise. Here, the current study revealed an increased mean score of a combination of multimedia instructional methods performance such as live demonstration and video based as compared to live demonstration alone.

The group who received a combination multimedia instructional methods of live demonstration and mobile / CD video based showed higher mean performance scores followed in rank by the group who taught thorax and lungs assessment using live demonstration alone. The reasons for the effectiveness of these educational videos in the current study is that these videos demonstrate complex procedures and skills and show the actual situation of events that would not be adequately represented through live demonstration only because the student used “stop,” “playback,” and “repeat” functions to emphasize complex and key procedures of correct performance. The benefit of utilizing instructional video is that students can practice independently outside of class and view the procedures performed correctly, especially before the lab practical. This may be the reason that the instructional video had higher scores than the live demonstration only.

Previous findings may be attributed that students often find it difficult practicing health assessment with limited lab time. Conversely, the lack of reference materials hinders the willingness of students to practice after lab time. So, the instructional videos available for students after lab time, provide an effective alternative for students to view and practice on their own, especially before the health assessment class and practical posttest exam. [41] Many studies reported that the positive impacts of mobile learning on participants' performance in nursing

education showing the potential of using mobile technologies for improving learners' performance in nursing training courses [21, 42- 46].

Another researcher concluded that video contributes to learner satisfaction in an instructional program. The researcher reported that "the simultaneous processing of both auditory and visual information increases learner comprehension and retention". Therefore, the use of video can help students learn by expanding the capacity of working memory. [47] Several studies have proved the audiovisual materials or e-learning or use of multimedia to be the effective tool in learning the practical skill. [10, 48]. The influence of educational videos on ophthalmic physical examination teaching was evaluated. The researcher found overall that implementing the educational video would improve students' lab performance on ophthalmic performance [18, 34,35, 41,49].

With recent advancement in the use of technology, simulation training provides an excellent (and safe) learning environment in the curriculum of students as well as for ongoing training for current healthcare professionals. [50, 51] Other researchers indicated that repetitive content is an ideal material to move from traditional instructional methodology to computer-based virtual reality for first-line instruction. The researchers added that interactive learning systems may improve the quality of education, facilitate visualization and understanding and also increase the effectiveness of the education. [52] Therefore, this study revealed that use of combination methods of instruction as the live demonstration with video-based learning as effective ways of delivering skill regarding thorax and lungs assessment.

Research Hypotheses

Results of the paired t-test in each group revealed that mean score of knowledge had significant differences in the pre-test and 1st posttest; pretest and 2nd posttest and 1st posttest and 2nd posttest. Thus, there is sufficient evidence to support the sub-hypothesis, which states that post participation in the multimedia instructional methods, the study group will have higher knowledge level regarding instructional multimedia methods (as measured by pretest, posttest). Also, the results of paired t-test in each group revealed that the mean score of psychomotor performance had significant differences in live demonstration alone and the combination of two methods. Thus, there is sufficient evidence to support the sub-hypothesis, which states that post participation in the instructional multimedia methods, the study group will have a higher performance level regarding instructional multimedia methods.

Based on findings of the current study, there is the highly significant improvement in study subjects in knowledge and psychomotor performance after multimedia instruction methods implementation as evidenced by knowledge and performance scores. So, the result of this study supported the main hypothesis which expected that the study group who will receive the instructional multimedia methods will show improvement on learning outcomes in relation to knowledge acquisition and psychomotor performance. Therefore, the result of the present study

shows that the suggested multimedia instructional methods are effective on the learning outcomes in comparison with traditional methods.

CONCLUSIONS

Based on the results of the current study, the researcher can conclude that combining different methods of teaching in the nursing field are useful teaching strategies in health assessment course that facilitate students understanding and performance. Carefully designed and developed multimedia instructional methods for knowledge as self-paced instruction and lecture, or for performance as video based and live demonstration is effective in acquisition of knowledge and performance. Each method has its own advantages and limitations, therefore both methods should be considered in teaching undergraduate health examination course in order to improve learning experiences and to match different learning preferences of students. Therefore, understanding the most effective multimedia instruction methods may provide some insight for nursing educators to implement successful knowledge acquisition and psychomotor performance for student's nurses.

RECOMMENDATIONS

In the light of the current result, the following recommendations were suggested:

Recommendations related to educators: (a) Designing the multimedia programs which better motivate learners on students' learning outcomes. (b) Use Information and Communication technology (ICT) to provide access to content, professional development and professional learning communities.

Recommendations for educational stakeholders: (a) Consider the impact of the learning instructional methods that has the most positive impact on the time and financial resource of the health institution. (b) Educational stakeholders should encourage teachers to have qualifications in education, so they are exposed to modern methods of teaching, which help to improve learning outcomes. (c) Provide teachers with ongoing simple support strategies, such as teacher observation and feedback by a skilled educator, have been shown to positively influence teacher practice and motivation.

Recommendations for further researches: (a) Assessing effect multimedia instructional methods on a larger sample size, in other levels, other practice settings, in longer term courses and tailoring with different learning preferences is recommended. (b) It is also recommended that future studies examine not only immediate knowledge gain and practice but retention of knowledge over a more extended period of time. (c) It is further recommended that future researchers consider conducting qualitative studies exploring the thoughts and feelings of students in terms of the satisfaction with each of the methods.

REFERENCES

- [1] Dahiya, S. & Dahiya, R. (2015) Class Room Seminar and Journal Club (CRSJC) as an Effective Teaching Learning Tool: Perception to Post Graduation Pharmacy Students . The Journal of Effective Teaching, 15, (1), 69-83.
- [2] Faye, F.R. (2011). Integrating Nursing Science in the Education Process, Creative Nursing Journal, 17(3): 1-3.
- [3] Rafii, F., Amiri, M. J., Dehnad, A. and Haghani, H. (2016). The Effect of Workshop and Multimedia Training Methods on Nurses' Knowledge and Performance on Blood Transfusion. Client-Centered Nursing Care, 2 (4): 223-230.
- [4] Nozari, Y. A. & Siamian, H. (2015) The Effect of Applying Podcast Multimedia Teaching System on Motivational Achievement and Learning Among the Boy Students. ACTA Inform, 23 (1): 23-29.
- [5] Disch, J. (2012). Patient-centered care/student-centered learning. Nursing Outlook, 60, 340–341.
- [6] Soper, T. (2016). Knowledge into learning: comparing lecture, e- learning and self- study take-home packet instructional methodologies with nurses. Wiley Nursing Online, 4: 76-83.
- [7] Landeen, J. Carr, D., Culver, K., Martin, L., Matthew-Maich, N., Noesgaard, C. & Beney-Gadsby, L. (2016). The impact of Curricular Changes on BSCN Student's Clinical Learning Outcomes. Nursing Education in Practice; 21: 51-58.
- [8] Anderson, R.P. & Wilson, S.P. (2009). Quantifying the Effectiveness of Interactive Tutorials in Medical Library Instruction. University of South Carolina Scholar Commons, 1-21.
- [9] Smith, A.R., Cavanaugh, C. & Moare, W.A. (2011). Instructional multimedia: An investigation of student and instructor attitudes and student study behavior. BioMed Central Medical Education, 11-38.
- [10] Gazbare, P. & Rathi, M. (2017). Effective of Audio-Video Clips On Practicle Skills Performance in Physiotherapy Students. International Journal of Pharma and Bio Sciences, 8 (1): 30-40.
- [11] Abrahams,I. & Reiss, M. (2015). The Assessment of Practical Skills. The School Science Review: 96 (357): 40 – 44.
- [12] Vogel, D. & Harendza, S. (2016). Basic practical skills teaching and learning in undergraduate medical education – a review on methodological evidence. Journal for Medical Education: 33(4), 1-19.
- [13] Ljubojevic, M., Vaskovic, V., Stankovic, S. & Vaskovic, J. (2014). Using Supplementary Video in Multimedia Instruction as a Teaching Tool to Increase Efficiency of Learning and Quality of Experience. The international Review of Research in Open and Distance Learning, 15(3), 275-291.
- [14] Tomesko, J., Touger-Decker, R.E. & Dreker, M. (2017). The Effectiveness of Computer-Assisted Instruction to Teach Physical Examination to Students and Trainees in

- the Health Sciences Professions: A Systematic Review and Meta-Analysis. Journal of medical education and curricular development.
- [15] Russell, S. A., Joyce, J., Catherine, C., John, V. & William, W. (2006). Effect of Interactive Multimedia on Basic Clinical Psychomotor Skill Performance by Physical Therapist Students, *Journal of Physical Therapy Education*, 20 (2): 61-67.
- [16] Hansen, M.M. (2004). The Effectiveness of an Interactive Multimedia Learning Tool on Nursing Students' Math Knowledge and Self-efficacy. The University of San Francisco USF Scholarship: a digital repository @ Gleeson Library Geschke Center, 22 (1): 26-33.
- [17] Bodkyn, C. & Stevens, F. (2015). Self-directed learning, intrinsic motivation and student performance. *Caribbean Teaching Scholar*, 5 (2): 79–93.
- [18] Orientale EO, Kosowicz L, Alerte A, Pfeiffer, C. ; Harrington, K. ; Palley, J. ; Brown, S. & Sapieha-Yanchak, T. (2008). Using webbased video to enhance physical examination skills in medical students. *Fam Med* ; 40(7):471–6. 12.
- [19] Davis, B. & Summers, M. (2015). Applying Dale’s Cone of Experience to increase learning and retention: A study of student learning in a foundational leadership course. *QScience Proceedings (Engineering Leaders Conference 2014)* 2015:6 <http://dx.doi.org/10.5339/qproc.2015.elc2014.6>.
- [20] Wu, T.J. & Tai, Y.N. (2016). Effects of Multimedia Information Technology Integrated Multi-Sensory Instruction on Students’ Learning Motivation and Outcome. *Eurasia Journal of Mathematics, Science & Technology Education*, 12(4): 1065-1074.
- [21] Mehrdad, N. , Zolfaghari, M. , Bahrani, N. & Eybpoosh, S. (2011). Learning Outcomes in Two Different Teaching Approach in Nursing Education in Iran: E-Learning versus Lecture. *Acta Medica Iranica*,49 (5): 296 -301.
- [22] Chaghari, M. Saffari, M., Ebadi, A. Ebadi, A. & Ameryoun, A. (2017). Empowering education: A new model for in-service training of nursing staff. *Journal of Advances in Medical Education & Professionalism*, 5(1): 26-32.
- [23] Salsali, M. (2005). Evaluating teaching effectiveness in nursing education:An Iranian perspective. *BMC Medical Education*, 5(29): 1-9.
- [24] Kaduèáková, H. (2007). Using of Effective Methods of Education in Nursing. *Studia Medyczne Akademii Świètokrzyskiej*, 11-17
- [25] Crookes, K. (2016). Meaningful and engaging teaching in nursing education, thesis is presented as part of the requirements for the award of the Degree of Master of Philosophy at the University of Wollongong, 3.
- [26] Al-Hariri, M.T. & Al-Hattami, A. (2017). Impact of students' use of technology on their learning achievements in physiology courses at the University of Dammam. *Journal of Taibah University Medical Sciences*; 12 (1): 82-85.

- [27] Reddi, U.V. & Mishra, S. (2011). Educational Multimedia. A handbook for teacher-developers. A publication for the Common wealth Educational Media Centre for Asia, 4th ed. www.cemca.org/emhandbook/edmul_full.pdf
- [28] Mayer, R.E. (2005) The Cambridge Handbook of Multimedia Learning. Cambridge University Press.
- [29] Dick, W., Carey, L. & Carey, J. (2014). The Systematic Design of Instruction (8th edition). Pearson Publishing.
- [30] Bautista, R.G. (2015). Optimizing classroom instruction through self-paced learning prototype. Journal of Technology and Science Education (JOTSE), 5(3), 184-193. <http://dx.doi.org/10.3926/jotse.162>.
- [31] Dinardo, J. (2008). "natural experiments and quasi-natural experiments". The New Palgrave Dictionary of Economics. pp. 856–859. doi:10.1057/9780230226203.1162. ISBN 978-0-333-78676-5.
- [32] Polit, D. & Beck, C. (2012). Textbook of Nursing Research-Principles and Methods, (7th ed.), Philadelphia: J.B. Lippincott Co., p.181.
- [33] Yamane, T. (1973). "Statistics: an introductory analysis." 3rd ed, Harper and Row, New York.
- [34] Innes, J.A., Dover, A.R. & Fairhurst, K. (2018). Macleod's Clinical Examination. 14th ed, Elsevier, 90-92.
- [35] O'Neill, P., Evans, A., Pattison, T., Tolhurst-Cleaver, M. & Tolhurst-Cleaver, S. (2016). Macleod's Clinical OSCEs – E-Book. Churchill Livingstone, Elsevier, 80e2 – 83e2.
- [36] El-Senousy, H. & Alquda, J. (2017). The effect of Flipped Classroom Strategy using Blackboard Mash-Up Tools in enhancing achievement and Self-Regulated Learning skills of university students. World Journal on Educational Technology: Current Issues: 9 (3), 144-157.
- [37] Chen, L. (2016). Impacts of Flipped Classroom in High School Health Education. Journal of Educational Technology Systems, 44(4), 411-420.
- [38] Tang, B., Coret, A., Qureshi, A., Barron, H., Ayala, A. P. & Law M. (2018). Online Lectures in Undergraduate Medical Education: Scoping Review. JMIR MEDICAL EDUCATION: 4 (1); 1-10.
- [39] Mickelson, J., Kaplan, W. & MacNeilly, A. (2009). Active learning: A resident's reflection on the impact of a student centered curriculum. Canadian Urological Association Journal, 3, 399–402.
- [40] Cha, N. H. & Kim, Y. K. (2014). Effects of self study circle activity on self- directed learning ability and learning attitude in nursing students. Journal of Korean Academic Society of Nursing Education, 20, 659–666.
- [41] Zhang, N. & Chawla, S. (2012). Effect of Implementing Instructional Videos in a Physical Examination Course An Alternative Paradigm for Chiropractic Physical Examination Teaching. Palmer College of Chiropractic Florida: 26 (1): 40-46.

- [42] Green, S. S., Comer, L., Elliott, L. & Neubrandner, J. (2011). Exploring the value of an international service-learning experience in Honduras. *Nursing Education Perspectives*, 32(5), 302e307. <http://dx.doi.org/10.5480/1536-5026-32.5.302>.
- [43] Keegan, R. D., Oliver, M. C., Stanfill, T. J., Stevens, K. V., Brown, G. R., Ebinger, M. & et al. (2016). Use of a mobile device simulation as a preclass active learning exercise. *Journal of Nursing Education*, 55(1), 56e59. <http://dx.doi.org/10.3928/01484834-20151214-14>.
- [44] Lee, N. J., Chae, S. M. M., Kim, H., Lee, J. H., Min, H. J. & Park, D. E. (2016). Mobile-based video learning outcomes in clinical: Nursing skill education a randomized controlled trial. *CIN - Computers Informatics Nursing*, 34(1), 8e16. <http://dx.doi.org/10.1097/CIN.0000000000000183>
- [45] Nguyen, T., Irizarry, C., Garrett, R. & Downing, A. (2015). Access to mobile communications by older people. *Australasian Journal on Ageing*, 34(2), E7eE12. <http://dx.doi.org/10.1111/ajag.12149>.
- [46] Zayim, N. & Ozel, D. (2015). Factors affecting nursing students' readiness and perceptions toward the use of mobile technologies for learning. *CIN - Computers Informatics Nursing*, 33(10), 456e464.
- [47] Choi H. and Johnson S. D. (2007). The effect of problem based video instruction on learner satisfaction, comprehension and retention in college courses. *British Journal of Educational Technology*: 38(5): 885-95.
- [48] Chang, C.Y., Lai, C. L. & Hwang G.J. (2018). Trends and research issues of mobile learning studies in nursing education: A review of academic publications from 1971 to 2016. *Computer and Education*; 116: 28- 48.
- [49] Ahsen NF, Batul SA, Imam SZ, Iqbal H, Shamshair K & Ali H. (2010). Developing counseling skills through prerecorded videos and role play: a pre- and post-intervention study in a Pakistani medical school. *BMC Med Educ* ;10:7.
- [50] Sun, Y., Pan, C., Li, T. & Gan, T. J. (2017). Airway management education: simulation based training versus non-simulation based training-A systematic review and meta-analyses. *BMC Anesthesiology*, 17(17); 1-7.
- [51] Conn,J.J., Lake, F.R., McColl, G.J., Bilszta, J. L. & Woodward-Kron, R. (2012). Clinical teaching and learning: from theory and research to application. *Medical Education Journal*; 196 (8): 527- 534
- [52] Bruniges, M. (2005). An evidence-based approach to teaching and learning. *Australian Council for Educational Research*: 102-105.