

Comparing Effects of Traditional and Multimedia Teaching of Vital Signs Assessment on Knowledge Acquisition of Nursing Students at Islamic University in Uganda.

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ABSTRACT

This study aims at comparing effect of traditional and multimedia teaching of vital signs assessment on knowledge acquisition of nursing students at IUIU. Quasi-experimental design was used for the study and a sample of 62 students were randomly selected. Knowledge acquisition levels of both the groups were compared using paired t - test and independent t- test.

The study findings revealed a statistically significant difference on knowledge, $t(30) = 4.42$, $p < 0.05$ (two tailed) acquisition after the multimedia intervention. Knowledge acquisition scores significantly improve after the traditional intervention and there was a statistically significant difference in knowledge, $t(30) = 7.99$, $P < .05$ (two tailed). There was no statistically significant difference between post-test knowledge scores of students in multimedia and traditional groups $t(60) = .061$, $P > .05$. The mean post-test knowledge of traditional ($M = 19.79$, $SD = 1.93$) was slightly higher than multimedia ($M = 19.76$, $SD 2.21$). Therefore, it was recommended that multimedia method should be enhanced and used in combination with traditional method when teaching complex procedures. The management of IUIU should provide more multimedia delivery tools such as television and videos in the skills laboratory to ensure delivery by tutors and learning by students at their extra time.

(Keywords: comparing effects, traditional and multimedia teaching, vital signs assessments, knowledge acquisition)

INTRODUCTION

Change in student population, increased use of educational technology and dramatic changes in the practice of nursing and health care policies have demanded new approaches to the transformation of nursing education (Sushma, 2013). Simpson (2003) discussed how technology has transformed nursing education and stressed that nursing instructors should consider incorporating technology into traditional nursing classrooms as a mechanism to enhance instruction. Rowland, Spasoff, and Tyler (2009) opined that in today's learning environment, traditional lecture-demonstration method may be boring and inadequate in stimulating and addressing the diverse need of contemporary learners.

Multimedia is the combination of various digital media types such as text, images, audio and video, into an integrated multi-sensory interactive application or presentation to convey information to the learners. By incorporating digital media into the system of education, students learn better since they use multiple sensory modalities. Multimedia allows students to view actual objects and realistic scenes, to see sequences in motion, and to listen to narration (Zhang, Zhou, Briggs and Nunamaker, 2006). In this regard, one aspect of nursing practice that is vital signs assessment, which is basic and fundamental responsibility of nurses, requires adequate preparation, good knowledge base, and innovative teaching method to serve the needs of variety of learners. It is one of the essential clinical skills to assess health and nursing students must have sufficient proficiency and the necessary conditions for exact measurements should be provided for them

(Brokalaki, Matziou, Gymnopoulou, Galanis, Brokalaki and Theodossiades, 2008).

Skills acquisition is an important desired outcome of teaching in nursing schools. Providing sufficient quality experience to develop competence has been recognized as a problem in skills acquisition (Goldsmith, Stewart and Ferguson, 2006). Over the past several years, nurse tutors use variety of traditional teaching method in order to help students learn and acquire skills before practice in clinical setting.

Recently, the advancement in information and communication technology provides further opportunities for presenting variety of nursing procedures in multimedia form (Nursing skills and technology center, 2015). While there are many views about how clinical skills should be taught (Stayt and Merriman 2012), there remains little consensus on the most appropriate method for teaching such skills. The international literature proposes a number of nomenclatures for skills in nursing (DeBourgh 2011). These include use of the words 'motor skill', 'psychomotor skill', 'affective skill', 'clinical skill' and 'practical nursing skills'. The principal components of skill should include, psychomotor, affective and cognitive ability and these sub-categories should be synthesized to form a comprehensible model of what constitutes competency (DeBourgh, 2011). The cognitive element of clinical skills development refers to the knowledge, intellectual abilities and the processes necessary to perform the clinical skill (Saididen and Kneebone, 2012).

The Nursing and Midwifery Council (2008a; 2010) clearly stipulated that nurse education programs should use evidence- based practice and ensure that teaching approaches address the learning needs of the diverse student population. Nursing education needs to play its key role in training innovative, committed, responsible students, so that they can effectively acquire skills, take different roles and critical nursing duties in different situations (Marlin, Muhammad and Ghader, 2013).

In Uganda, the bodies responsible for training and licensing student nurses to practice when qualified have taken step forward embracing the use of multimedia such as video, power point shows and simulation by including the listed multimedia teaching tools in the curriculum and also emphasizing on the need for the training institution to train their tutors for using the tools (Diploma in nursing curriculum, 2012). However, research needs to be carried out to determine the

effectiveness and suitability of such multimedia tools.

Statement of the Problem

As part of transforming nursing education to meet the emerging challenges and practices, it is advocated that teachers use a variety of teaching methods and instructional materials to teach the 21st century nursing students (Vaughn and Baker, 2001). Many universities in developed countries have responded positively and embraced the use of multimedia or video based instruction to both conventional and distance learning nursing education. However, the most common mode of instruction in most schools of nursing in developing countries is mainly through the conventional lecture- demonstration method that involves the use of black or white board with chalk or marker and the use of artificial model or fellow students for demonstration of skills in the laboratory. It has the advantage of being cheap/economical, with the teacher in control (Saalu, Abraham and Aina, 2010), but method has some drawbacks such as lack of feedback, boring and lacks stimulus for learning (Rowland, Spasoff and Tyler, 2009).

In school of nursing at IUIU, most tutors use the traditional method with a few gradually responding to the global call to suit the learning needs of the contemporary students by using computer-aided instructional (CAI) materials such as PowerPoint, video and audio clips for teaching and demonstration of nursing procedures. The use of different methods of teaching by different tutors exposes the students to variety of ways of acquiring skills. However, students tend to develop more interests and readiness to learn especially when the tutors use multimedia or video clips while some students remain less interested and less attentive when the tutors use traditional method.

These new technologies (computer assisted learning and multimedia programs) have been said to have advantages over conventional lecture-demonstration methods (Rowland et al. 2009). However there is no clear evidence that multimedia can improve students' skills acquisition (Ford, Mazzone and Taylor, 2005). Romanov and Nevgi (2007) opined that the results are rather mixed. Hence, it is important to study the comparative effect of the use of traditional and multimedia teaching of vital signs assessment on skills acquisition of nursing students at School of Nursing, Islamic University in Uganda.

Objectives

The specific objectives of the study are to:

- i. determine the effect of multimedia teaching of vital signs assessment on knowledge acquisition of nursing students at IUIU.
- ii. examine the effect of traditional teaching of vital signs assessment on knowledge acquisition of nursing students at IUIU.
- iii. compare the effect of traditional and multimedia teaching of vital signs assessment on knowledge acquisition of nursing students at IUIU.

Research Hypotheses

The study was guided by the following research hypotheses:

H_a: There is no statistically significant difference between knowledge acquisition of nursing students before and after multimedia teaching of vital signs assessment in IUIU.

H_b: There is no statistically significant difference between knowledge acquisition of nursing students before and after traditional teaching of vital signs assessment in IUIU.

H_c: There is no statistically significant difference between knowledge acquisition of nursing students after multimedia and traditional teaching of vital signs assessment in IUIU.

Content Scope

The study focused on comparing effect of traditional and multimedia methods of teaching vital signs assessment on knowledge acquisition of nursing students at IUIU. The vital signs assessment covered were temperature, pulse, respiration and blood pressure measurement.

Significance of the Study

The completed study is hoped to be useful in the following ways:

- i. Findings of the study would be beneficial to educational stakeholders, that is, the University management and the nursing organization bodies like Ugandan Nurses' Examinations Board and Ugandan nurses and midwifery council in planning and implementing instructional policies

that will facilitate students' skills acquisition during teaching and learning process.

- ii. The study finding would benefit the students and tutors to modify and strengthen their teaching and learning process. This is expected to suit the learning needs of the contemporary learners while still maintaining the expected standard.
- iii. The result of the study adds to the existing literature and avenue for further research.

MATERIALS AND METHODS

Research Design

In order to achieve the objective of the study, quasi-experimental design, specifically two groups pre-test and post-test design was used. This design allowed collection of data before and after the intervention; appropriate for measuring change, differences between groups and change within groups (Burns & Grooves, 2011).

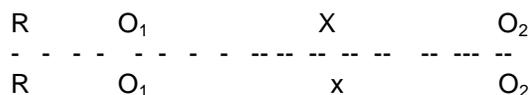


Figure 1: Two group Pre-test Post-test design.

Where R = randomization, O₁ = first observation (pre - test) O₂ = second observation (post - test) X = treatment.

Experimental and Control Interventions

The treatments used in this study focused on teaching and demonstrating vital signs assessment using the traditional and multimedia method. Two groups were used in the study. In all the groups the duration of the treatment was 2 hours per day to cover 2 days in a week but the content of the treatment differed. The multimedia group, which is the experimental (group A), received multimedia lectures and demonstration of vital signs assessment. In this group, the researchers did not carry out live demonstration.

The traditional group which is the control (group B) consisted of participants who were taught using lectures in the classroom and demonstration of the skills in the laboratory by the researchers.

The study was conducted over four weeks. During the first week of the study, all participants were required to provide written informed consent and basic demographic information. Pre-test was given to the participants and they were randomly divided into two groups, experimental group (multimedia teaching method) and control group (traditional teaching method). The students and the researchers agreed on the intended time, 4 hours in two days each week.

During week two of the study, students of experimental group received multimedia lectures and demonstration of taking temperature pulse and respiration which was repeated by the participants in the group. The control group also received lectures on temperature, pulse and respiration in classroom and live demonstration in skills laboratory by the researchers also repeated by the members of the group. The two groups received the treatment on separate days and time in the week. Each group got a total of 4 hours in the week.

During week three of the study, participants in experimental group received multimedia lectures and demonstration of measuring blood pressure. The control group also received lectures on blood pressure in classroom and live demonstration in skills laboratory which was repeated by the students. Again, each group received a total of 4 hours with the researchers in separate sessions in the week. During week 4 of the study, students took written test related to the intervention using the developed instruments.

Population and Sample Size

At the time of this study, the school of nursing in UIIU had total enrolment of 397 students. The researchers selected the sample for the study from the population taken into consideration below exclusion and inclusion criteria.

Inclusion criteria are the characteristics that the subjects possess. That is, students who were traditionally taught (lecture-demonstration) vital signs assessment and acquired some skills, students who were not highly exposed to clinical experience that lead to mastering of skills to be measured and students who voluntarily consented and accepted to be part of the study.

Exclusion criteria are those characteristics that can cause a person to be excluded from the target population. That is, students who were not exposed to traditional teaching of vital signs assessment, students who were exposed to

traditional teaching of vital signs assessment and have undergone series of clinical posting/experience and lastly students who do not accept and consent to participate in the study.

Taking into consideration the above inclusion and exclusion criteria, students that qualified to be included were 2nd year certificate nursing students. The total population of the students in the class is sixty seven (67), considering the population, the researchers decided to select all the sixty (67) as census for the study. However, out of the 67 that initially agree to participate in the study, 5 participants (3, from experimental, 2 from control group) withdrew from the study giving an attrition rate of 8% and 6% for the experimental and control group respectively. A total of 62 participants (n = 31, experimental and n = 31 control) was used. The sample retention was 91% and 93% for the experimental and control group, respectively.

Sampling Technique

Simple random sampling was used to allocate the students to experimental and control group. The researchers formed a sampling frame (a list of students in the class) and numbered them consecutively. Table of random number was used to randomly allocate students to the groups.

Data Collection Methods and Instruments

Data was collected for the study using self-developed instrument (paper and pencil test).

Paper and Pencil Test Instrument

Paper and pencil test was used to measure cognitive skills of the study subjects before and after the intervention. It is divided into two sections, section A deals with socio-demographic characteristics (sex and age) of the respondents while section B consists of four (4) true/ false, four (4) fill in the blanks and eighteen (18) multiple choice questions, all question carry equal mark (1) with a total score of 22 marks. The choice of the method is in line with recommendation of Vinson (2015) who suggested that fill in and multiple choice questions are appropriate for measuring cognitive aspect of learning.

Procedure of Data Collection

The researchers received a written introductory letter from the Dean of Faculty Education at Islamic University in Uganda to the Principal Tutor. The researchers met with the principal tutor and the Tutor in charge of skills laboratory and brief them about the research and sought for their permission. After obtaining permission, the researchers identified and met the class concerned, explained the purpose of research and sought for consent and permission to participate in the study. paper and pencil (cognitive test) was conducted in a class room.

Data Quality Control

The data quality control methods were ensured through the following:

Validity

To establish validity, the developed instruments were subjected to the scrutiny by experts (Nurse Academicians and clinicians) for them to evaluate the relevance of the items in the instruments. The experts' agreement with the content and their recommendations were used to finally modify questions and format of the tools. Out of 25 questions, 22 were found relevant. The content

validity index (CVI) was computed and the result obtained was 0.88.

Reliability

The reliability of the paper and pencil test instrument was determined using test- retest reliability. 10 nursing students who were not part of the sample for the study were served the instruments twice at a week interval. The responses of the students were correlated using Cronbach's Alpha coefficient. The result obtained was 0.72. This showed that instrument is reliable.

Methods of Data Analysis

After the marking of the paper and pencil test, scores of the students were generated. The scores were coded and entered into Statistical Package for Social Sciences (version 20). Analysis was done using descriptive statistics (frequency, percentage, mean and standard deviation) and inferential statistics (paired t- test and independent t-test). Research objectives 1& 2 were analyzed using paired sample t-test (comparing pre and post- test mean of dependent sample) while research objective three was analyzed using independent t-test (comparing post-tests of the two groups). Results of the analyzed data were presented in tables.

RESULTS AND DISCUSSION

Table 1: Gender Distribution of Groups

		Gender		Total
		Male	Female	
Experimental	Frequency	12	19	31
	Percentage	38.7%	61.3%	100.0%
Control	Frequency	13	18	31
	Percentage	41.9%	58.1%	100.0%
	Frequency	25	37	62
Total	Percentage	40.3%	59.7%	100.0%

Source: Pimary data (2015)

Table 2: Participants Age Distribution.

		Age		Total
		18-25	26-32	
Experimental	Frequency	23	8	31
	Percentage	74.2%	25.8%	100.0%
Control	Frequency	26	5	31
	Percentage	83.9%	16.1%	100.0%
Total	Frequency	49	13	62
	Percentage	79.0%	21.0%	100.0%

Source: Primary data (2015)

Results presented in the Table 1 above indicates that the highest number of students in the experimental group were female with 19 (61.3%) followed by male who were 12 (38.7%). Similarly in the control group the highest number of participants in control group were female 18 (58.1%) followed by male 13 (41.9%). In the entire group female were the majority with a total of 37 (59.7%) participants. This may not be unusual because female folks constitute the majority of the nurses population in various parts of the world. Studies of Sok et al. (2014) showed most of the participants were female (89.5%); but unlike Schuttz (2011) study, all participants were female.

From the results in Table 2 above, the majority of the students in the experimental group are between 18-25 years old representing 23 (74.5%) followed by 26-32 representing 8 (25.8%). In the control group the age range 18-25 was represented by 26(83.9%) followed by 26-32 years old represented by 5 (16.1%).

The age range with the highest frequency in experimental and control group was 18-25 represented by 49 (79.0%). This may be due to the fact that the majority of certificate nursing students are students who had just completed their senior four.

In Schuttz's (2011) study, the Mean age for traditional classroom lecture was 24.8 (SD ± 6.9), while the mean age for computer-assisted instruction participants was 26.4 (SD ± 9.2). This confirms that the majority of the admitted students in schools of nursing were adults.

As indicated in Table 3a, the mean knowledge score of students in experimental group before the intervention was (M = 17.26, SD = 2.97) compared to mean knowledge score of students after the intervention (M = 19.758, SD = 2.2131) the student's knowledge score was higher after the intervention. The mean standard error of the post-test (.3975) is lower than the mean standard error of the pre-test (.5332). The statistics indicates that the students' skills acquisition improved significantly after the intervention.

A paired sample t-test was conducted to evaluate the impact of the multimedia on students' knowledge scores. There was a statistically significant increase in students' knowledge scores from "before" (M = 17.26, SD = 2.97) to "after" (M = 19.758, SD = 2.21), $t(30) = 4.42$, $p < 0.05$ (two tailed).

The mean increase in knowledge scores was 2.5000 with a 95% confidence interval ranging from 1.3449 to 3.6551. The eta squared statistics (39.4%) indicated a large effect size. Therefore, the null hypothesis was rejected. Hence, multimedia method is effective in improving the knowledge scores of nursing students.

The finding of this study is in agreement with Desalu, et al. (2013) which shows the total mean percentage score of asthma knowledge increased significantly from pre intervention to post intervention. Research Findings of Diomidous, (2005) concur with the finding of this hypothesis as his results also proved the efficiency of Multimedia in teaching the rather difficult subject of Epidemiology. Finding Further support the views of Holzinger, Kickmeier-Rust and Albert (2008) and Ahmadi, et al. (2011).

Table 3a: t-test Effect of Multimedia Intervention (Knowledge Paired Samples Statistics).

		Mean	N	Std. Deviation	Std. Error Mean
Pre Test Knowledge scores EXP		17.258	31	2.9689	.5332
Post Test Knowledge scores EXP		19.758	31	2.2131	.3975

Source: Primary data (2015)

Table 3b: t-test Effect of Multimedia Intervention (knowledge Paired Samples Test).

	Paired Differences					t	df	Sig.(2-tailed)
	Mean	Std. Dev	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Post Test Knowledge scores EXP - Pre Test Knowledge scores EXP	2.5000	3.1491	.5656	1.3449	3.6551	4.420	30	.000

Source: Primary data (2015)

Table 4a: t-test Effect of Traditional Intervention (Knowledge Paired Samples Statistics).

	Mean	N	Std. Deviation	Std. Error Mean
Pre Test Knowledge scores Traditional	16.290	31	2.1900	.3933
Post Test Knowledge scores Traditional	19.790	31	1.9269	.3461

Source: Primary data (2015)

Table 4b: t-test Effect of Traditional Intervention (Knowledge Paired Samples Test).

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Post Test Knowledge scores Traditional - Pre Test Knowledge scores Traditional	3.5000	2.4393	.4381	2.6053	4.3947	7.989	30	.000

Source: Primary data (2015)

Table 5a: t-test Comparison of Post Test Knowledge Scores of Experimental and Control (Group Statistics).

	GROUPS	N	Mean	Std. Deviation	Std. Error Mean
Post Test Knowledge scores Group A & Group B	Experimental	31	19.76	2.213	.397
	Control	31	19.79	1.927	.346

Source: Primary data (2015)

Table 5b: t-test Comparison of Post Test Knowledge Scores of group A & group B (Independent Samples Test).

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Dif	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Post Test Knowledge Group A & B	Equal variances assumed	.049	.826	.061	60	.951	.032	.527	-1.086	1.022
	Equal variances not assumed			.061	58.89	.951	.032	.527	-1.087	1.022

Source: Primary data (2015)

Table 4a showed that the mean knowledge scores of students in traditional teaching group increases significantly from (M = 16.29, SD 2.19) to mean knowledge score of (M = 19.79, SD = 1.93). The mean standard error of the post-test (.3461) is lower than the mean standard error of the pre-test (.3933).

A paired samples t-test was conducted to evaluate the knowledge scores. There was statistically significant increase in students knowledge scores from "before" (M = 16.29, SD = 2.19) to "after" (M = 19.79, SD = 1.93), $t(30) = 7.99$, $P < .05$ (two tailed). The mean increase in knowledge scores was 3.500 with a 95% confidence interval ranging from 2.61 to 4.39. The eta squared statistics (68%) indicated a large effect size. Therefore, the null hypothesis was rejected. Hence, traditional method was effective in improving knowledge scores nursing students in traditional group. Hill (2002) found that the lecture method is most effective in the cognitive domain. Similarly findings of Jeffries et al. (2003);

and Heravi, et al. (2004) are in agreement with the finding of this study as the learning rate of participant increased significantly after the intervention.

Chalton (2006) opined that lectures are probably the best teaching methods in many circumstances and for many students; especially for communicating conceptual knowledge and where there is a significant knowledge gap between lecturer and audience. The increase in knowledge scores as obtained in this study also concur with the views of Royse and Newton (2007). Also, in agreement with this finding is the study by Namnabati, et al. (2011). The researchers concluded that the lecture method keeps its standing point and value in the educational system. Similarly this finding is in agreement with Dal and Sarpkaya (2013) who found out that the average CPR knowledge score of students increased after the CPR lecture.

Independent sample t-test was used to determine if the post-tests knowledge scores of nursing students in multimedia and traditional lecture method differed significantly. The results as illustrated in table 5a above showed the mean scores (M = 19.76, SD 2.21) for multimedia lecture and (M = 19.79, SD = 1.93) for traditional lecture. The mean standard error of the post-test control group (.346) is slightly lower than the mean standard error of the experimental post-test (.397). This means that the scores of participants in both the groups were not too different.

An independent-samples t-test was conducted to compare the post test knowledge scores for group A and group B. There was no significant difference in scores for group A (M = 19.76, SD 2.21) and group B (M = 19.79, SD = 1.93); $t(60) = .061, P > .05$, the null hypothesis was not rejected. Therefore, there was no statistically significant difference in knowledge scores of nursing students in multimedia and traditional teaching method after the intervention. Meaning both groups acquire cognitive skills as a result of the intervention. Hence, multimedia and traditional method were both effective in improving knowledge scores of nursing students in IUIU.

The study finding that show no statistically significant difference is in agreement with the findings of Kim, et al. (2003) which indicates no significant difference between the two groups in self-learning measures. Similarly the finding is in agreement with that of Bloomfield et al. (2010) which found that the hand washing knowledge test scores showed no differences between the control and the experimental group. In another related finding Sushma (2013) indicated that there was no statistically significant difference between group A and B. Furthermore a finding of the study is similar with the finding of Siavash, et al. (2011), Hall (2013) and Sadeghi, et al. (2014) all reported no statistically significant difference between the post-test knowledge scores of the experimental and control group.

Findings that are not in agreement with the finding of this study include research findings of Kermaniyan et al. (2008) that found significant difference between experimental and control group. Similarly Ackerman (2009) post-test scores found that the experimental group demonstrated significantly higher scores for acquisition of CPR knowledge. Lastly Marlin, et al. (2013) in measuring (post-test) mean score of lecture group found a higher score than that of multimedia

software group and there was a significant difference between the two groups.

CONCLUSIONS

The results obtained showed clearly students' knowledge acquisition was significantly higher after the intervention than before the intervention in traditional and multimedia teaching methods. In both teaching methods knowledge acquisition scores of students were not significantly different. The two methods of teaching improved students' knowledge acquisition. Therefore, the two teaching methods used in this research were effective at improving cognitive skills acquisition of nursing students in IUIU.

Suggestions for Further Research

The following areas are suggested for further research:

- Research on perception, satisfaction and preference of nursing students on multimedia and traditional method of teaching.
- Nursing students' perception of their skills acquisition using multimedia in teaching theory and practical.

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SUGGESTED CITATION

Inuwa, A., L.A. Nafiu, H.Habu, M. Matovu, and B. Maigari. 2017. "Comparing Effects of Traditional and Multimedia Teaching of Vital Signs Assessment on Knowledge Acquisition of Nursing Students at Islamic University in Uganda". *Pacific Journal of Science and Technology*. 18(1):215-226.

 [Pacific Journal of Science and Technology](http://www.akamaiuniversity.us/PJST.htm)