IJIAET International Journal of Innovative Analyses and Emerging Technology

| e-ISSN: xxxx-xxxx | www.openaccessjournals.eu | Volume: 1 Issue: 1

THE EFFECT OF ANIMATED AND STATIC MAP ON FORM FIVE STUDENT ACADEMIC PERFORMANCES IN MAP INTERPRETATION AND MAP ANALYSIS IN GEOGRAPHY, SOUTH WEST REGION CAMEROON

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ABSTRACT: This paper aimed to compare the effect of animated and static maps on students' academic performance in the map interpretation and map analysis in geography. This study explore the use of animate audio visual topographic maps to teach map reading and interpretations to form five students. This study utilizes an explanatory sequential mixed method. The quantitative data was achieved using the matched quasi experimental pretest and posttest and the quantitative data was generated using interview .The participants in these study includes of 52 students in both the experimental group and student in the control group all form five students in a secondary school. Students in the experimental groups were taught using animated maps while those in the control groups were taught using the traditional static maps .An interview was conductor to 8 students who participated in the experimental group as a follow up of the experiment. The result reveal that there is a significant difference in the students' performance in interpretation, and analysis using animated maps. The result obtained from the interview from the student reveal that animating the maps helps to easily recognized features and to analysis relationships on a map.

KEYWORDS: Animated maps, students' academic performance map reading and interpretation Geography. Map Analysis and Map interpretation.

INTRODUCTION

Teaching and learning of Geography in the Cameroon has been done using various teaching methods and using the traditional instructional material which is the static maps to teach map reading and interpretation. Mapping are not the whole of geography but they can be no geography without maps(Woodward ,1992 &Farinelle,2003).The purposes and functions of maps in geographic study are so significant that it seems appropriate to say to the geographer that if the subject can't be explored fundamentally by maps, it's debatable whether it's inside the landing field of geography.

Background

Most students in schools have difficulty mastering geographical skills such as geographical information map interpretation, and map analysis. These problems could be resolved by introducing tools for teaching and learning geography in education technology. Technology can help these students to gain a better understanding of map reading and geographical understanding of concept. Interactive media resources (such as videos, the Internet and CD-ROMs) have been useful for improving learning in the classroom, especially if students can use them at their own pace (Giardina, 1992). In addition, computerized learning activities can be adapted to different class sizes (Schick, 1993) provided that there are sufficient computers. These benefits are becoming increasingly important as schools get crowded (Ready et al., 2004; National School Boards Association, 1999; O'Neil and Adamson, 1993). These media are also much more interesting for young people (Olson, 1997), and if they enjoy learning, they are more likely to remain focused for as long as they can learn the concepts they teach (Calvert, 1993-1994).

Cartographers have introduced animation in an attempt to assist in Problem solving on map reading. The map user is presented with computer-based maps that can be manipulated to adjust both content and complexity. Animations in general and animated maps in particular are now commonly used as aids for teaching and learning about a wide variety of earth and social science processes in multimedia environments (e.g., Acevedo and Masuoka 1997; Blok et al.1999; Lowe 1999; Harrower, MacEachren, and Griffin 2000; Slocum et al. 2000; Harrower 2002). Animated maps have been proposed as ideal vehicles for learning and scientific discovery because they can explicitly represent dynamic systems and processes.

By static maps imply procedure /steps presented on a static map and instructions to accomplish a task. Paper map is one of the oldest of them used in problems solving to enhance the teaching geography once the topic is spatial in nature. Maps have been utilized in education for several years. Though much of the analysis into maps and education has centred on the event of map reading skills for its own sake (e.g., Blaut and Stea, 1971; Boardman, 1989; Freundschuh, 1990), some studies have shown that each thematic and reference maps will facilitate students learning geographic facts and ideas (e.g., Bailey, 1979; Boardman, 1985; Trifonoff, 1995). Traditional static maps present a fixed compilation of

geographic information to form a single image. Depending upon the information to be presented on a map, this image can be quite simple or extremely complex. Increasing complexity leads to a concomitant increase in cognitive loading for the map reader (Mennecke, Crossland, & Killingsworth, 2001). Muir (1985) argues, "Young children need single-concept maps, each with a single feature, such as rivers on a map, cities on a different map, and elevation on a different map. Such maps allow students to concentrate on a concept without distraction. (p.213).

Geography is a broad subject, it is divided in two main branches that is: the physical (Map reading and interpretation, mathematical geography) and the human and Economic Geography (Cameroon geography).This subject has been taught in the past using different approaches .The New Pedagogy Approach is the approached that has been used by geography teachers in Cameroon to teach students from Form three to five for the past five years (Geography Syllabus for GCE 2011). According to this new pedagogy approach, the primary role of the teacher is to set the stage for learning to occur. The manner (methods/techniques) in which the teacher prepared this stage therefore impacts greatly on the learners outcomes. Consequently, effective delivery strategies will enhance greatly the effective learning and the development of competences that will optimise learners' performance in life just in the same way that poorly chosen strategy will compromise significantly learning outcome. Thus, it has been established that the strategy used in teaching (the how of teaching geography) is primordial of all the factors that contribute to an effective teaching -learning process.

With the introduction of competence base approach in Cameroon in the year 2012, teaching and learning in of Cameroon classroom shifted from the traditional system to the use of modern educational technology, to be able to meet up with the 21st century challenges. The competence base approach emphasis that teaching and learning within the classroom should be skilled based .To bring out the skill of interpretation and analysis this study uses animated maps to find out if there is a significant different between students taught using animated maps and those taught using static maps in performance in map interpretation and map analysis. The Cameroon classroom saw the introduction of modern ICT tool to be used in teaching and learning in 2001.The introduction of technology has fascinated the production and aid teaching and learning using maps.

Learners' poor performance can partly be blamed on the poor choice of instructional strategy by the teacher. Teachers should be exposed to an array of effective delivery strategy that can put the learner at the Centre of his or her own learning and transform the teacher into a mere guide or facilitator to the learners' process of constructing knowledge and equip them with life skills. The objective of pedagogy practices of geography is left on the hands of the teachers to make a fair and appropriate choice considering the class size and the didactic resources at their disposal which prepares the students for observation, description, and interpretation of their environment (Geography syllabus, 2011).

Map Interpretation

Map reading: involves identifying and naming phenomena on the map the ability to read and comprehend/interpret maps is central to the geographic enterprise including the element of scale, symbol, direction coordinates and projection. Map reading follows four stages symbolic detection, symbolic distinction, and symbolic interpretation and map interpretation. (Lambrisnos 2001). In map reading one learns an unused dialect; in map interpretation one starts to talk it (Dury, 1962). For students to be able to read a map they ought to have an essential geographic vocabulary. With either of these sorts of frameworks, the map reader is displayed with a computer-based map that can be controlled to alter both substance and complexity. GIS and SDSS put much of the control of the introduction of geographic information into the hands of the map reader altering the relationship between the cartographer and map reader (Peterson, 1995). The alternatives given by animated maps offer the map reader a criticism choice that permits the user to alter the map to suit a specific need or to illuminate a characterized issue (Peterson, 1995). Computer-delivered, interactive maps might, for occasion, open with a clear map of an area of intrigued and offer the students the opportunity to overlay region and line information such as geology, water highlights, political boundaries, and/or point information like cities and towns.

However, Mennecke, Crossland and Killingsworth (2000) suggest that the cognitive load increases significantly when a map reader has a figuration, arguing instead that a computer-based, animated map shows a more manageable alternative for map-makers learned more than map-readers (Gregg, 1997), and students making maps in groups had a better understanding of map concepts than those who worked individually (Leinhardt, Stainton, & Merriman Bausmith, 1998).

Map analysis

When analysing a map, the users must reduce the information in the map according to certain classification in other to understand it and be able to describe it to other people. Analysis provides a description not an explanation or interpretation (Muehrcke, Kimerling, Juliana, and Muehrcke,2001).Map analysis involve processing information for example to describe patterns and relationships between locations(Wiegand, 2006).The map skills associated with map analysis allow users to extract information about the phenomenon at a location and its distribution to determine the spatially relationship between phenomena ,compare the spatial distribution of phenomena and use the map scale or plan

route for navigation(.Havelková, &. Hanus, 2018) what map users come up with during map analysis will depend on the operationalisation of geographical concept. Mastering the language of a maps is a prerequisite for students to effectively draw out information such as distribution patterns of features and the relationship between these patterns (Ogondo,1991) This relationship comes as a result of combination of many factors. These connections can be made by studying the map critically or by creating your own maps either actual or mental. The point of using a modern technology is to create the picture of the relationship quickly and accurately and then be able to manipulate the map in different ways. During map analysis someone who cannot classify in to spatial distribution and areal differentiation (by using generalisation and regionalisation concept) or who cannot discover a real association is not able to analyse a map. Based on this Van der Schee and Van der Zjipp, (2014) developed geographical teaching materials aimed at developing geographic procedural knowledge in other to improve the execution of specific map –analysis task. The procedure developed in both programmed instruction and individual remedial teaching consisted of teaching to perform map analysis task. The following are sequences of step used to relate phenomena on the map. According to Dorling (1992), animation improves the recognition of flow trend patterns. He found that animations are useful when illustrating change to map readers, especially when movements are involved. Since patterns are not dependent on studying the legend, the points of interest can be observed and compared directly over time. Attention does not have to shift away from the animated sequence. Also, animation allows the map reader to view changes over time on a single display by expanding or shrinking the line accordingly. In contrast, paper map series and computer map series require the map reader to make comparisons across multiple maps to judge differences in line widths over time. Although the computer and other modern technology can be of great help in identifying patterns and relationships, it will not do the thinking for the students. The more creative they are the more involve they are in the process of analysis.

The problem

In spite of the importance of geography, students show little or no interest in the study of geography and this has greatly affected their performance in the subject. From 2011 up to 2015, the results of ordinary level Geography have been very dismal. The chief examiner's subject report obtained during the period under review reflect that the section on Map reading and interpretation has always recorded the worst performance. It is the most attempted question and the general remark made from the report is that students' performance in this section is very poor. From the question analysis it is realised that the question on knowledge is often well answered, the part testing comprehension (that required skill of interpretation) and analysis, most often candidates are not able to interpret and analysis patterns or relationships on the map. The mastery of the course content is very shallow; In this light, this study attempts to make a scientific evaluation and to ascertain that if students are trained to read maps with scaled animations (rather than by static, symbolic representations) and to choose the features on the map dynamically, they will have greater success in solving problems than students using static maps.

Research Objectives

This study seeks to determine if there is a significant difference in performance in map interpretation between students taught using animated and those taught using static maps.

To find out if there is a significant different in performance in map analysis between students taught using animated maps and those taught using static maps.

Research Question

Is there a significant difference in performance in map interpretation between students taught using animated maps and those taught using static maps?

Is there a significant difference in the performance in map analysis between students taught using animated maps and those taught using static maps?

Methods

The explanatory sequence method was the research design that was used for this study. The quasi experimental pre and post-test was used to generate the quantitative data and an interview was used to generate the qualitative data.

The researcher designed the lesson from the latest version of geography syllabus .The content was assessed by experience geography teachers and examiners for both control and experimental group.

A quasi experimental research design was used for this study. Fifty- two form five student participated in this study which lasted for 6weeks .All the students took the pre-test before the treatment began and which lasted for 5weeks following the topics in map reading and interpretation that were of interest to the researcher. The intact classroom was used for the both the experimental and control group. One group of students receive instruction using animated computed map while the other group of students received instructions using the static(paper map).The instructions was delivered by the researcher to both groups. The experimental group received instructions using a computer and a projector. The students work in groups used computer with assess to maps so that they can have controlled over to displace and be able to zoom in and out at will.

The maps that were used by both group depict two geographical skill appropriate to form 5 students that were of interest to the researcher. Two different types of maps were used to identify and interpret geographical features (both manmade and natural features) on the maps and to analysis (describe) patterns and relationships in a topographic map. Students in both groups were expected to identify and interpret these features after the instruction. The experimental group uses the animated maps where they have full control of the content while the control group uses the static or paper maps. Students were asked to make a sketch map and insert the features in it. A portion of the second map was extracted and animate and present to the students in the experimental group using the computer and a projector, while the control group had the whole map .The students in both groups were expected to describe patterns at the end of the instruction.

The pre-test comparison determined the equivalence of the two groups those taught with the animated maps and those taught with the static maps. The scores were compared for across groups using assessment for knowledge. In the pretest students were presented with six question short answer questions to identify features interpret them and insert them on a sketch diagram. While students were required to answer two open ended short answered questions on analysis .The questions tested both map interpretation and map analysis skills.

An interview was conducted by the researcher to eight students who were part of the experimental group .To express their taught about animated maps.

Methods of Data Analysis

The data for this study was analysed using both the descriptive and inferential statistics. These two statistical approaches were used because the study deals essentially with quantitative data. Before the data was analysed, a data sheet was extracted on Excel and exported to SPSS version 25.0 (IBM Inc., 2017) for analysis. On the SPSS software, both descriptive and inferential statistics was used in analyzing the data. The descriptive statistical tools used were mean, standard deviation, standard mean of error, frequency count and percentages. The mean indicates the average performance of the participants in both groups while percentage was used so that one could appreciate in percentage, the pass rate among the participants. Standard mean of error was used to estimate the upper and lower level of the true mean. The standard deviation was also used to determine how participants differ in their marks score between the lowest and highest persons.

To test the hypotheses of the study, the Dependent Samples T- Test was used. This which is a parametric test was used by the data for the study was approximately normality as shown on the table of Test of Normality below with P-values all above 0.05. The Dependent Samples T test was also used because it's a test that is applicable in comparing means between two groups as we have in this study (control and experimental group). Testing for normality assumption of every data where inferential statistics of this nature is to apply is very important to avoid committing the type I or II hypothesis error. Finally, findings were presented using frequency distribution tables, and charts and all statistics was presented at 95% level of confidence interval with alpha set at 0.05 levels accepting, 5% margin of error.

Table 1: Tests of Normality

Variables	Test levels	Shapiro-Wilk Test		
		Statistic	df	P-value
Interpretation	Pretest control group	.300	26	.011
	Posttest control group	.224	26	.168
	Pretest experimental group	.254	26	.067
	Posttest experimental group	.233	26	.133
Analysis	Pretest control group	.300	26	.011
	Posttest control group	.260	26	.053
	Pretest experimental group	.342	26	.002
	Posttest experimental group	.217	26	.200*

*. This is a lower bound of the true significance.

Lilliefors Significance Correction

As shown on the table of test of normality, the data for all the variables at group groups and test levels were approximately normally distributed meaning that the data did not significantly deviate from the normal distribution. Thus, using the Dependent Sample T-Test which is parametric in nature in testing the hypotheses of the study was appropriate.

Findings

The study was experimental in nature and it consisted of 52 students with 26 of them belonging to the control group and 26 in the treatment/experimental group. In both groups, there was a pre-test and post-test which involve same items on both test. The results are presented based on the specific research questions that guided that study and hypotheses tested.

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Result

The study was experimental in nature and it consisted of 52 students with 26 of them belonging to the control group and 26 in the treatment/experimental group. In both groups, there was a pre-test and post-test which involves the use of static and animated maps at different test level especially in the treatment group. The results are presented based on the specific research questions that guided that study and hypotheses tested.

Question one: Is there a significant difference in performance in map interpretation between students taught using animated maps and those taught using static maps?

Table 2: Comparing Participants Marks Score at Pretest Level in Both Groups in map interpretation

Pre test	Control group	Treatment/experimental group
N	26	26
Mean	4.08	3.73
Minimum	0	1
Maximum	8	8
Std. Deviation	2.607	2.491
Std. Error of Mean	.511	.489

Results on table 2 shows that at the pretest level without any treatment on both the control group and experimental group, the average marks scored/performance by participants in the control group and experimental group was almost the same. For instance, in the control group, the mean score/performance was 4.08±0.511 while in the experimental group, the mean score/performance was 3.73±0.489. The lowest mark score in the control group was 0 on 10 while the highest mark was 8 on 10. In the experimental group, the lowest mark score was 1 on 10 while the highest mark score was 8 on 10. Therefore, at the pretest level, all the 52 participants (26 from the control group and 26 from the experimental) did not significantly differ in their performance

Table 3: Comparing Participants Marks Score at Posttest Level in Both Groups in Interpretation

Posttest	Control group	Treatment/experimental group
N	26	26
Mean	4.38	7.31
Minimum	0	3
Maximum	10	10
Std. Deviation	2.609	2.093
Std. Error of Mean	.512	.411

Results on table 3 show that at the posttest level where animated map was used on the experimental group, and not on the control group, the marks / performance by participants in the experimental group at the posttest was higher when compared to the marks/performance by participants in the control group. For instance, in the control group, the mean score/performance was 4.38±0.512 while in the experimental group, a significant increase was observed with the mean score/performance which stood at 7.31±0.411. In order to appreciate participants passed and failed rate in terms of percentage, the results were presented using the cross tabulation technique as shown on the table 6 below.

Table 4: Presentation of Participants Marks Score in interpretation for both Group and Test Level using Percentages

Groups		Pretest		Posttest		Total
		Pass (score 5 and above on 10)	Fail (score less than 5 on 10	Pass (score 5 and above on 10)	Fail (score less than 5 on 10)	
Control group	N	10	16	5	21	26
	%	38.5%	61.5%	19.2%	80.8%	
Treatment/ experimental group	N	16	10	24	2	26
	%	61.5%	38.5%	92.3%	7.7%	

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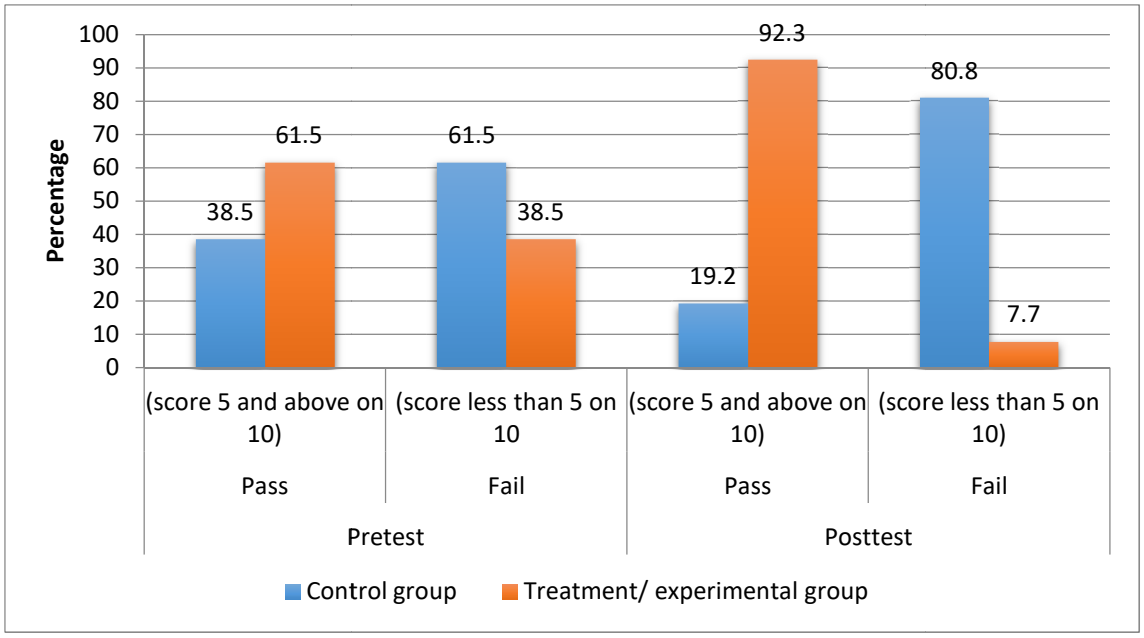

Figure 1: Distribution Showing Participants Pass Rate in Interpretation for both Group and at Different Test Level Using Percentages

Using the cross tabulation technique, results on table 4 and figure 1 show that in the control group were only static map was used at both levels, 19.2% of the students passed while at the experimental/treatment group were animated map was used at the post-test level, a majority of the students 92.3% passed which is almost eight times higher than the percentage of students passed who were taught using static map.

In addition to the above results, among the few students interviewed, they said animated maps are clear and visible and easy to interpret as they reported "Because images are large and clear and you actually see the real picture of what is there". Another group of students said "animated maps serve as motivation because immediately they saw projectors and computer they were curious to know what it will be used for". Another group of students said "animated maps makes them to pay attention and keeps them focused to the lesson". In addition, another group of students said "with animated maps, they are so engaged in the lesson and participated in the lesson and that not only did they used their eyes and brain, their hands were also involve as they had to draw what they have observe".

Testing of Hypothesis One

H_o1: There is no significant relationship between the use of static and animated maps in Interpretation and student academic performance in map reading geography

H_a1: There is a significant relationship between the use of static and animated map in interpretation and students' academic performance in map reading geography

Table 5: Dependent T-Test Analysis of Influence of the Type of Map Used on the interpretation of Map Reading (N=26)

Type of Map	N	Mean	Std. Deviation	T-value
Static Map	26	3.73	2.61	7.16*
Animated Map	26	7.31	2.09	

*P<0.05, df=25; critical t = 2.06

The results on table 5 reveal that the mean performance for students taught using static map was 3.73 while that for students taught using animated map is 7.31 which double the performance of the students taught using static map. And, statistically, the calculated t-value was 7.16 higher than the critical t-value of 2.06 at 0.05 levels of significance with 25 degrees of freedom. With this result, the null hypothesis was rejected and alternative retained. This means that there a significant relationship between the use of static and animated maps in map interpretation and students' academic performance in map reading in Geography. In other words, the marks score by the students taught using animated maps is higher than the marks score by the students taught using statistic map and this difference in performance was significant ($p < 0.05$).

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Question Two: Is there a significant difference in the performance in map analysis between students taught using animated maps and those taught using static maps?

Table 6: Comparing Participants Marks Score at Pretest Level in Both Groups in Analysis

Pre test	Control group	Treatment/experimental group
N	26	26
Mean	.69	1.38
Minimum	0	0
Maximum	6	5
Std. Deviation	1.715	1.745
Std. Error of Mean	.336	.342

Results on table 6 shows that at the pretest level without the use of treatment on both the control group and experimental group, the average marks scored/performance by participants in the control group was 0.69±0.336 while in the experimental group, the mean score/performance was 1.38±0.342. The lowest mark score in the control group was 0 on 10 while the highest mark was 6 on 10. In the experimental group, the lowest mark score was 0 on 10 while the highest mark score was 5 on 10.

Table 7: Comparing Participants Marks Score at Posttest Level in Both Groups in Map Analysis

Posttest	Control group	Treatment/experimental group
N	26	26
Mean	.00	4.38
Minimum	0	1
Maximum	0	7
Std. Deviation	.000	1.651
Std. Error of Mean	.000	.324

Results on table 7 show that at the posttest level where animated map was used on the experimental group, and not on the control group, the marks/performance by participants in the experimental group at the posttest was higher when compared to the marks /performance by participants in the control group which was zero. For instance, in the control group, the mean score/performance was 0.00 while in the experimental group, a significant increase was observed with the mean score/performance which stood at 4.38±0.324. In order to appreciate participants passed and failed rate in terms of percentage, the results were presented using the cross tabulation technique as shown on the table 14 below.

Table 8: Presentation of Participants Marks Score in Map Analysis for both Group and Test Level using Percentages

Groups		Pretest		Posttest		Total
		Pass (score 5 and above on 10)	Fail (score less than 5 on 10	Pass (score 5 and above on 10)	Fail (score less than 5 on 10)	
Control group	N	1	25	3	23	26
	%	3.8%	96.2%	11.5%	88.5%	
Treatment/ experimental group	N	0	26	13	13	26
	%	0.0%	100%	50.0%	50.0%	

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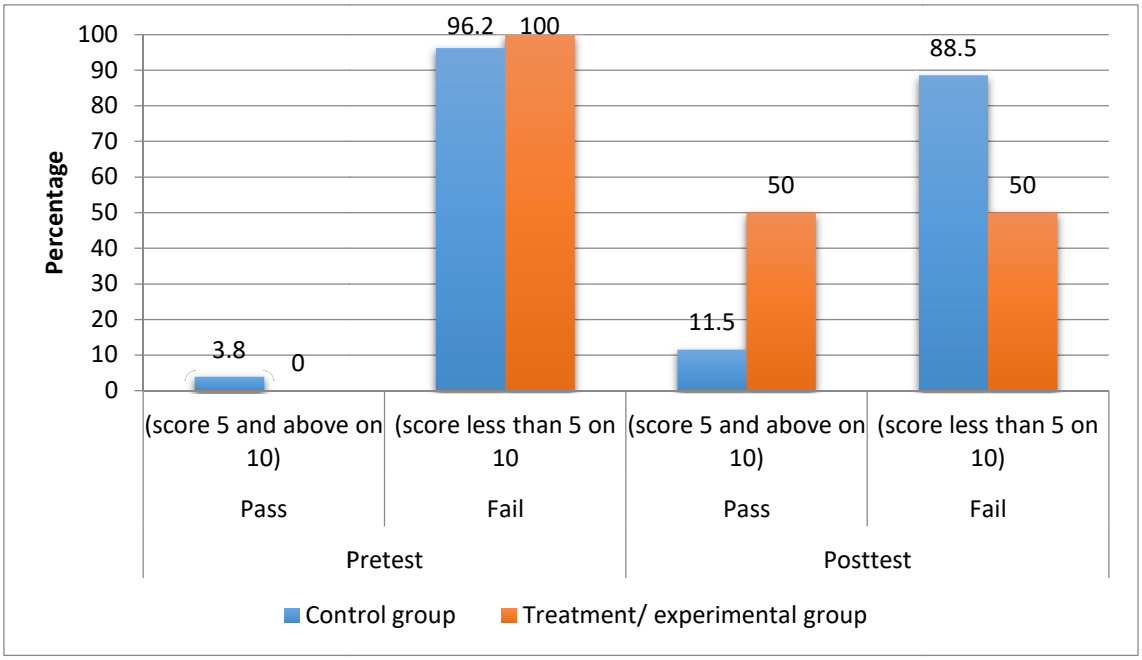

Figure 3: Distribution Showing Participants Pass Rate in Map Analysis for both Group and at Different Test Level Using Percentages

Using the cross tabulation technique, results on table 8 and figure 3 show that in the control group were only static map was used at both levels, 11.5% of the students passed while at the experimental/treatment group were animated map was used at the post-test level, 50.0% of the students passed, which is higher compared to the percentage of students passed that were taught using static map.

In addition to the students' personal opinion about animated maps, they all said it is very easy to analyse as they reported "It was very easy to analyse relationships using the animated maps, the demarcation using the contours were very visible and that they are able to bring out the following relationships that were found in a particular area". Another student said "Using the animated maps, the contour lines and their gradations are visible and easy to read".

In addition to the above responses, another student said "When I see, I remember and it sticks in my brain I was able to remember everything that I saw in the video and this help me to be able to answer some of the question without having to go back to my notes to read". This is to say that animated maps help students to remember things faster as they could see them on videos.

Furthermore, another student said "Using the narratives and the sound behind the animation, add more power to the way they learn the music which help them to remember".

Finally, another student said "with animated maps, they felt very free to express their worry because the class is so interactive".

Testing of Hypothesis Two

H_o3: There is no significant relationship between the use of static and animated maps analysis and students' academic performance in map reading geography.

H_o3: There is a significant relationship between the use of static and animated maps analysis and students' academic performance in map reading geography.

Table 9: Dependent T-Test Analysis of Influence of the Type of Map used on the Analysis of Map Reading (N=26)

Type of Map	N	Mean	Std. Deviation	T-value
Static Map	26	0.00	0.00	13.54*
Animated Map	26	4.38	1.65	

*P<0.05, df=25; critical t = 2.06

The results on table 9 reveal that all the students taught using static map failed, scoring zero as justified with an average mean/performance of 0.00, while that for students taught using animated map is 4.38 which is four time higher than the

performance of the students taught using static map. And, statistically, the calculated t-value was 13.54 higher than the critical t-value of 2.06 at 0.05 levels of significance with 25 degrees of freedom. With this result, the null hypothesis was rejected and alternative retained. This means that there is a significant relationship between the use of static and animated maps analysis and students' academic performance in map reading geography.

Conclusion

The purpose of this study was to determine if there is a significant difference in performance in map interpretation and map analysis between students taught using animated and those taught using static maps in map reading geography. It was able to prove that the use of animated maps in the teaching of map reading geography can improve students' performance in this branch of geography. Although the computer and other modern technology can be of great help in the teaching of map reading and interpretation, it won't do the thinking for the students. The more enagaged they are in the process of learning will help them to improve their performance. Animated maps do not replace static maps, neither are they intrinsically better or worse than static maps; they are simply different. Like any form of representation (words, images, numerical formulas), animated maps are better suited to some knowledge construction tasks than others. Understanding what those tasks are is one of the key research challenges for geo visualization (MacEachren and Kraak, 200l & Slocumet aI. 2001).

Recommendation From the findings presentations and conclusion drawn above the following, recommendations were made

1. Schools should use ICT tools in the teaching of map reading and interpretation geography and to make the learning engaging and motivating. Computers should be supplied to schools and geography teachers should make use of them. Those that cannot use it should be sent for refresher course on the computer so that it can be comfortable for them to use it.
2. Schools should use different types of maps in the teaching of map reading and interpretation. Maps should be animated and kept in teachers resources so that they can have as to it when need be
3. Teachers should let the students use the computer lab during instructions so that the student can actually gain control over the maps and be able to manipulate the maps so as to help them to process the information.

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