

COMPARATIVE EFFECTS OF ELECTRONIC AND PRINTED BOOKS ON BIOLOGY STUDENTS' ACHIEVEMENT AND ATTITUDE TOWARDS GENETICS CONCEPTS IN COLLEGES OF EDUCATION IN NIGER STATE, NIGERIA

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ABSTRACT. This study was carried out to determine the effects of electronic and printed books on Biology students' achievement in Genetics in Colleges of Education in Niger State, Nigeria. The influence of gender was also examined. The study adopted a quasi-experimental design in which three research questions and three corresponding null hypotheses guided the study. The sample of the study consists of 120 year one Biology students selected through a multi-stage sampling procedure from two Colleges of Education within the study area. The two schools were randomly assigned to experimental and control groups, in which 52 students (24 males and 28 females) and 68 students (33 male and 35) students were respectively exposed to genetics concepts through electronic and printed books. A 50-Multiple Choice Objective Question Items, named Genetics Achievement Test was used for data collection at pretest and posttest after being validated and found reliable. Findings revealed that electronic book significantly improved Biology students' achievement in Genetics better than printed book. Also gender difference does not exist in students' achievement after exposure to the two types of books. Similarly, attitude of students towards Biology was better improved with electronic book than printed book. Based on these findings, it was recommended that instructional contents should be disseminated to students in form of electronic books as these would attract, enhance their independent study and improve their academic achievement.

Keywords: Book, Electronic book, Printed book, Genetics, Biology, Academic achievement

INTRODUCTION

Colleges of Education are training institutions in Nigeria where preservice teachers are equipped with pedagogical skills and methodologies on specific teaching subjects. Essentially, students graduating from Colleges of Education are equipped with training on content and pedagogy known as double majors. In this case, contents are taught to students in the departments of their choice while pedagogical training is provided in the mother school of education. Hence, Sele (2013) stated that issuance of teaching certificate such as Nigerian Certificate in Education should follow rigorous training in both contents and pedagogy. Courses offered in colleges of education includes Biology Education with a philosophy of training preservice teachers to take a leadership role in raising young scientist at primary and junior secondary school level. The students trained at these levels are expected to become medical doctors, pharmacists, laboratory scientist and surgeons. In training preservice biology teachers especially in this 21st century, Dinah (2013) submitted that teaching and learning resources contribute significantly to the academic achievement of students. This implies that, without necessary resources including a leverage of Information and Communication Technology (ICT), students' academic achievement in the subject will not be realized (Knox, 2013).

ICT is one of the most effective tools for communicating biology curriculum materials. Oliver (2002) asserted that the use of ICT in colleges of education will enhances student-centred learning and increase chances for students' access to learning materials. Hence, ICT tools are necessary for biology teachers and students of colleges of education in Nigeria at less; to accelerate the learning process by increasing teachers' efficiency, at most; to improve students' learning outcome and raise the quality of

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biology education graduates generally (Osakwe, 2012). Presently, students of colleges of education in Nigeria constitute the major ICT tools users and the level at which students use handheld devices is becoming a norm or a new way of making a social presence among peers, thus paving a way to electronic learning. The rate at which students uses ICT related tools informally; mostly for social interactions surpasses device ownership and that their familiarity with these devices exceeds the computer capabilities of their teachers. Amanda, Jennifer, Kimberly and David (2013) argued that the level of expertise in the use of ICT tools among students is a preparatory ground for the adoption of electronic and mobile learning. This is based on the premise that ICT tools hold prodigious promise to advance the current learning generation of tertiary education students. In connection to the promises of ICT tools in accelerating students learning coupled with their expertise in the use of electronic devices comes the need to exploit a new way of communicating curricular contents to biology students. Conventionally, biology curricular contents are communicated by experts through textbooks, in that the textbook is seen as the single, definitive resource for teaching and learning. There is therefore little focus on the use of other teaching materials and the interplay this usage may have with more advanced, effective pedagogy. The textbook culture as point out by Fischer, Hilton, Robinson and Wiley (2015) can only provide students access to these books at a time when they are available in bookstores, when libraries are open and when students are taught how to use cataloguing system to retrieve the needed copy book. Textbook is seen as the vehicle of education, a symbolic hub of the power structure that governs the teacher's daily routine (Kumar, 1988). This emphasis on the textbook as Amanda, Jennifer, Kimberly and David (2013) mentioned is reinforced by the limited availability of alternative resources. Consequently, the increased use of textbooks in collages stimulated rapacious authors supported by predatory publishers to continue exploiting the market with high cost per copy even to the detriment of students and their parents. There recently a growing belief that hardcover textbooks published by predatory publishers lack the requisite quality in terms of content, structure, and relevance (Wiley, Hilton, Ellington & Hall, 2012; Richardson & Mahmood, 2012). Similarly, the quest for generating revenue among tertiary education lecturers facilitated the inadvertent transformation of an old century lecture notes to textbooks often meant for students as the target market. These developments have subjected Nigerian education system to a lot of setbacks ranging from the cost of purchasing traditional hard cover textbooks, difficulty in gathering information from primary sources for learning purposes, carrying extra weights in terms of more books to school among others. With these concerns, Mohammed and Shima (2015) stated that higher education can be a huge burden for low-income families with the eventual dropping out of the system due to poor finances. However, libraries in colleges of education have tried to address the lack of textbooks by offering services for photocopying copyrighted material free of charge, but the cost associated with photocopying is unbearable to meet the demand of poor students struggling to survive school fees, accommodation and feeding. In many cases, these initiatives were also shut down by multinational publishers who felt these practices negatively impacted upon their market share. Indeed, Wiley, Hilton, Ellington and Hall (2012) and Khalid (2015) argued that as a result of the high cost of textbooks and the lack of alternatives, there is currently a ratio of 50 students per textbook in the most well-attended courses in collage libraries with the implication of subjecting students to sourcing illegal copies of textbooks, while others do not have any access at all. In this context, open access to educational resources in higher education could be part of the strategy to close achievement gaps in educational provision and to support strategies of lowering the economic cost of teaching and learning materials (Jimes, Weiss & Keep, 2013). With the advent of e-books and its introduction in school learning process, Fischer, Hilton, Robinson and Wiley (2015) are of the opinion that students and teachers that need certain information can get it immediately by downloading an electronic book (e-book) at cheaper rates. Knox (2013) remarked that the prompt accessibility of ebooks increases their popularity among students and stimulate their interest toward increasing demand for online versions of e-books. E-books can be as short as a few pages or as long as a few hundred pages and are typically delivered to the buyer in a pdf file or as EXE file (executable file) which gives buyers preferences to save it, read it directly from computer screen or print the entire document (Fischer, Hilton, Robinson & Wiley, 2015).

Furthermore, Knox (2013) stated that the emergence of electronic books into the field of education have pave way for electronic learning with a possibility to learn anywhere and anytime. This development has enlivened the life of students by saving their energy in carrying unnecessary load of hard copy textbooks with the electronic version of such books which can be read on a computer and handheld devices such as cell phones and

tablets. E-books are not the same as print books, as Richardson and Mahmood (2012) highlighted, a printed book can be converted electronically to sell online in an electronic document, but a true e-book reads more like a webpage. Mohammed and Shima (2015) added that electronic books can be downloaded from the web, and then read using particular devices, identified as ereaders. An e-reader allows one to store several books at once, and is portable, just like a conventional book. In principle, an e-book is quite similar to a printed book only the medium is different either paper or electronic (Sele, 2013). An e-book as Fischer, Hilton, Robinson and Wiley (2015) put it, is an electronic text that constitutes the digital media equivalent of a conventional printed book, sometime restricted with a digital rights management system. However, not all e-books have a paper version, some e-books are written as born-digital books, while thousands of existing print works have been digitized, and a small number are published in parallel with the printed books which are been used by students in Colleges of Education. In a study conducted by Mohammed and Shima (2015), the effect of interactive e-book on students' achievement at Najran University in computer in education course using quasi-experimental study designs was examined. The sample consisted of 60 students in fifth grade from students registered in computer in education course in the first semester of the academic year (2013-2014). The findings indicate a statistically significant differences at the significance level of (0.05) between the means of students' scores of experimental group in both pre and post achievement tests in favour of posttest. The findings also indicate a statistically significant differences at the significance level of (0.05) between the means of students' scores of experimental group (e-book) and control group (printed book) in the posttest measurement of achievement tests in favour of experimental group. However, the study did not show any statistical difference between gender in both experimental and control groups. In another study by Khalid (2014) compared freshmen and graduate students' preference of textbook with the e-book and the results shows that for all levels of students, preference for e-books is higher than printed books. Similarly, the percentage of those preferring eBooks seems to be consistent with their academic achievement in sciences than those in printed books. While, the study of Amanda, Jennifer, Kimberly and David (2013) revealed that students who used e-textbooks for their education courses had significantly higher perceived psychomotor and affective learning than students who choose to use traditional print textbooks. That is, students who used e-textbooks perceived better acquisition of skill. Also, students using the e-textbook as compared to the traditional textbook had an increasing internalization of positive attitudes toward the content or subject matter. Gender and cognitive learning did not reach statistical significance in all the groups.

STATEMENT OF THE RESEARCH PROBLEM

With all the availability of alternative use of textbook as e-book, the flexibility, weightlessness, interactivity and reading on-the-go attached to e-books, they are not widely used by students in colleges of education. Mastering Biology concepts such as genetics may be difficult without the support of textbooks embedded with graphical illustration in colour form. Hardcover textbooks available in college libraries are generally printed black and white with illustrations shadowed with dark regions which is too difficult to decipher by students. Similarly, the lock and key culture of timing entry and exit of students enshrined by library administration in colleges of education do not provide them with direct access to books anywhere anytime. While this culture denies students access to learning resources at their comfort zone, it forces them to do away with important lecture schedules and meeting up with scheduled assignment submissions to meet up with the library timings, thereby widening the achievement gap. To avert this trend, students needed to be given leverages to become active in the learning process while studying independently. One of such leverages is through the use of well-structured electronic book. Electronic books possess interactive features such as bookmarking pages, using highlighter pen to highlight areas of interest, easy navigation supported by text to speech capabilities and most importantly their readability in the night which is compatible with present dark hours of electricity supply. Khalid (2014) remarked that these interactive features of e-book tied with their accessibility on mobile devices makes them interesting to students. Thus, if instructional contents are disseminated through such devices, students could be more responsible for their learning and achieve higher. Hence this study was carried out to determine whether electronic book and printed book would improve students' achievement in genetics concept.

Aim and Objectives of the Study: The aim of this study was to compare the effects of printed and electronic book on the achievement of Biology students in Genetics in

Colleges of Education in Niger State, Nigeria. Specifically, the study was carried out to:

- i. Determine the difference in the mean achievement scores of Biology students exposed to electronic and printed books on Genetics concepts.
- ii. Examine the influence of gender on the mean achievement scores of Biology students exposed to electronic book on Genetics concepts.
- iii. Examine the influence of gender on the mean achievement scores of Biology students exposed to printed book on Genetics concepts.
- iv. Determine the mean attitude scores of Biology students exposed to Genetics concepts using electronic and printed books.

The Research Questions: This study was guided by the following research questions:

1. What is the difference in the mean achievement scores of Biology students exposed to electronic and printed books on Genetics concepts?
2. Does gender have any influence on the mean achievement scores of Biology students exposed to electronic book on Genetics concepts?
3. Does gender have any influence on the mean achievement scores of Biology students exposed to printed book on Genetics concepts?
4. What is the mean attitude scores of students towards Biology when exposed to electronic and printed books on Genetics concepts?

Research Hypotheses: The following null hypotheses were tested in the study: **HO₁:** There is no significant difference in the mean achievement scores of Biology students exposed to electronic and printed books on Genetics concepts

HO₂: There is no significant difference in the mean achievement scores of male and female Biology students exposed to electronic book on Genetics concepts **HO₃:** There is no significant difference in the mean achievement scores of male and female Biology students exposed to printed book on Genetics concepts

HO₄: There is no significant difference in the mean attitude scores of students towards Biology after exposure to electronic and printed books.

METHODOLOGY

The research design adopted for this study was quasi experimental with nonequivalent control and experimental group design. The study involved two levels of independent variables (printed and electronic book), one level of dependent variable (achievement) and two levels of a moderating variable (gender: male and female). The population for this study comprised of all year one students offering Biology combination courses in Federal College of Education Kotangora and Niger State College of Education, Minna. A total of 120 students were sampled for the study using a multi-stage sampling procedure. First, purposive sampling technique was used to select the two Colleges of Education in Niger State because they are the only ones within the study area. Thereafter, the two Colleges were randomly assigned to Experimental (Ebook) and Control Group (Printed book) in which intact classes were purposively used for the study. The Experimental Group was made up of 52 students (24 male & 28 female) while the Control Group was made up of 68 students (33 males and 35 females).

Three research instruments were used in the study. They are Printed Book on Genetics Concept (PBGC), Electronic Book on Genetics Concept (EBGC) and Genetics Achievement Test (GAT). The PBGC was a 32-page well-structured lesson note on Genetics concepts printed in coloured form on paper while the EBGC was the electronic version of the PBGC. Both appeared in colour form but instead of diagrams and pictures in the printed version, the electronic version has short video clips and animations. The GAT was a 50-item multiple-choice objective questions with five options (A-E), out of which there was only one correct answer which attracts two marks each, hence, the total maximum score that a student could obtain was 100 Marks. The Three research instruments were validated by Educational Technology experts and two Biology experts. Thereafter, a pilot study was conducted on 15 randomly selected year one students offering Biology as a Minor course in College of Education Minna. These students were part of the study population but were not part of the main study. GAT was administered once on them and a reliability coefficient index of 0.82 was obtained using Kuder-Richardson-20 formula. Hence the instrument was considered reliable.

After permissions were obtained from appropriate authorities, students were intimated with the objectives of the study. Two research assistants were trained in the administration of the research instruments. The students in the experimental group (e-book) were given the electronic book on Genetics while their counterparts in the Control group received and used their smartphones to access the Genetics concepts. Independent study of the Genetics concepts was ensured for four weeks in between the

administration of GAT as pretest and posttest. The data collection process lasted for four weeks.

The data were analysed using Mean, Standard Deviation and t-test statistics. Specifically, Mean and standard Deviation were used to answer the three research questions while t-test statistics were used to test the three null hypotheses. Significance of the hypotheses were ascertained at 0.05 alpha level using Statistical Package for Social Sciences (SPSS) version 21.

RESULTS

Research Question One: What is the difference in the mean achievement scores of Biology students exposed to electronic and printed books on Genetics concepts?

Table 1. Mean Scores and Standard Deviation of Experimental and Control Group at Pretest and Posttest

Group	N	Pretest Mean		SD		Posttest Mean		SD		Mean Gain
Experimental	52	32.74	12.14	68.75	11.34	36.01				
Control	68	33.19	11.83	52.11	13.23	18.92				

Table 1 shows the mean scores and standard deviation of experimental and control groups at pretest and posttest. The table reveals that students in the experimental group exposed to electronic book had mean scores of 32.74 with standard deviation of 12.14 at pretest, and mean scores of 68.75 and standard deviation of 11.34 at posttest. The table further reveals that students in the control group exposed to printed book had mean scores of 33.19 with standard deviation of 11.83 at pretest, and mean scores of 52.11 with standard deviation of 13.23 at posttest. The mean gain scores of 36.01 and 18.92 was recorded for experimental and control groups respectively. This shows that differences exist in the mean achievement of the two groups in favour of experimental group exposed to electronic book.

Research Question Two: Does gender have any influence on the mean achievement scores of Biology students exposed to electronic book on Genetics concepts?

Table 2. Mean Scores and Standard Deviation of Male and Female Students in Experimental Group at Pretest and Posttest

Group	N	Pretest Mean		SD		Posttest Mean		SD		Mean Gain
Male	24	33.95	10.13	67.32	12.18	33.37				
Female	28	31.28	11.66	69.45	12.45	38.17				

Table 2 shows the mean scores and standard deviation of male and female students in the experimental (electronic book) group at pretest and posttest. The table reveals that male students had mean scores of 33.95 with standard deviation of 10.13 at pretest, and mean scores of 67.32 and standard deviation of 12.18 at posttest. While female students had mean scores of 31.28 with standard deviation of 11.66 at pretest, and mean scores of 69.45 with standard deviation of 12.45 at posttest. The mean gain scores of 33.37 and 38.17 was recorded for male and female groups respectively. This shows that difference exist in the mean achievement of the two groups in favour of female students.

Research Question Three: Does gender have any influence on the mean achievement scores of Biology students exposed to printed book on Genetics concepts?

Table 3. Mean Scores and Standard Deviation of Male and Female Students in Control Group at Pretest and Posttest

Group	N	Pretest Mean		SD		Posttest Mean		SD		Mean Gain
Male	33	33.16	14.46	51.33	13.53	18.17				
Female	35	33.22	13.23	53.60	12.89	20.38				

Table 3 shows the mean scores and standard deviation of male and female students in the control (printed) group at pretest and posttest. The table reveals that male students had mean scores of 33.16 with standard deviation of 14.46 at pretest, and mean scores of 51.33 and standard deviation of 13.53 at posttest. While female students had mean scores of 33.22 with standard deviation of 13.23 at pretest, and mean scores of 53.60 with standard deviation of 12.89 at posttest. The mean gain scores of 18.17 and 20.38 was recorded for male and female groups respectively. This shows that difference exist in the mean achievement of the two groups in favour of female students.

Research Question Four: What is the mean attitude scores of students towards Biology when exposed to electronic and printed books on Genetics concepts?

Table 4: Mean Scores and Standard Deviation of Responses on Students' Attitude Towards Electronic and Printed Books

S/N	Item	X ₁	S.D ₁	X ₂	S.D ₂
1	I believe the use of electronic book/printed book is effective in learning Biology	3.43	0.43	2.76	0.24

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2	I feel that using electronic book/printed book is an innovative way of learning Biology	3.16	0.16	2.59	0.41
3	I prefer learning Biology through electronic book/printed book	3.11	0.11	3.23	0.23
4	I will appreciate Biology better if all my course contents are converted to electronic book/printed book	4.17	1.17	3.32	0.32
5	The use of electronic book/printed book will improve my understanding of Biology	3.87	0.87	2.19	0.81
6	The use of electronic book/printed book makes Biology concepts precise and sequentially arranged	3.43	0.43	2.86	0.14
7	The use of electronic book/printed book improves my reading and comprehension ability	3.27	0.27	3.14	0.14
8	I feel relaxed and confidence while learning Biology through electronic book/printed book	3.87	0.87	2.67	0.33
9	I am able to move at my own pace while learning Biology through electronic book/printed book	3.96	0.96	3.01	0.01
10	The use of electronic book/printed book allows me to be actively involved in the teaching and learning process	3.97	0.97	2.54	0.46
	Grand Mean	3.62	0.62	2.83	0.31

X_1 & $S.D_1$: Mean Attitude Scores and Standard Deviation for Electronic Book

X_2 & $S.D_2$: Mean Attitude Scores and Standard Deviation for Printed Book

Table 4 shows the Mean and Standard Deviation of respondents on students' attitude towards Biology after exposure to electronic and printed books. The table reveals that the mean scores to each of the items for electronic book is constantly above the decision mean of 3.0. However, for printed book, it can be seen from the table that only four of the items recorded a mean scores above the decision mean with six items recording mean scores that were below the decision mean of 3.0. The grand means scores of 3.62 with standard deviation of 0.62 recorded for electronic book was above the decision mean of 3.0 while the grand mean scores of 2.83 with standard deviation of 0.31 recorded for printed book was below the decision mean of 3.0. This implies that students in the experimental group agreed that electronic book improved their attitude towards Biology while students in the control group disagreed that printed book improved their attitude towards Biology.

Hypothesis Testing:

Hypothesis one: There is no significant difference in the mean achievement scores of Biology students exposed to electronic and printed books on Genetics concepts.

Table 5: t-test Comparison of Posttest Mean Achievement Scores of Students in Experimental and Control Groups

Group	N	Mean	SD	Df	t-value	p-value
Experimental	52	68.75	11.34	118	7.243*	0.001
Control	68	52.11	13.23			

*Significant at $p = 0.05$

Table 5 shows the t-test comparison of the posttest achievement scores of students in the experimental and control groups. The table reveals that the calculated t- value ($t=7.243$, $df=118$, $p<0.05$) is significant at alpha level. Hence hypothesis one was rejected. This implies that significant difference exists in the achievement of Biology students in Genetics when exposed to electronic and printed book in favour of those exposed to electronic book.

Hypothesis two: There is no significant difference in the mean achievement scores of male and female Biology students exposed to electronic book on Genetics concepts.

Table 6: t-test Comparison of Posttest Mean Achievement Scores of Male and Female Students in Experimental (electronic book) Group

Group	N	Mean	SD	Df	t-value	p-value
Male	24	67.32	12.18	50	6.743 ^{ns}	0.321
Female	28	69.45	12.45			

Ns: Not Significant at $p = 0.05$

Table 6 shows the t-test comparison of the posttest achievement scores of male and female students in the experimental group. The table reveals that the calculated t- value ($t=6.743$, $df=50$, $p>0.05$) is not significant at alpha level. Hence hypothesis two was not rejected. This implies that no significant difference exists in the achievement of male and female Biology students in Genetics when exposed to electronic book.

Hypothesis three: There is no significant difference in the mean achievement scores of male and female Biology students exposed to printed book on Genetics concepts.

Table 7: t-test comparison of posttest mean achievement scores of male and female students in control (printed book) group

Group	N	Mean	SD	Df	t-value	p-value
Male	33	51.33	13.53	66	4.512 ^{ns}	0.512
Female	35	53.60	12.89			

NS: Not Significant at $p = 0.05$

Table 7 shows the t-test comparison of the posttest achievement scores of male and female students in the control group. The table reveals that the calculated t- value ($t=4.512$, $df=66$, $p>0.05$) is not significant at alpha level. Hence hypothesis three was not rejected. This implies that no significant difference exists in the achievement of male and female Biology students in Genetics when exposed to printed book.

Hypothesis four: There is no significant difference in the mean attitude scores of students towards Biology after exposure to electronic and printed books.

Table 8: t-test Results of Students' Attitude Towards Biology after Exposure to Electronic and Printed Books

Group	N	Mean	SD	Df	t-value	p-value
Experimental	52	72.4	12.48	118	6.354*	0.001
Control	68	56.6	13.46			

*Significant at $p = 0.05$

Table 4.15 shows the t-test comparison of the mean attitude scores of students towards Biology after exposure to electronic and printed books. The table reveals that the calculated t- value ($t=6.354$, $df=118$, $p<0.05$) is significant at alpha level. Hence hypothesis seven was rejected. This implies that significant difference exists in the attitude of students towards Biology after exposure to electronic and printed book in favour of those exposed to electronic book.

SUMMARY OF FINDINGS

Based on the results analysed, the following are the findings of the study: 1. Difference exists in the achievement of Biology students' exposed to electronic and printed books, as students exposed to electronic book on genetics concepts achieved better than their colleagues that were exposed to printed book on the same genetics concepts;

2. There is no significant difference in the achievement scores of male and female Biology students exposed to electronic book on genetics concept;
3. There is no significant difference in the achievement scores of male and female Biology students exposed to printed book;
4. The attitude of students towards Biology was better improved when exposed to electronic book than when exposed to printed book.

DISCUSSION OF RESULTS

The finding of the study on the mean achievement scores of Biology students exposed to electronic and printed books on Genetics concepts shows that Biology students' exposed to electronic book on genetics concepts achieved better than their colleagues that were exposed to printed book on the same genetics concepts. This finding is not surprising because students enjoy navigating through the e-book due to its ease of use in terms of taking notes, highlighting, and finding particular sections for quick reference. The result of the current study is confirming the finding of previous studies of Mohammed and Shima (2015) which also implied a superiority of experimental groups that used e-book over the control groups that used printed-book. This finding is consistent with the earlier finding of Khalid (2014) whose results show a statistically significant differences between the means of students' scores of experimental group (e-book) and control group (printed book) in the posttest measurement of achievement tests in favor to experimental group. It is also in agreement with the study of Amanda, Jennifer, Kimberly & David (2013) who revealed that students who used e-textbooks

for their education courses had significantly higher perceived psychomotor and affective learning than students who choose to use traditional print textbooks.

The finding of the study on the mean achievement scores of male and female Biology students exposed to electronic book on Genetics concepts showed no statistically significant difference in the achievement scores of male and female Biology students exposed to electronic book. The finding is consisted with Mohammed and Shimaa (2015) whose result indicated no statistical significant difference between male and female students exposed to e-book.

The finding of the study on the mean achievement scores of male and female Biology students exposed to printed book on Genetics concepts indicated that no significant difference in the achievement of male and female Biology students in Genetics when exposed to printed book. The finding is supported by the study of Mohammed and Shimaa (2015) whose result indicated no statistical significant difference between male and female students exposed to e-book. It is also consistent with Amanda, Jennifer, Kimberly & David (2013) study which says gender and cognitive learning did not reach statistical significance in all the groups. The finding of the study on the mean attitude scores of students towards Biology after exposure to electronic and printed books shows a significant difference in the attitude of students towards Biology after exposure to electronic and printed book. The finding agrees with the study of Amanda, Jennifer, Kimberly & David (2013) whose result indicated that students using the e-textbook as compared to the traditional textbook had an increasing internalization of positive attitudes toward the content or subject matter.

CONCLUSIONS

Based on the findings of this research, it was concluded that;

1. Biology students' exposed to electronic book on genetics concepts achieved better than their colleagues that were exposed to printed book on the same genetics concepts;
2. Both electronic book and printed book are favorable to male and female Biology students.
3. The achievement scores of male and female Biology students exposed to printed book did not differ;
4. The attitude of students towards Biology was better improved when exposed to electronic book than when exposed to printed book.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations are made;

1. Instructional contents in colleges of education should be disseminated to students in form of electronic books as these would attract and enhance their independent study while also improving their academic achievement. In doing so, the administration of colleges of education should as a matter of urgency stimulate the acquisition of tablet computers among lecturers and student so as to prepare for the uptake of e-book for instructional purposes.
2. The National Commission for Colleges of Education (NCCE) should lunch initiatives that encourage lecturers to design and develop e-book as a substitute for printed book and make them openly available to all students irrespective of gender. In doing that, a special allowance should be attached after providing all the necessary materials and moral support necessary for the uptake of e-book.
3. Building on the positive attitude of students toward using e-book, it is necessity to train college lecturers and students for its sustainability in collages of education.

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