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Full Length Research

EFFECT OF ANIMATED BASED INSTRUCTION ON THE PERFORMANCE OF MEDICAL STUDENTSIN GOMBE STATE UNIVERSITY

Nasruddeen, Abubakar,[1] Newton, Barka[2] and Sani, Musa[3].

[1]Department of Industrial Design, Faculty of Environmental Science, Modibbo Adama University, Yola, Adamawa State, Nigeria.Email: nasruddeenah@mau.edu.ng/08034629113
[2]Department of Vocational Education, Faculty of Education, Modibbo Adama University, Yola, Adamawa State, Nigeria. Corresponding author: newtonbraxtakson@gmail.com/08165987900
[3]Department of Industrial Design, Faculty of Environmental Technology, AbubakarTafawa Balewa University, Bauchi, Nigeria. Email: sanimusa157@gmail.com

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The study determined the effect of animated based instruction on the performance of medical students in Gombe State University. Animated visuals in medicine explicitly explain general activity and motion of human body and its organs as instructional aid. The aim of this study is to determine the effect of animated based instruction on the performance of medical students. Non-availability of 3D Interactive Learning triggered the need to carry out a wider research. Quantitative approach (quasi-experimental and descriptive research design) was used to determined pre-performance test of pre-clinical students of medicine, post-performance test and perception of students from medicine and pharmacy on the use of animated visuals as instructional aid. A structured questionnaire was designed for data collection which addressed the perception of the students. The result showed that pre-test performance of the students is below average as indicated by mean value of 48.76 %, and post-test performance of the students is above average as indicated by mean value of 65.45 %, these vindicated that there is significant difference as indicated by t-statistics of 8.102 and p-value of 0.000 are within the recommended threshold of 1.96 minimum and 0.05 maximum respectively, meanwhile, the mean difference is 16.684 % with post-test having the upper scores. The perception of medical students on learning indicated the mean scores of 4.13 to 4.58, while on best mode for teaching anatomy the result indicated mean ranking of 1.30 to 2.22,which showed the students agreed that Animated Based Learning (ABL) is better than traditional didactic learning (TDL); it gives better knowledge of anatomy, it promotes better students participation in learning process, and is more effective in fulfilling learning objectives. Therefore, the study concluded that the intervention of animated based learning for medical students is effective and significant. The study also recommends the Provision of 3D Interactive Learning tools; Medical colleges should have curriculum evaluation mechanism that will embrace dynamics of modern teaching.

Keywords: Effect, Animated Visual, Method of Instruction, Academic Performance,didactic lectures and Medical students

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INTRODUCTION

Teaching and learning are important events in the life of an individual. Teaching is effective when a learner understands what is being taught (Josh, 2016). According to Sajjad (2013) teaching and learning are the two sides of a coin. The most accepted criterion for measuring good teaching is the amount of student learning that occurs. Medicine may be one of the most interesting and important field of Science, but it is extremely difficult to study. Although, learning

a main concept may be sufficient in other disciplines, medical students must learn many details, understand all relevant mechanisms; study hundreds of pages and attempt to remember them forever (Cingi, 2013).

Medical students must also be acclimatized with methods, concepts, and contents from one or more of the humanities' disciplines to investigate illness, pain, disability, suffering, healing, therapeutic relationships, and other aspects of medicine and healthcare practice. With the advent of Technology people now embrace computer aided designs to address problem of traditional teaching (chalk and talk) methods. Proper use of animation can bring into the class inaccessible processes, materials, events, objects, changes in time, speed and space (Kwasu, 2015). A good visual impact is better than the descriptive lectures based on words. Animation is a developing and interesting visual communication instrument; with multipurpose functions such as entertainment, information, advertisement and education (Josh, 2016).

The major limitation of traditional method of teaching is that the listener passively receives the materials and feels bored and sleepy. According to Mayer (2003), there is empirical evidence that the verbal only method does not always work so well. Their research shows, on average, that students who listen to (or read) explanations that are presented solely as words are unable to remember most of the key ideas and experience difficulty in using what was presented to solve new problems.

Animation as instructional tool will make students experience powerful, it will provide the cognitive and emotional impact they need for knowledge retention. Learning is best achieved when a lecture is coupled with a motion picture, because this combination provides a reference point from which students can appreciate the knowledge presented in the motion picture (Paivio, 1991). Animated visuals simulate the actual living situation, thereby making real an otherwise. Students in general confirmed that animations are beneficial to learning, and were a good media to explain concepts more clearly, it improves understanding of the content of topics, they also pointed out that animations were particularly helpful in explaining complicated and dynamic concepts which were otherwise difficult to represent through mere text or static images. In addition, some students became more interested in learning, and admitted that animations facilitated memorizing of content Hwang, *etal.* (2012).

According to Berk (2010) multimedia verbal and visual stimuli increase memory, comprehension, understanding, and deeper learning than either stimulus by itself. Learning in the pictorial conditions tested (video and audiovisual) was superior to learning in the verbal (audio) conditions. A well designed animated visual will enhance learning and improve and facilitate teaching. The expressive, illustrative, descriptive and narrative potentials of the materials will be greatly enhanced.

This research is undertaken on the assertion that current innovations in medical graphics especially animated visuals have positive effect and impact on teaching and learning, as indicated by several studies within and outside Nigeria. Therefore, there is need to conduct this research for medical students in Gombe state university. Adoption of this teaching aid will have strong and positive impact on students because according to Hwang, *etal.* (2012) animated visuals could explain complicated contents more explicitly to students.

Statement of the Problem

Inadequate adoption of new instruction and learning methods in tertiary institutions, like the use of animated visuals as instructional resources paved the way and encouraged the use of traditional teaching and learning methods (Roopashree, Tiwari&Niranjana, 2013). This challenge could be effectively approached through good graphic design input through animations. Studies conducted by Azu and Osinubi, (2011); Abdulraheem, Musa, Oladipo, (2010); Saalu*et al*. (2010); Onasanya. (2002); Yisah.(2008); Onasanya*et al*. (2010); Salisu, (2015); Kwasu and Ema. (2015) indicates the use of animated visuals in teaching; however none of these studies considers undergraduate medical students in Gombe state University.

Purpose of the Study

1. Assess the level of students' pre-performance test towards traditional didactic lectures to medical students in Gombe state university.
2. Determine the level of students' post-performancetesttowards Animated Based Learning as instructional aid.

Research questions

1. What is the level of medical students' pre-performance test in Gombe state University?
2. What is the level of post-performance test for medical students in Gombe state University?

Theoretical Framework

Research on learning with animations and pictures has been conducted from different theoretical perspectives; this study is based on Mayer (2002) Aids to computer-based multimedia learning.Mayer‘s theory opine that learner is a constructor of his or her own knowledge, actively select, organize, and integrate relevant visual and verbal information. However, the theory considers that students are able to create a deeper understanding of words when they establish connections between verbal and visual representations.

Medical illustrations

A medical illustration is a form of biological illustration that helps to record and disseminate medical, anatomical, and related knowledge. Medical illustrations have been made possibly since the beginning of medicine in any case for hundreds (or thousands) of years. Many illuminated manuscripts and Arabic scholarly treatises of the medieval period contained illustrations representing various anatomical systems (circulatory, nervous, and urogenital), pathologies, or treatment methodologies (Crosby, 1991). These plates portray Medical illustrations from early stages to modern form of illustration, plate I&II shows low quality illustrations of a transverse cut exposes an intricate view of the organs of the spinal column and surgical repair of the bronchus the Mayor technique for removing a cancerous goiter respectively.

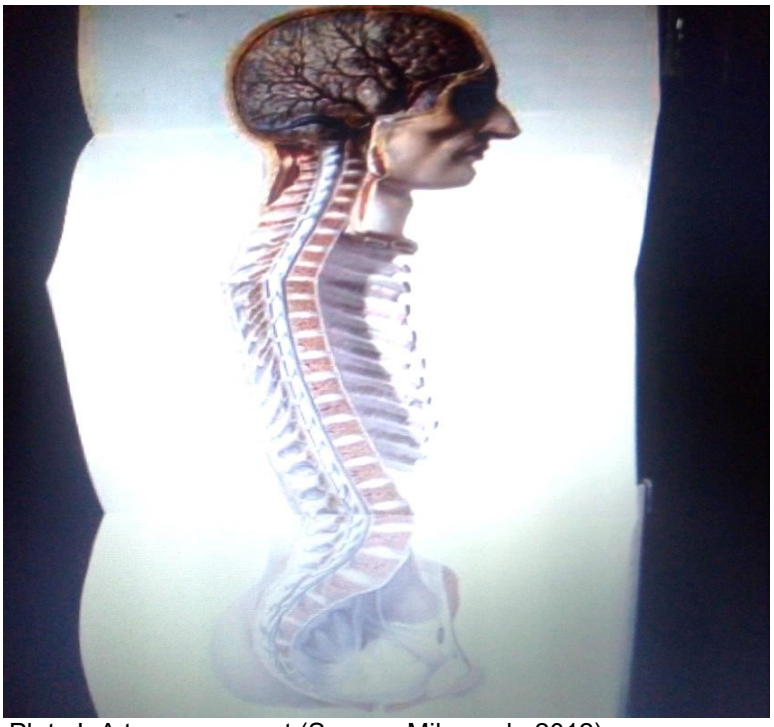


Plate I: A transverse cut (Source: Miksanek, 2012).

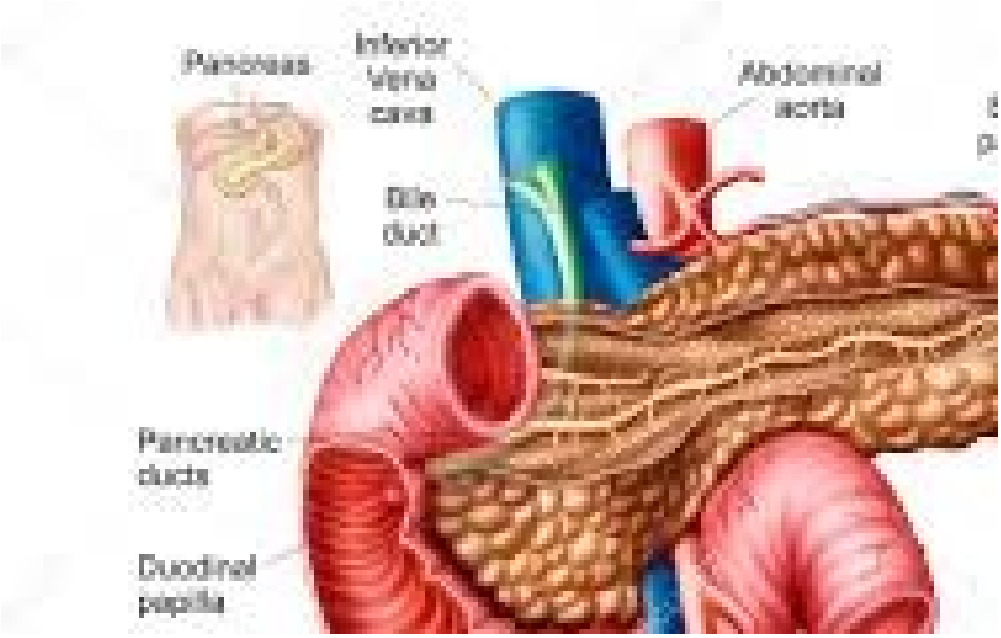
Plate II: Removing a Cancerous Goiter(Source: Miksanek, 2012)

From plate III to plate VII are of high quality with more details and sections which enhances teaching and learning better than low quality illustration.

Plate III: The Eye (Source: Mills, 2017)

Plate IV: Section of a Face (Source: Mills, 2017)

Plate V: Anatomy of a Hand (Source: Mills, 2017)



Animation in Instruction and Learning

According to Hwang, *et al.* (2012) dynamic concepts are difficult to explain in traditional media such as still slides. Animations seem to have the advantage of delivering better representations of these concepts. A wide range of subject areas such as chemistry and computer sciences are currently using animation to demonstrate their course contents. Similarly, animation can be applied in the study of physiology, such as presenting modules covering the respiratory, muscular,cardiovascular, urinary, and nervous systems. There are, however, limitations concerning the use of animations in teaching and learning. Designing and developing quality animations for teaching and learning can be challenging. Fast-paced animations would impose difficulties to the students in observing detailed procedural information.One of the most difficult aspects of teaching is communicating ideas effectively. When this becomes too difficult using the classical teaching tools (speech, blackboard etc.) animation can be used to convey information. From its nature, an animation sequence contains much more information than a single image or page of text. This and the fact that an animation can be very “pleasing to the eye” which make animation the perfect tool for learning. A good example of the use of animation for learning is Astrophysicists for Supercomputing Effect; work with artists, in order to explain some phenomena which cannot be seen such as the visualisation of the gravitational field of a black hole. The latter is not visible as it absorbs all light that falls onto it. The only way of experimenting with it is to animate it on a computer (Tan, 2016).

METHODOLOGY

The study used quantitative (quasi-experimental and descriptive) research design because it is survey and experimental. Survey considers issues such as economy of the design, rapid data collection and ability to understand a population from a part of it, suitable for extensive research. While experimental is a sure way to establish cause-effect relationship (Usman, 2015). This study was carried out in the Medical school of Gombe State University.GombeStatewas formed in October 1996 from part of the old Bauchi State by the Abacha military government, located in the north eastern zone, the state shares common borders with the states of Borno, Yobe, Taraba, Adamawa and Bauchi. Gombe State is located between latitude 10° 15 N and longitude 11° 10 E,and has 11 Local Government Area.

The state has an area of 20,265 km² and a population of around 2,365,000 people as of 2006 (2006 Population census).

***Figure 1*:** Map of Gombe LGA (Source: Google map 2016)

The population of the study covered 200, 300, 400, and 500 level Medical and Pharmacy students in college of Medical sciences of Gombe State University.The study adopted the approach of using published tables of Krejcie and Morgan (1970), the sample frame covered by the population of the study is 250 and the sample size is 152.

Sampling techniques are appropriate means of selecting the right number of the sample size from the population of the study (Kothari, 2004). Therefore, the study used Simple Random sampling technique to ensure that each member of the target population has equal and independent chance of being included in the sample as used by Roopashree*et al,*(2013). Quasi-experimental design was used for both pre-performance test (objective 1) and post-performance test (objective 2) for 38 students of medicine (pre-clinical) in order to estimate the causal impact of intervention on animated visuals.A structured questionnaire was designed for data collection which addressed the study (objective 3), 152 questionnaires were distributed and 110 retrieved and analysed which is 88% of 152, the study failed to retrieve only 12%. The questionnaire was designed to appeal to respondents' ease of reading, completing and coding. The design incorporates the use of only close-ended questions opinedby Likert scale to ease the means of assessing the respondents (Kothari, 2004).

The data collected was analyzed using descriptive method (mean and standard deviation), they were compared and analyzed to indicate the effectiveness of animated visuals in teaching medical students, and Paired sample t-test was used to compare the result of the pre-test result and the post-test result of medical students of Gombe state university.

RESULTS

Research Question one:

What is the level of medical students' pre-performance test in Gombe state University?
In order to answer the above research question, the performance of pre-test is collected and presented in histogram as shown in figure 3 below.

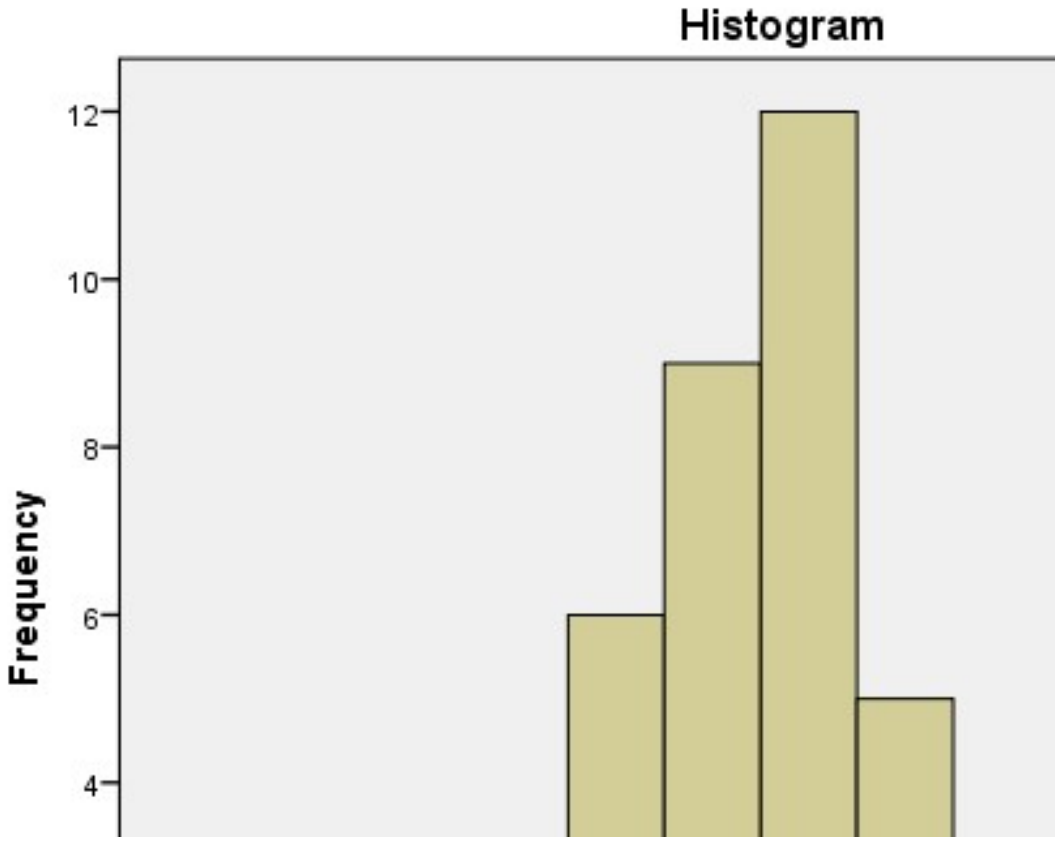


Figure 3: Pre-test result of Medical students in Gombe state university
Field Survey (2019)

Figure 3 shows the pre-test result of medical students in Gombe state university. The figure shows that more than 50 percent of the distribution range from 40 percent to 60 percent with 50 percent to 55 percent having the highest frequency. This shows that the pre-test performance of the students is below average as indicated by mean value of 48.76 percent.

Table 5 below shows the measures of central tendency of the pre-test result. The table shows the average pre-test result of 48.76 with median score of 50 percent with the lowest mode of 43 percent. This result shows that the pre-test performance of medical students of Gombe state university is below average.

Table 1: Pre-test result statistics

Measures	Statistics
Mean	48.76
Median	50.00
Mode	43[a]
Skewness	-1.166
Std. Error of Skewness	.383
Kurtosis	1.922
Std. Error of Kurtosis	.750
Minimum	23
Maximum	61
Sum	1853

Field Survey (2019)

Additionally, the distributions of the scores were normally distributed as indicated by Skewness and kurtosis values all within the recommended values of +/-2 (George & Mallery, 2010).

Research Question two:

What is the level of post-performance test for medical students in Gombe state University?
In order to answer the above research question, the performance of post-test is collected and presented in histogram as shown in figure 4.

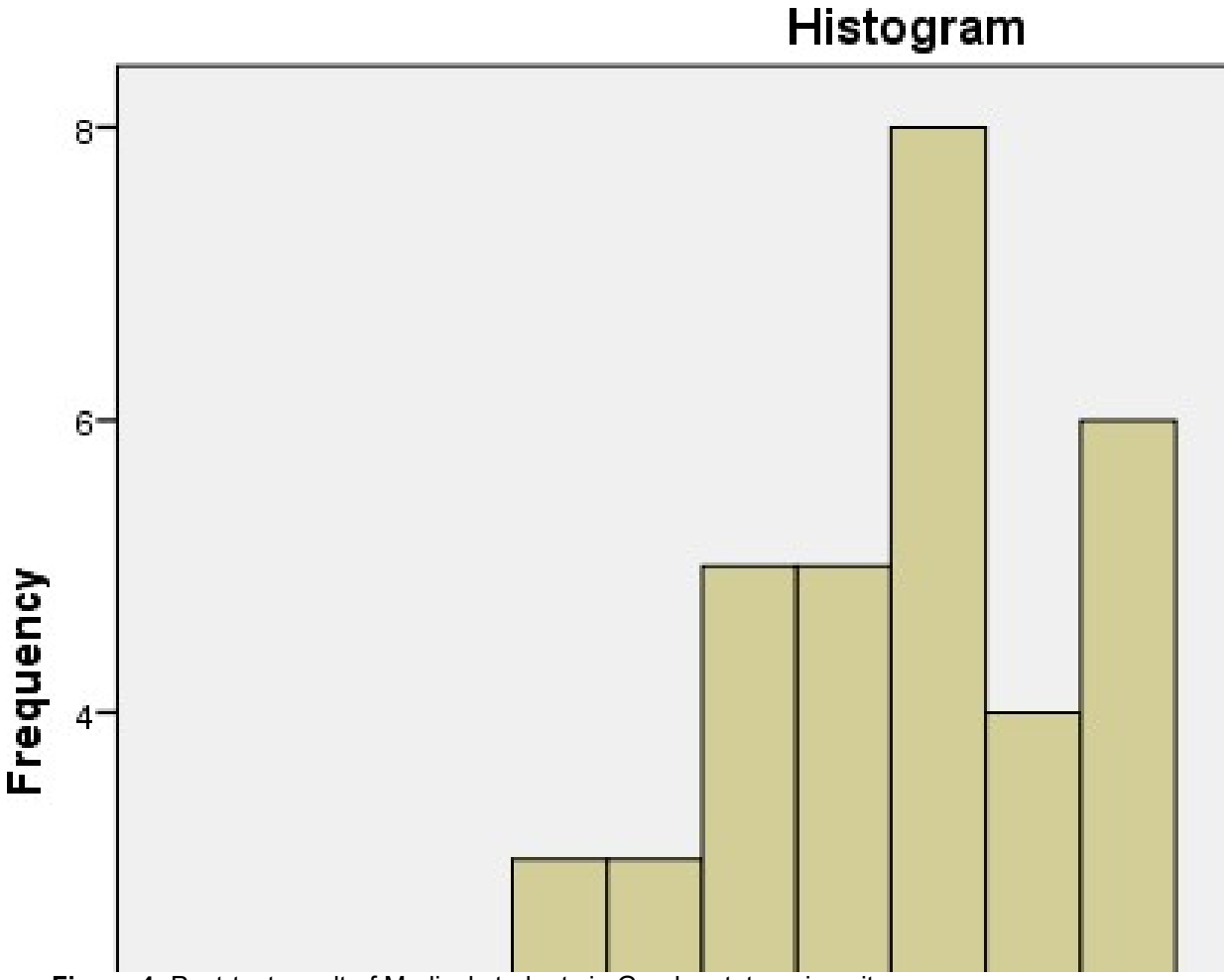


Figure 4: Post-test result of Medical students in Gombe state university
Field Survey (2019)

Figure 4 shows the post-test result of medical students in Gombe state university. The figure shows that more than 50 percent of the distribution range from 50 percent to 80 percent with 70 percent having the highest frequency. This shows that the post-test performance of the students is above average as indicated by mean value of 65.45 percent.

Table 6 below shows the measures of central tendency of the post-test result.The tableshows the average post-test result of 65.45 with median score of 67 percent with the lowest mode of 68 percent. This result shows that the post-test performance of medical students of Gombe state university is above average.

Table 2: Post-test result statistics

Measures	Statistics
Mean	65.45
Median	67.00
Mode	68[a]
Skewness	-.383
Std. Error of Skewness	.383
Kurtosis	-.562
Std. Error of Kurtosis	.750
Minimum	40
Maximum	84
Sum	2487

Field Survey (2019)

Additionally, the distribution of the scores was normally distributed as indicated by Skewness and kurtosis values all within the recommended values of +/-2 (George &Mallery, 2010).

To compare the result of the pre-test result and the post-test result of medical students of Gombe state university, Paired-sample t-test was conducted in order to determine whether there is significant difference in the pre-test and post-test performance of medical students of Gombe state university. The paired sample t-test is presented in table 7.

Table 7: Paired-Sample T-test

	Paired Differences					t	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference			
				Lower	Upper		
Post-testresult – Pre-testresult	16.684	12.694	2.059	12.512	20.857	8.102	0.000

Paired sample t-test measures if there is significant difference between two distinct variables. Therefore, this test establishes if there is significant difference between the pre-test result and post-test result. The result shows a mean difference of 16.684 percent with post-test having the upper scores. This difference is statistically significant as indicated by t-statistics of 8.102 and p-value of 0.000 and within the recommended threshold of minimum of 1.96 and maximum 0.05 respectively (Pallant, 2011). This result shows that the intervention of traditional methods of learning and animated based learning in teaching medical students in Gombe state university is effective and significant.

Pre-performance test

The pre-test shows that performance of the students is below average as indicated by mean value of 48.76 percent, with median score of 50 percent with the lowest mode of 43 percent. Figure 1 shows that more than 50 percent of the distribution range from 40 percent to 60 percent with 50 percent to 55 percent having the highest frequency.

The average pre-test result of 48.76 with median score of 50 percent with the lowest mode of 43 percent, this result shows that the pre-test performance of medical students of Gombe state university is below average. Additionally, the distributions of the scores were normally distributed as indicated by Skewness and kurtosis values all within the recommended values of +/-2 (George & Mallery, 2010).

Post-performance test

However, the post-test shows that performance of the students is above average as indicated by mean value of 65.45 percent with median score of 67 percent with the lowest mode of 68 percent. Figure 2 shows that more than 50 percent of the distribution range from 50 percent to 80 percent with 70 percent having the highest frequency.

The average post-test result of 65.45 with median score of 67 percent with the lowest mode of 68 percent, this result shows that the post-test performance of medical students of Gombe state university is above average. Additionally, the distribution of the scores was normally distributed as indicated by Skewness and kurtosis values all within the recommended values of +/-2 (George &Mallery, 2010). According to Cingi (2013), animations of anatomical structures and surgical procedures are helpful educational materials. When compared the efficacy of various education materials, it was observed that animation was an effective teaching tool. Most of students felt that, the ABL sessions were better at fulfilling learning objectives, by giving better factual knowledge of Anatomy and promoting better student participation in the learning process, ensured more students team work and interpersonal skills acquisition, enabled more students' reflective/critical thinking and reasoning of anatomy, and makes learning fun, as compared to traditional teaching methods. Most students opined that more such sessions should be organized in the future Saalu, *et al.* (2010).

Paired-sample t-test

To compare the pre-test result and the post-test result of medical students of Gombe state university, Paired-sample t-test was conducted in order to determine whether there is significant difference in the pre-test and post-test performance of medical students. The result shows a mean difference of 16.684 percent with post-test having the upper scores. This difference is statistically significant as indicated by t-statistics of 8.102 and p-value of 0.000 and within the recommended threshold of minimum of 1.96 and maximum 0.05 respectively (Pallant, 2011). This result shows that the intervention of traditional methods of learning and animated based learning (still and motion) in teaching medical students in Gombe state university is effective and significant.

CONCLUSION

In conclusion, the results were positive which shows animations surely explain contents more explicitly to students (especially for the explanation of dynamic and complicated biological processes), make students more interested in the subjects taught; and there is a greater demand for similar learning tools from the students. The results clearly indicate that animations are good supplementary learning materials for students particularly for learning complicated concepts.

RECOMMENDATIONS

The study recommends the following;

1. Provision of modern facilities for teaching and research.
2. Teachers should expose students to animated based instruction so as to motivate and improve students' performance.
3. Medical colleges should have curriculum evaluation mechanism that will embrace dynamics of modern teaching.

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