



Role of PowerPoint Presentation as Instructional Tool for Enhancing Senior Secondary School Students Performance in Biology

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Abstract

This study enthralled the role of PowerPoint presentation as an instructional tool for enhancing students' performance in biology at the secondary level within Ethiope East Local Government Area (EELGA), Delta State. To achieve this, questionnaires on Biology Achievement Test (BAT) were administered to secondary school (SSII) students subjected to the projected presentation via PowerPoint and lecture methods in two (2) secondary schools randomly selected within EELGA of Delta State. The data collected were analyzed using the student t-test and mean score. The result indicated a significant difference ($p > 0.05$) in student performance in biology between students taught using projected presentation via PowerPoint with a mean-score of 59.3 compared to those taught without projected presentation via PowerPoint with a mean score of 57.5. Biology performance among male and female students taught using projected presentation via PowerPoint was significantly ($p > 0.05$) higher compared to their counterparts taught using the lecture method. The study also recorded a significant difference ($p > 0.05$) between the performance of male and female students in biology. The study recommends that teachers should encourage PowerPoint presentations for teaching and also encourage group interactions. Government and ministries should make available resources for schools to enable adequate use of instructional resources.

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Introduction

Biology is among the core subjects in the Nigerian secondary school curriculum; because of its importance, almost all students enroll for it in certificate examinations (Okwara *et al.*, 2017). The teaching of science subjects, including biology, requires projected presentations such as PowerPoint as instructional channels through which messages, information, ideas, and apprehension are conveyed or disseminated to learners (National Teachers' Institute [NTI], 2011). Projected instructional media like PowerPoint is used in displaying pictures and texts. Materials such as book pages, objects, postcards and other non-transparent are projected and their effects depend on the image quality projected. This medium could help to reduce abstract nature and enhance students' biology achievement. Eniayeju (2007), in support of this, reported that defective facilities, lack of technological know-how coupled with insufficient learning facilities are responsible for students' poor achievement (Okwara *et al.*, 2017). Projected instructional tools are channels of presentation which enhance instruction delivery and aid teachers in communicating ideas effectively to students (Adalikwu and Iorkpilgh, 2013). These media are an alternative medium of communication that a biology teacher can utilize to concretize a concept during his/her teaching. They include all the substantial resources that an educator might use to implement instruction that facilitates students' achievement. These instructional aids significantly improve the academic achievement of the student as they are effective learning-support agents and also assist teachers in the dissemination of instruction (Aninweze, 2014). The use of appropriate instructional tools enables students to acquire the necessary science process, attitudinal, creative and practical skills, which will enable them to function effectively (Aninweze, 2014). The instructional delivery approach, PowerPoint presentation, a software produced to for computer-based presentations, is a package that allows on-screen computer presentations, overhead projection transparencies, posters and web pages (Allan, 2003). PowerPoint allows the manipulation of text and

graphical elements with great creative flexibility whilst also providing a set of pre-designed templates which make it possible for use by the non-artistic user. In an educational setting, it is ideal for producing full-screen computer presentations to enhance lectures, demonstrations, or displays. Naki (2011) opined that PowerPoint could enhance classroom lectures by highlighting key points, providing pictures and other graphics supporting the material. PowerPoint is a useful tool for displaying learning objectives, presenting information to students, giving directions and incorporating multimedia into a lesson. It can also be an effective tool to present material and encourage student learning, project visuals which would otherwise be difficult to bring to class and prepare lectures and presentations which help instructors refine their material to salient points, thereby making it easier for the teachers to keep the students interested in class (Russell and Joel, 2006). The PowerPoint presentation also has advantages such as; easy to learn; it can effectively hold student's attention through graphics and video, students can receive the slides in advance and use them in their presentation (Aninweze, 2014). The term "gender" conveys socially ascribed duty, functions and opportunities linked with women and men and the unseen power formation that presides over relationships. Gender is the parallel and socially unequal division into manliness and womanhood (Beniamino, 2019). Gender difference and achievement have, over time, raised issues of concern among researchers. Ajai and Imoko (2015) stated that an established problem already exists between the level of achievement between genders under the same condition, with males performing better in terms of academic achievement when set aside by female counterparts. Dania (2014) studied gender differences and student's achievement and reported that gender had no effects on student's achievement. Other studies on gender and student's achievement have been documented (Amosun, 2011; Awofala *et al.*, 2011). With the reports from the different researchers, there is a need to evaluate the role of the projected approach using the PowerPoint presentation as an instructional approach

to evaluate male and female achievement levels in biology.

Statement of problems

In secondary schools, the conventional instructional delivery approach of teaching is in vogue. This has constantly led to poor students' performance at certificate examinations. The persistence of poor biology student's achievement in Nigeria secondary schools has raised concern to educational administrators and stakeholders. Empirical studies involving PowerPoint presentation instructional delivery approach in teaching biology are few in numbers. Studies on practical teaching of biology using projected instructional tools are rare. This study is undertaken to bridge these gaps. Therefore, will the use of projected presentation via PowerPoint enhance the achievement of student Biology? will the use of projected presentation via PowerPoint close the gap in biology achievement of males and females? This study therefore aimed at determining the role of the projected presentation via PowerPoint purpose on senior secondary school students' achievement in biology.

Research questions

The following research questions will guide the study;

- i. Is there any effect of PowerPoint presentation on senior secondary school biology students' achievement?
- ii. Do students taught using PowerPoint presentations achieve higher in biology than those taught without PowerPoint presentations?
- iii. Do male students taught using PowerPoint presentation achieve higher in biology than male students taught.

Research hypotheses

The following research hypotheses were formulated to guide the study.

- i. There is no significant effect of PowerPoint Presentations on senior secondary school Students' achievement in biology.
- ii. Students taught using PowerPoint presentations do

not significantly achieve higher in biology than those taught without PowerPoint presentations.

iii. Male students taught using PowerPoint Presentation do not significantly achieve higher in Biology than male students taught without PowerPoint Presentation.

iv. Female students taught using PowerPoint presentations do not significantly achieve higher in biology than female students taught without PowerPoint presentations.

Significance of the study

The findings of this study will be beneficial to stakeholders in the educational sector. These stakeholders include curriculum planners, government, teachers and students. If the use of these instructional delivery approaches is found valuable, curriculum planners will be provided with information that may be used in recommending effective innovations in teaching strategies. Findings could provide information that could inform the government on the need for workshops, seminars and conferences on the use of PowerPoint presentations as instructional delivery approaches for teaching biology. The study might provide an insight into other school subjects on whether to use PowerPoint presentations to enhance students' achievement. The study could be useful to classroom teachers who decide what instructional delivery approach to present content will be.

Materials and methods

Research design

The design of the study is quasi-experimental. This design of a non-equivalent control group was adopted because it is suitable for students where absolute control of all the variables involved cannot be achieved, i.e., it was not possible to have complete randomization of subjects. In-tact classes were used for the two groups, and the two existing groups were administered treatment and then tested.

Population of the study

There are 34 secondary schools situated in various communities in EELGA. The population for the study

is made up of 2,266 SSII Biology Students in secondary schools of EELGA (Source: Ministry of Primary and Secondary Education, Asaba, 2018).

Sample and sampling technique

The sample of this study was hundred senior secondary school students selected from two mixed secondary schools. In-tact classes were used for the study. This was done by randomly selecting two mixed schools and from two of the schools selected, a class each was randomly selected and all the subjects in the class were used. SSII students were used for the study because almost all the students were not new to the school environment.

Research instrument

An instrument known as Biology Achievement Test (BAT) and PowerPoint presentation lesson notes was the instrument used for data collection. The BAT development by the researcher is a baseline assessment on the biology topics. Subjects in both the experimental and the control groups were administered chemistry questions created by the researcher focusing on biology topics.

Validity of the instrument

For content validity, this research questionnaire was subjected to criticism and correction by experts in measurement and evaluation in the Department of Science Education, Delta State University, Abraka to ensure that the items were representative of the content that was covered during the treatment phase of the study.

Reliability of the instrument

The reliability test of the instrument was conducted and determined using the Kuder-Richardson 20 procedure for establishing the internal consistency reliability. The instrument was administered to 30 subjects who were not part of the study. The data

collected was analyzed and a coefficient of 0.85 was obtained.

Method of data collection

In order to compare the effects of PowerPoint presentation on senior secondary school students' achievement in biology and the traditional expository method, the researcher personally carried out teaching; a lesson plan was developed by the researcher for the experimental group using PowerPoint presentation and control group using lecture method for two consecutive weeks. The resident teachers were requested to help to organize the students in their various classes. After the treatment, 40 objectives biology achievement test items were administered to the students to determine the equipment of their ability level.

Method of data analysis

The data collected for the study were analysed in line with the research questions using mean and standard deviation using Microsoft Excel Version 2016 while hypotheses were tested at 0.05 level of significance with t-test analysis using the formula:

$$t = \frac{X_1 - X_2}{\sqrt{\left(\frac{N_1 S_1^2 + N_2 S_2^2}{N_1 + N_2 - 2}\right) \left(\frac{N_1 + N_2}{N_1 \times N_2}\right)}}$$

Results

The response and analysis of results obtained from the study are presented herein. Table 1 shows the mean scores of projected presentations via PowerPoint and lecture methods on senior secondary school students' performance in biology. From the result, the mean score of PowerPoint presentation (59.3) was higher than that of the lecture method (57.5) indicating a positive effect of projected presentations via PowerPoint on senior secondary school students' achievement in biology.

Table 1. Mean (SD) scores of projected presentations via PowerPoint and lecture method on senior secondary school students' achievement in biology.

Variables	N	X	S.D
Scores of PowerPoint presentation	50	59.3	15.95
Score of lecture method	50	57.5	14.08

Table 2 shows the mean (SD) scores of biology students taught using projected presentations via PowerPoint and those taught without the use of projected presentations via PowerPoint. From the results, a higher mean score (59.8) was obtained from biology students taught using projected presentations via PowerPoint, which was higher compared to those without projected presentations via PowerPoint

(55.25). This indicates that students taught using PowerPoint presentations achieve higher in biology than those taught without PowerPoint presentations. Table three (3) shows mean (SD) scores of male biology students taught using projected presentations via PowerPoint and male biology students taught without using projected presentations via PowerPoint.

Table 2. Mean (SD) scores of biology students taught using projected presentations via PowerPoint and those taught without using PowerPoint presentations.

Variables	N	X	S.D
Scores of students taught using PowerPoint Presentation	50	59.8	19.0
Score of students taught without using PowerPoint Presentation	50	55.25	12.13

The result showed that a higher mean score (61.42) was recorded for male students taught using projected presentations via PowerPoint, while those taught without projected presentations via PowerPoint recorded a lower mean score (61.25). This is an indication that male biology students taught using projected presentations via PowerPoint achieve higher in biology than those taught without PowerPoint presentations. Table four 4 shows the mean (SD) scores on female biology students taught using projected presentations via PowerPoint and

those taught without using projected presentations via PowerPoint. The result showed a higher mean score of 65.1 for female biology students taught using projected presentations via PowerPoint, while those taught without projected presentations via PowerPoint recorded a lower mean score of 39.8.

The result revealed that female biology students taught using projected presentations via PowerPoint achieve higher than female students taught without projected presentations via PowerPoint.

Table 3. Mean (SD) scores of male biology students taught using projected presentations via PowerPoint and those taught without projected presentations via PowerPoint.

Variables	N	X	S.D
Scores of male biology students taught using projected presentations via PowerPoint	50	61.42	14.9
Score of male biology students taught without projected presentations via PowerPoint	50	61.25	14.77

Testing of research hypotheses

Hypothesis one

Ho₁: There is no significant effect of PowerPoint presentations on senior secondary school students' achievement in biology. Table five (5) indicated that the t-calculated value of 2.82 is greater than the t-critical value of 0.72 at a 0.05 level of significance. Therefore, the null hypothesis, which states that there is no significant effect of projected presentations via PowerPoint on senior secondary school students'

achievement in biology, is rejected. This means that there is a significant effect of projected presentations via PowerPoint on senior secondary school students' achievement in biology.

Hypothesis two

Ho₂: Students taught using projected presentations via PowerPoint do not significantly achieve higher in biology than those taught without PowerPoint presentations.

Table 4. Mean (SD) scores on female biology students taught using projected presentations via PowerPoint and those taught without using projected presentations via PowerPoint.

Variables	N	X	S.D
Scores of female students taught using PowerPoint Presentation	50	65.1	14.6
Score of female students taught without using PowerPoint Presentation	50	39.8	12.10

Table six (6) indicated that the t-calculated value of 2.91 is higher than the t-critical value of 0.72 at a 0.05 level of significance. Therefore, the null hypothesis, which states that students taught using projected presentations via PowerPoint do not significantly achieve higher in biology than those taught without PowerPoint presentations, is rejected. This means students taught using projected presentations via PowerPoint significantly achieve higher in biology than those taught without projected presentations via PowerPoint.

Hypothesis three

Ho₃: Male students taught using projected presentations via PowerPoint do not significantly

achieve higher in biology than male students taught without projected presentations via PowerPoint.

Table seven (7) indicated that the t-calculated value of 2.87 is higher than the t-critical value of 0.72 at a 0.05 level of significance. Therefore, the null hypothesis, which states that male students taught using projected presentations via PowerPoint do not significantly achieve higher in biology than male students taught without projected presentations via PowerPoint, is rejected. This means that there is a male student taught using projected presentations via PowerPoint significantly achieves higher in biology than male students taught without projected presentations via PowerPoint.

Table 5. T-test analysis of projected presentations via PowerPoint on senior secondary school students' achievement in biology.

Method	N	X	S.D	D.f	t.cal	t.cri.	Sign	Mark
Score of PowerPoint Presentation	50	59.3	15.9	98	2.82	0.72	0.05	Rejected
Score of lecture method	50	57.5	14.1					

Hypothesis four

Ho₄: Female students taught using projected presentations via PowerPoint do not significantly achieve higher in biology than female students taught without projected presentations via PowerPoint.

Table eight (8) indicates that the t-calculated value of 1.86 is greater than the t-critical value of 0.72 at a 0.05 level of significance. Therefore, the null

hypothesis, which states that female students taught using projected presentations via PowerPoint do not significantly achieve higher in biology than those taught without projected presentations via PowerPoint, is rejected. This means that female students taught using projected presentations via PowerPoint significantly achieve higher in biology than those taught without projected presentations via PowerPoint.

Table 6. T-test analysis of biology students taught using projected presentations via PowerPoint and those taught without projected presentations via PowerPoint.

Method	N	X	S.D	D.f	t.cal	t.cri.	Sign	Mark
Students taught using projected presentations via PowerPoint	50	59.8	19.0	98	2.91	0.72	0.05	Rejected
Students taught without projected presentations via PowerPoint	50	57.5	15.0					

Discussion

From the data obtained and analysed, the following findings emerged; a significant effect of projected presentations via PowerPoint on achievement in biology among senior secondary school students. The result supports the findings of Aninweze (2014), who opined that instrument materials like that of PowerPoint affect students' knowledge positively. The finding of this study is supported by Lari (2014), who stated that students taught using PowerPoint presentation shows positive outcome when compared to others taught without using PowerPoint presentation. Similarly, Hasan *et al.* (2010) reported that PowerPoint presentations had a significant effect

on achievement and attitude towards biology. The concept of PowerPoint presentations in the teaching process increases students' interest and motivation towards learning (Marmiene, 2006) and subsequent performance and achievement in examinations (Aydogdu, 2006). Gambari *et al.* (2014) reported on the effectiveness of PowerPoint on students' achievement and reported that students taught using PowerPoint had better performance compared to their counterparts taught without PowerPoint presentations. Accordingly, Gunel *et al.* (2006) stated that students' presentation using PowerPoint presentation results in higher and better performance and achievements.

Table 7. T-test analysis of male biology students taught using projected presentations via PowerPoint and male students taught without projected presentations via PowerPoint.

Method	N	\bar{X}	S.D	D.f	t.cal	t.cri.	Sign	Mark
Male students taught using projected presentations via PowerPoint	50	61.42	15.59	98	2.87	0.72	0.05	Rejected
Male students taught without projected presentations via PowerPoint	50	57.5	14.9					

Male students taught using PowerPoint presentations significantly achieve higher in biology than male students taught without PowerPoint presentations. Female students taught using PowerPoint presentations significantly achieve higher in biology than female students taught without PowerPoint presentations. This study conforms to the study of Asogwa and Echemazu (2011), who stated that male

students taught using PowerPoint presentation shows better academic outcome than those male students taught without using PowerPoint presentation.

This study negates the result of Gambari *et al.* (2014), who stated that there was no significant difference in the achievement of male and female taught using PowerPoint presentations.

Table 8. T-test analysis of scores of female biology students taught using projected presentations via PowerPoint and those taught without projected presentations via PowerPoint.

Method	N	\bar{X}	S.D	D.f	t.cal	t.cri.	Sign	Mark
Female students taught using projected presentations via PowerPoint	50	65.1	14.6	98	2.86	0.72	0.05	Rejected
Female students taught without projected presentations via PowerPoint	50	39.8	14.0					

Also, the present study disagrees with the results of Savoy *et al.* (2009), Apperson *et al.* (2006), Bartsch and Cobern (2003), Beets and Lobingier (2001), Susskind (2005), and Szabo and Hastings (2000) who did not find any beneficial effects of PowerPoint

on students' academic achievement.

Conclusion

Results from the findings revealed a significant difference in biology performance between secondary

school students taught using projected presentations via PowerPoint and those taught using the lecture method. Also, male and female students taught using projected presentations via PowerPoint significantly achieve higher in biology than male and female students taught without projected presentations via PowerPoint. Based on the findings of this study, it was recommended that teachers should encourage PowerPoint presentations for teaching. Also, government, ministries and other stakeholders of education should ensure an adequate supply of PowerPoint facilities to enhance students' academic achievement.

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