

ASSESSMENT OF THE EFFECT OF DIGITAL INFO-GRAPHICS ILLUSTRATION ON THE ACADEMIC ACHIEVEMENT OF STUDENTS' IN DIGESTIVE SYSTEM BIOLOGY CONCEPT IN DUTSIN-MA METROPOLIS

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Abstract

This study assessed the effect of digital info-graphics illustration on the academic achievement of students' in digestive system biology concept in Dutsin-Ma metropolis. The study targeted all SSI biology students in all public secondary schools in Dutsin-Ma metropolis. Two intact classes of 42 and 40 samples making a total of 82 students were used from randomly selected public secondary schools in Dutsin-Ma Township. The instrument used to collect data in this study was Digestive System Achievement Test (DSAT) comprises thirty objectives questions on the concept of digestive system taught to the students. The instrument was faced validated by the biology teacher and Educational Technologist. The reliability of the test instrument was also carried out through test-re-test after pilot testing it using separate sample from the one used for the main field study. The reliability value of 0.74 was attained after analyzing the test. The data collected was analyzed using frequency counts, mean and t-test statistical analysis. The results of the finding showed that, students taught with digital info-graphics illustration learning strategy in digestive system in biology have higher mean achievement than their counterpart taught with conventional method. T-test analysis equally showed significant difference in the mean achievement scores in favor of experimental group that used info-graphics. Added to the above, the finding indicated the significant difference in the mean achievement in favor of male students as against the female students when exposed to info-graphics illustration on digestive system biology concept. Based on the findings, it is recommended that biology teachers should be

encouraged to use info-graphics illustration learning strategy as a medium of instruction to improve students' achievement in biology subject.

Keywords: Digital Info-graphics, Illustration Learning Strategy, Digestive System Biology Concept, Students' Academic Achievement, Dutsin-Ma Metropolis.

Introduction

The joy of every teacher is to see that learners are able to achieve the stated objectives of the lesson discussed at the end of the teaching activities. This motive has been one of the motivating factors for teacher in employing different strategies and integrating various media to ensure learners have better understanding of the instructional content discussed during the lessons. One out of many media that could be used in helping students to learn meaningfully is called Info-graphics. This is also referred to Information Graphics.

Info-graphics are graphic visual representations of information, data, or knowledge intended to present information quickly and clearly. They can improve cognition by utilizing graphics to enhance the human visual system's ability to see patterns and trends. Info-graphics are tools that combine pictures and text to succinctly frame information and ideas. Info-graphic is the illustration of information using graphics like illustrations, charts, bars, maps or diagrams. Info-graphics are devices that transmit information through illustrations (Newsom & Haynes, 2004; Öztürk, 2012). Similarly, Smiciklas (2012) confirms that info-graphics is data visualization or information construction which aim to make understanding of complex information, data and ideas faster, easier and simpler. In this context, with the use of info-graphics in lessons for instructional purposes, different dimensions of knowledge can be transmitted by explaining the processes and events, establishing connections between concepts and concretizing abstract notions (Holsanova, Holmberg, & Holmqvist, 2009; Meeusah & Tangkijviwat, 2013). Info-graphics can be either manually designed or digitally designed. When it is manually designed, teachers make use of it in the class without using computer but when it is digitally designed, it will be used on the computer.

An info-graphic (or information graphic) is a visual representation of information or data. But the meaning of an info-graphic is something much more specific. An info-graphic is a collection of imagery, charts, and minimal text that gives an easy-to-understand overview of a topic. Info-graphics are great for making complex information easy to digest. They can be helpful anytime a teacher wants to:

- Provide a quick overview of a topic
- Explain a complex process
- Display research findings or survey data
- Summarize a long blog post or report
- Compare and contrast multiple options
- Raise awareness about an issue or cause (MacEachren & Monmonier, 1992 and Taş, 2006).

Any teacher or instructor that is motivated to use info-graphics to teach a concept must be prepared to use the following principles when producing and designing info-graphics:

- (1) Its aim must be set,
- (2) The topic must be determined,
- (3) It must be simple and understandable,
- (4) Visuals, videos, sounds, animations or information are to be relevant to the topic discussed,
- (5) Its references are to be reliable,
- (6) It must be appropriate to the students' level,
- (7) Its inscription, figure, graphic and illustrations must be logically presented (MacEachren & Monmonier, 1992 and Taş, 2006).

Biology is one of the core science subjects taught in all secondary schools in Nigeria. The teaching of Biology starts from the nursery school through primary to secondary school and tertiary institution. Nwagbo (2008) stated that as a science subject in school curriculum, Biology is designed to produce individuals some of whom may or may risk taken biological studies in their professional pursuits. It is however hoped that in whatever profession they finally find themselves, the Biology education they acquire in school would be of value to the totality of their education.

The Biology curriculum as a teaching syllabus has four main objectives derived from the National Policy on Education (2004). These objectives include:

- i. Adequate laboratory and field skills in Biology
- ii. Meaningful and relevant knowledge
- iii. Ability to apply scientific knowledge to everyday life on matters of personal and community health and agriculture.
- iv. Reasonable and functional scientific attitudes.

In accordance with the above stated objectives, the content and context of the syllabus place emphasis on field studies, guided discovery and conceptual studies and hence laying emphasis on practical approach on the teaching of Biology. The study of Biology involves both practical and theoretical work. Biology practical according to Ndioho (2007) is any learning experience" which involves students in activities such as observing, counting, experimenting, recording, observation and carrying out field work. In that case, for proper teaching of biology concepts in school, learners need to be exposed to clearer and quality visuals for better understanding and this is part of what info-graphics aim to encourage during lessons either through theory or practical class in school.

Purpose of the Study

The main purpose of this study was to find out how effective is the use of digital info-graphics illustration on the academic achievement of students in digestive system biology concept in Dutsin-Ma Metropolis. Specifically the study:

1. Determined whether there will be any difference in the mean achievement of students taught digestive system biology concept using digital info-graphics illustration learning strategy and those taught with conventional method.
2. Found out if there will be any difference in the mean achievement of male and female students taught digestive system biology concept using digital info-graphics illustration learning strategy.

Research Questions

The following research questions were asked to provide guide for the study:

1. What are the mean achievements of students taught digestive system biology concept using digital info-graphics illustration learning strategy and those taught with conventional method?
2. Will there be any difference in the mean achievement of male and female students taught digestive system biology concept using digital info-graphics illustration learning strategy?

Research Hypotheses

The following hypotheses were formulated and tested at 0.05 level of significance.

H₀₁: There is no significance difference in the mean achievement of students taught digestive system biology concept using digital info-graphics illustration learning strategy and those taught with conventional method.

H₀₂: There is no significance difference in the mean achievement of male and female students taught digestive system biology concept using digital info-graphics illustration learning strategy.

Method

The research design for this study was quasi-experimental. Precisely, the study used a non-randomized pre-test, post-test control group design. The subjects of the study were not randomized into experimental and control groups but were left as intact classes. The reason for using intact class was to avoid interruption of the school programs. The target population of this study was all the SSI students in Dutsin-Ma Local Government Areas of Katsina State. The population of the study comprises all the senior secondary one (SS1) students from six government owned secondary schools in the study area. Simple random sampling technique was used to select two schools from 6 senior secondary schools. The choice of senior secondary school one was purposive. This was basically because students are not prepared for state mock examination as well public examination. Also, it is at this level that most of digestive system concepts were taught. The sample size for the study was 82 students. This was made of 42 students for the experimental group and 40 students for the control group. The choice of which schools and classes to be used as experimental and control was done through simple random sampling with the use of a flip of coin. The instrument used for the study was Digestive System Achievement Test (DSAT) comprises thirty objectives questions on the concept of digestive system taught to the students. The researcher constructed two instructional guides on digestive system for the two groups, treatment materials are info-graphics learning material while the control group was taught using biology textbook for the control group. The test instrument was faced validated by the biology teacher and Educational Technologist. The reliability of the test instrument was also carried out through test-re-test after pilot testing it using separate sample from the one used for the main field study. The reliability value of 0.74 was attained after analyzing the test. The two groups were exposed to

digestive system using two different instructional guides. The instruction lasted for four weeks. After applying the treatment, Digestive System Achievement Test was administered to both the experimental and control groups. The marking and collation was done by the researchers to avoid bias and thereafter, the data collected was analyzed using frequency counts, mean and t-test statistical analysis.

Results

The analysis was done following the research questions and the hypotheses formulated for the study.

Research Question One

What are the mean achievement of students taught digestive system biology concept using digital info-graphics illustration learning strategy and those taught with conventional method?

Research Hypothesis One

H₀₁: There is no significance difference in the mean achievement of students taught digestive system biology concept using digital info-graphics illustration learning strategy and those taught with conventional method.

Table 1: Analysis and results of the mean achievement of students taught digestive system biology concept using digital info-graphics illustration learning strategy and those taught with conventional method.

Teaching Strategies	N	Type of Test	Mean (x)	SD	MD
Experimental group	42	Pre-test	10.27	2.14	10.04
		Post-Test	16.82	5.31	
Control group	40	Pre-test	5.85	0.72	
		Post-test	6.78	1.56	

The results in Table 1 reveals that experimental group has a mean score (x) of 16.82 and a standard deviation (SD) of 5.31 which shows that the mean difference of the experimental was 6.55 and control group was 0.93. The mean difference between experimental and control group is 10.04 in favor of the experimental group. This implies that students taught with digital info-graphics illustration learning strategy have higher achievement than their counterpart without it.

Table 2: Analysis and results of t-test analysis of the significant difference in the mean achievement of students taught digestive system biology concept using digital info-graphics illustration learning strategy and those taught with conventional method.

Teaching Strategies	N	Mean (x)	SD	t	P	Decision
Experimental group	42	16.82	5.31	28.14	0.012	significant
Control group	40	6.78	1.56			

The results in table 2 shows that the t-values is 28.14 and the p-value is 0.012 which is less than $P \geq 0.05$ set for the experiment. This implies that students exposed to digital info-graphics illustration learning strategy performed significantly better than their counterparts not exposed to it. The null hypothesis was rejected and the alternative hypothesis accepted.

Research Question Two

Will there be any difference in the mean achievement of male and female students taught digestive system biology concept using digital info-graphics illustration learning strategy?

Research Hypothesis Two

H₀₂: There is no significance difference in the mean achievement of male and female students taught digestive system biology concept using digital info-graphics illustration learning strategy.

Table 3. Analysis and results of the mean achievement of male and female students taught digestive system biology concept using digital info-graphics illustration learning strategy and those taught with conventional method.

Group	N	Mean (x)	SD	MD
Male Students	22	14.57	4.01	12.33
Female Students	20	2.24	0.98	

Table 3 shows male students have a mean score (x) of 14.57 and a standard deviation (SD) of 4.01 and the female students have mean score of 2.24 and a standard deviation (SD) of 0.98. The mean difference between male mean score and female mean score is 12.33 in favor of the male students. This implies that male students taught with digital info-graphics illustration learning strategy have higher achievement than their female counterpart.

Table 4: Analysis and results of t-test analysis of the significant difference in the mean achievement of male and female students taught digestive system biology concept using digital info-graphics illustration learning strategy and those taught with conventional method

Group	N	Mean (x)	SD	t	P	Decision
Male	22	14.57	4.01	26.01	0.001	significant
Female	20	2.24	0.98			

The results in table 4 shows that the t-values is 26.01 and the p-value is 0.001 which is less than $P \geq 0.05$ set for the experiment, based on this, the null hypothesis was rejected. This implies that there is significant difference in the mean achievement scores of male students and female students taught using digital info-graphics illustration learning strategy.

Discussions

Students taught digestive system in biology using info-graphics learning strategy mode of instruction performed better than those taught with the conventional method in terms of their mean achievement. The method of instruction had a positive change in student's achievement in biology. The difference in their achievement might have been as a result of inclusion of digital visuals and digital interactivity between students and teachers and between students and students' discussions during the instruction which the control group were not exposed to. This finding is in agreement with the study of Odo (2016) which concluded that appropriate instructional method is synonymous to high achievement and retention. The finding equally supported the work of Yildirim (2016) and George (2013) that people remember visual representation more accurately, more quickly, and for a longer period of time" than words alone. The study is also in line with the work of Zinonyev (2010) which reported that the visual display in info-graphics allows individuals to visualize, analyze, and remember the message discussed or delivered during the lesson. In addition, participants in Matrix & Jaigris (2014) study believed that info-graphics enhanced their ability to critically process information and allowed them to filter out irrelevant data and prioritize some information over the rest.

Conclusion

It has been observed from the findings that when appropriate method of teaching is adopted, student's achievement in Biology is adequately improved. Using info-graphics learning strategy for instruction is appropriate in teaching and learning digestive system biology concept for better achievement.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. Biology teachers should be encouraged to use info-graphics illustration learning strategy as a medium of instruction to improve student achievement.
2. Biology teachers should be exposed to pre-service and in-service training to enable them acquire new knowledge on the use of info-graphics illustration for lesson delivery.

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