Bichi Journal of Technology Education (BIJOTE)
ISSN: (PRINT): 2006-9715; (ONLINE: 2735-9514) Volume 7, Issue 2 (September, 2024), PP 59 - 69

EFFECTS OF GIMKIT GAMIFICATION SOFTWARE ON THE ACHIEVEMENT AND RETENTION OF SENIOR SECONDARY SCHOOL BIOLOGY STUDENTS' IN MINNA METROPOLIS

Gambari, A. I.[1 *], Sobowale, F. M[1], Owoyomi, A. D.[1], Mohammed, A. N.[1]

&

Sadiku, A[1]

[1] Department of Educational Technology,
Schools of Science and Technology Education,
Federal University of Technology, Minna
Email: favoursobowale501@gmail.com
Contact No. 08039657282

***Corresponding author**

Abstract: *The study investigated the Effects of GimKit gamification software on the achievement and retention of senior secondary school biology students' in Minna metropolis, Niger state. The study asserted a quasi-experimental research design which was guided by four research question and four research hypothesis using independent sample t-test. The population comprises of SSII Biology Students in Minna metropolis. The target population constitute of SSII Biology students in Bosso. The Purposive and simple random sampling techniques was use to select 30 SSII Biology students for the control group and 20 SSII Biology students for experimental group for the study. The instrument used for data collection was Biology achievement test (BAT). The instrument was pilot tested among 30 randomly selected students, the collected data was analyzed using PPMC and reliability coefficient of 0.78 was obtained. The findings of the study revealed that students taught with the use of GimKit Gamification Software had the mean achievement score of (M=88.00, S. D=8.18). While student taught with traditional lecture method had mean achievement of (M=80.33, S. D=12.10). The student taught with GimKit Gamification Software had retention score of (M=89.20, S. D=7.41). While student taught with traditional lecture method had retention score of (M=79.43, S. D=9.54). Based on the findings of the study the following recommendations were made. The Ministry of Education should encourage the use of GimKit Gamification Software in teaching Biology in Senior Secondary School, School Authority and teachers should be enlighten on the importance of GimKit Gamification Software in teaching, the students should also be enlightened on the importance of GimKit Gamification Software of learning to their careers.*

Keywords: *Achievement, Gamification, GimKit, Retention*

I. INTRODUCTION

Science and technology have played a significant role in transforming the landscape of education in recent years following the trend of the 20th century. With the advancement of technology, the traditional model of education has been challenged, and new possibilities for learning have emerged. According to Razzouk and Shute (2017), technology has the potential to transform learning in three ways. First, it can provide new and diverse learning opportunities, such as online courses, simulations, and educational games. Second, technology can personalize learning, as it can adapt to the individual needs, interests, and abilities of learners. Third, technology can facilitate collaboration and communication, as it allows learners to connect with peers and experts from different parts of the world. Hill and Lomas (2019) also highlight the potential of technology to promote student engagement and motivation. They suggest that technology can provide

interactive and engaging learning experiences that stimulate curiosity and interest in learning. They also note that technology can support student autonomy and agency, as it can provide learners with control over their learning process and pace. Finally, Selwyn (2016) points out that the impact of technology in education is not uniform and can be influenced by social and cultural factors. He argues that technology can reinforce existing power structures and social inequalities, as it may favor those with access to technology and digital skills. Therefore, he suggests that the impact of technology in education should be critically evaluated and contextualized within larger social and cultural frameworks. With science and technology paving new way in the educational system, we would like to look into a very new technology development which is finding its way into the educational system and is gaining ground in different parts of the world and it is called gamification.

Gamification as defined by Deterding *et al* (2011) is the application of game-design elements to non-game contexts with the intention of modifying behaviours, increasing fidelity or motivating and engaging people. Gamification utilizes elements associated with video games (game mechanics and game dynamics) in non-game applications. It is targeted at improving people's engagement and to foster certain behaviours. While the concept has been delved into primarily in the area of marketing, the potential of its implementation has been extended to other spheres such as Health, Environment, Government and Education (Jorge, 2013). Gamification in the field of Education represents the inclusion of game designs, to increase student involvement, and create a learning environment with an increased level of motivation (Boyun, 2015). The aim is to generate levels of engagement which will equate to what games can produce usually (Fardo 2016). The major goals of gamification are to develop certain abilities, introduce objectives that give learning a purpose, engage students, optimize learning, adapt to behaviour change, and socialize (Borges et al. 2013; Knutas et al. 2014; Krause et al. 2015; Dichev & Dicheva 2017). Stimulated by the effects that game elements can deliver, many researchers have looked into the impact of Gamification in an educational context, getting favorable results, such as the increase of engagement, user retention, knowledge, and cooperation (Hakulinen & Auvinen 2014; Tvarozek & Brza 2016). Educators on all ranks have created an activity in the application of gamification technology with a diversity of available web and application-based software aids (El-Masri & Tarhini, 2015). These aids come with easy access and implementation in the classroom. Socrates, Kahoot, Quizlet and GimKit are some software models available to teachers who are interested in adapting gamification in their classrooms. Gamification software affords teachers the choice of allotting points to earn badges and medals and to build social connections in the form of leaderboards and student collaboration (Hanus & Fox, 2015).

Academic Achievement refers to the performance of students having undergone instruction (Mlotshwa *et al*., 2020). Academic achievement is commonly measured through examinations or continuous assessments but there is no general agreement on how it is best evaluated or which aspect is the most important in determining procedural knowledge between skills or declarative and knowledge such as facts but there are inconclusive results over which individual factors successfully predict academic achievement. The various features in the academic achievement of students include approaches towards learning, aptitudes, different levels of intellectual capabilities, diverse interest and teaching procedures which results in outstanding achievement that can lead to student satisfaction about concepts. Kerzic *et al*. (2015) discovered that there was a significant improvement in performance (a higher average grade and lower average number of admissions) at the different (faculty, student and course) levels after introducing the MOODLE e-learning platform. Furthermore, MOODLE can be used to create online courseware which provides opportunities for interaction and communication between students and teachers (Gudkova *et al.,* 2021). As a very popular learning management system, the use of MOODLE-based online learning allows students to have a more flexible and self-scheduled learning process which promotes students' independence and increases their achievements (Mlotshwa *et al*., 2020). Likewise, Falode *et al.* (2019) investigated the effectiveness of MOODLE and WizIQ towards enhancing students' achievement in educational technology concepts and findings revealed no significant difference in the effectiveness of the two platforms. Although, MOODLE was also found to enhance students' learning achievement in Agricultural Science when compared with lecture method on undergraduates in North-Central Nigeria (Sobowale *et al*., 2019). Similarly, Augustina

et al. (2019) used MOODLE to improve students' achievement in reading and writing and it was discovered MOODLE improved the writing skills of students than reading. Chen *et al*. (2022) examined the effectiveness of MOODLE-based e-learning management system on e-collaborative learning, perceived satisfaction, and study achievement among nursing students and discovered a significant difference in the achievement of the two groups in favour of MOODLE.

A study was carried out by Wathanti and Chaithongsri (2015) using Electronic Learning Management System (ATutor) in developing good outcome for learning, achievement and level of satisfaction of the students. The study revealed that students achievement and satisfaction levels of respondents were higher after learning than before learning. Based on studies carried out on MOODLE and ATutor platforms, it was revealed that there was improvement on Achievement, interest and satisfaction. This was evident in a study carried out by Zhu (2012), it was indicated that online collaboration enhances students' achievement and invariably increase the satisfaction level of the students. Learning satisfaction is regarded as the extent of joy, pleasure and contentment a learner derives from going through an instructional process within or outside the physical learning environment. It has been associated with the individual's feelings and attitudes towards the educational process and the perceived level of fulfillment connected to the individuals desire to learn, caused by the learning motivation (Hansen & Ringdal, 2018; Martin *et al*., 2018). Agbana *et al*. (2018) defined Learning Satisfaction (LS) as the level of pleasure learners derive from teaching methods and learning services student experiences. Martin (2021) posited that students' satisfaction is short-term attitude resulting from an evaluation of a student's educational experience. Mohammed *et al* (2020) identifies learning satisfaction with the level of coherence between the individual's expectation and his actual experience. In a situation where the individual's real experience is equal or expectations, the individual feels satisfied, as opposed to an experience that is under his expectation thus making him feel unsatisfied (Martin 2021). For example, some studies (Riddle & Gier, 2019; Morton *et al.*, 2016; Dooley *et al.*, 2018; Green *et al.*, 2018) revealed that online learning was highly satisfying and it makes students to achieve better learning outcomes than conventional learning while other studies showed no difference in terms of students' satisfaction (Pickering & Swinnerton, 2019).

Interest is an excitement or feeling accompanied by special attention to do something (Gimba, 2013). In this regard, interest could be seen as a fundamental factor necessary for supporting effective learning because it is capable of arousing curiosity that could hold students' attention and such curiosity may prompt the students' desire to reengage in content over time, to seek answers to questions, to acquire more knowledge, and to understand better, and promote achievement and excellence in students' performance in a school subject (Ilori, 2013). Lack of interest, on the other hand, may inhibit learning. For instance, some students may be intellectually and physically capable to learn but may never learn until their interest is aroused. Whenever students' interest are aroused, their attention may be guaranteed and can equally promote effective learning (Ben, 2013). Damola et al. (2016) reported that MOODLE was an effective learning platform compared to lecture method in teaching Basic Science and Technology for teaching junior secondary school in Oyo state. It was also found out that students developed better interest towards Basic Science and Technology when taught using MOODLE than lecture method.

Based on the empirical evidences shown above LMS allows the students take responsibilities for individualistic approach of learning which enhanced academic achievement, satisfaction and interest. In self-regulated learning, students are motivated, independent, and become meta-cognitively active learners in their pace of learning. It is on the above assertion that the theoretical framework for this study hedges on socio-constructivist theory. Therefore, this study was carried out to find out the Effect of GimKit Gamification software on the Achievement and Retention of senior secondary school students in Minna, Metropolis, Niger State.

Purpose of the Study

The purpose of the study is to investigate the Effect of GimKit Gamification software on the Achievement and Retention of senior secondary school students in Minna, Metropolis, Niger State. Specifically, the study seeks to find out:

1. The effect of GimKit gamification software and traditional lecture method on the academic achievement of students taught Biology in secondary school in Minna, Niger state.
2. The effect of GimKit gamification software and traditional lecture method on the retention of student taught Biology in secondary school in Minna, Niger state.
3. The effect of gender on the achievement of student taught Biology using the GimKit gamification software.
4. The effect of gender on the retention of student taught Biology using the GimKit gamification software.

Research Questions

The following research questions guided the study:
1. What are the mean achievement scores of senior secondary school student taught Biology using GimKit Gamification software and traditional lecture method in Minna, Niger state?
2. What are the mean retention scores of senior secondary school student taught Biology using GimKit Gamification software and traditional lecture method in Minna, Niger state?
3. What are the mean achievement scores of senior secondary school male and female student taught Biology using GimKit Gamification software?
4. What are the mean retention scores of senior secondary school male and female students taught Biology using GimKit Gamification Software?

Research Hypotheses

The following null hypotheses were tested in the study:
HO_1: There is no significant difference between the mean achievement score of senior secondary school student taught Biology using GimKit Gamification software and traditional lecture method in Minna, Niger state?
HO_2: There is no significant difference between the mean retention score of senior secondary school student taught Biology using GimKit Gamification software and traditional lecture method in Minna, Niger state?
HO_3: There is no significant difference between the mean achievement scores of senior secondary school male and female student taught Biology using GimKit Gamification software?
HO_4: There is no significant difference between the mean retention scores of senior secondary school male and female students taught Biology using GimKit Gamification Software?

II. METHODOLOGY

The study adopted a quasi-experimental design with pre-test and post-test measures shown in the research design layout below.

Table 1: Research Design Layout

Groups	Pretest	Treatment	Posttest	Retention test
Experiment Group	O_1	X_1	O_2	O_3
Control Group	O_4	X_0	O_5	O_6

Where:
O_1 and O_4 - represents Pretest for experimental and control group.
O_2 and O_5 - represents Posttest for experimental and control group.
O_3 and O_6 – represents Retention test for both experimental and control group.
X_1 – Treatment
X_0 – No Treatment
Table 1 shows that two groups are involved in the study. The two groups were taught Skeletal System. The topic was taught using Traditional lecture method and the gamification instructional package. The population of this study comprised of secondary school students studying Biology in Minna, Niger state

with approximately 6788 students [NSSEB, 2017], while the target population for the studies are SS2 biology students in Minna, Niger state. The reason for choosing SS2 student for this study is because the unit to be taught is in the SS2 scheme of work. The sample size was 50 students selected from two secondary schools in Bosso. The schools were purposefully selected to the availability of computers and Internet facilities. The 50 students were selected using simple random sampling technique. A purposive sampling technique was adopted in carrying out this study. The sample size will be determined by the number of students in each selected school that are studying Biology in the senior secondary school (SS2 class). Two schools were selected for the study, with one school serving as the experimental group and the other school serving as the control group and the experimental group was selected based on the availability of computer and internet connection for the study.

Two instruments were used in the study. They are the treatment instruments and test instrument. The treatment instrument of this research was adoption of a Gamification instructional package that contain the course content of what the learner was taught. Skeletal Systems was taught with Gamification instructional package. The test instrument was the achievement test. The achievement test was made up of twenty (20) multiple choice items consisted of four response options, one of which is the correct answer while the remaining three serve as distracters. The treatment instruments were validated by to two experts, an expert in the department of educational technology, school of science and technology education, federal university of technology Minna and a subject matter expert from the secondary school, Minna. Based on their observations, some adjustments were made before carrying out a pilot study. In order to determine the reliability of the achievement test, a single-shot pilot test was administered on 30 randomly selected students using a split-half method and a coefficient value of 0.78 was obtained using Pearson Product Moment Correlation (PPMC). Hence, the instrument was considered to have high reliability values which also showed that the instrument is suitable for the categories of students in this study.

In order to administer the instruments on the sampled students, one research assistant was trained and involved so as to eliminate hawthorn effect. Similarly, orientation was conducted for the students and mechanisms were put in place to ensure that there was no interaction that may likely pose some threats to the internal validity of the study. Students in experimental group were exposed to Gamification Instructional Package. Their counterparts in the control group were taught using traditional lecture method. The teaching experience lasted for two weeks. Prior to the administration of these treatments to the respective groups, the achievement test was administered as pre-test, and after the treatment had been administered, the achievement test was administered as posttest. After taking the required data from the student achievement test, the students were placed on retention test which takes place after the post test. The same questions were presented to the student to provide the appropriate answers in order to test their retention. The data collected were analyzed using descriptive and inferential statistics. Descriptive statistics of mean and standard deviation was used to answer the research questions while inferential statistics involving independent t-test was used to test the four corresponding null hypotheses 0.05 level of significant levels.

III. PRESENTATION OF RESULTS

Research question one: What are the mean achievement scores of senior secondary school student taught Biology using GimKit Gamification software and traditional lecture method in Minna, Niger state?

Table 2: Mean and Standard Deviation of Pretest and Posttest Scores of Experimental and Control Groups

Group	N	Pretest		Posttest		Mean Gain
		$\bar{X}$	SD	$\bar{X}$	SD	
Experimental	20	38.25	10.42	88.00	8.18	49.75
Control	30	43.33	12.13	80.33	12.10	37.00

Table 2 reveals the mean and standard deviation of students' achievement scores in experimental and control groups in pretest and posttest. The result revealed that mean and standard deviation scores of the pretest and posttest of experimental group are $\bar{X}$ 38.25, SD = 10.42 and $\bar{X}$ = 88.00, SD = 8.18 respectively. This gives a mean gain score of 49.75 for experimental (GimKit gamification software) group. On the other hand, the mean and standard deviation of the pretest and posttest of the control group are $\bar{X}$ = 43.33, SD = 12.13 and $\bar{X}$ =80.33, SD = 12.10 respectively and gives a mean gain score of 37.00 for the Control (lecture method) Group. The results revealed that experimental group and control group had mean gain score of 49.75 and 37.00 respectively with the experimental group (GimKit gamification software) having the higher mean gain than Lecture method.

Research question two: What are the mean retention scores of senior secondary school student taught Biology using GimKit Gamification software and traditional lecture method in Minna, Niger state?

Table 3: Mean and Standard Deviation of Posttest and Retention test Scores of Experimental and Control Groups

Group	N	Posttest		Retention test		Mean Gain
		$\bar{X}$	SD	$\bar{X}$	SD	
Experimental	20	88.00	8.18	89.20	7.41	+1.20
Control	30	80.33	12.10	79.43	9.54	-0.90

Table 3 reveals the mean and standard deviation of retention scores of experimental group and control group in posttest and retention test. The result revealed that mean and standard deviation scores of the posttest and retention text experimental group are $\bar{X}$ =88.00, SD = 8.18 and $\bar{X}$ = 89.20, SD = 7.41 respectively. This gives a mean gain of 1.20 in favour of retention test for GimKit Gamification software group. On the other hand, the mean and standard deviation of the posttest and retention test of the control group are $\bar{X}$ = 80.33, SD = 12.10 and $\bar{X}$ =81.83, SD = 10.73 respectively and gives a mean loss score of -0.90 for the Control Group. The results revealed that experimental group retained the lesson being taught better than the control group.

Research question three: What are the mean achievement scores of senior secondary school male and female student taught Biology using GimKit Gamification software?

Table 4: The mean and standard deviation of pretest and posttest scores of male and female taught biology using GimKit Gamification Software

Group	N	Pretest		Posttest		Mean Gain
		$\bar{X}$	SD	$\bar{X}$	SD	
Male	9	42.22	9.05	87.22	8.33	45.00
Female	11	35.00	10.72	88.63	8.39	53.68

Table 4 reveals the mean and standard deviation of the pretest and posttest scores of male and female students in the experimental group. From the result, it can be deduced that mean score and standard deviation of the pretest and posttest score of the male students are $\bar{X}$ =42.22, SD = 9.05 and $\bar{X}$ = 87.22, SD =8.33, the mean gain is 45.00 in favour of the male posttest achievement score. Similarly, the mean and standard deviation of pretest and posttest score of female students are $\bar{X}$ = 35.00, SD = 10.72 and $\bar{X}$ = 88.63,

SD = 8.39, the mean gain is 53.68 in favour of the female posttest score. The result revealed that female students perform better than the male students.

Research question four: What are the mean retention scores of senior secondary school male and female students taught Biology using GimKit Gamification Software?

Table 5: The mean and standard deviation of posttest and retention test scores of male and female student taught biology using GimKit Gamification Software

Group	N	Posttest		Retention test		Mean Gain
		$\bar{X}$	SD	$\bar{X}$	SD	
Male	9	87.22	8.33	89.11	8.09	1.89
Female	11	88.63	8.39	89.27	7.21	0.64

Table 5 reveals the mean and standard deviation of the posttest and retention test scores of male and female students in experimental group. From the result, it can be seen that mean score of the posttest and retention test score of the male students are $\bar{X}$ =87.22, SD = 8.33 and $\bar{X}$ = 89.11, SD =8.09, the mean gain is 1.89 in favour of the male retention score. Similarly, the mean and standard deviation of posttest and retention test score of female are $\bar{X}$ = 88.63, SD = 8.39 and $\bar{X}$ = 89.27, SD = 7.21, the mean gain is 0.64 in favour of the female retention score. Also the result revealed that the male students had higher retention score than the female students.

Testing of Hypotheses

HO_1: There is no significant difference between the mean achievement score of senior secondary school student taught Biology using GimKit Gamification software and traditional lecture method in Minna, Niger state?

Table 6: Summary of Analysis of Variance (ANOVA) comparison of the mean achievement scores of the experimental and control group taught Biology using (GimKit)

Groups	Sum of Squares	df	Mean Square	F	Sig
Between groups	705.333	1	705.333	6.1370	0.02
Within groups	5516.667	48	114.931		
Total	6222	49			

Significant at p <0.05

Table 6 shows the results of the analysis of variance on achievement test of students who taught Biology using GimKit gamification software and Traditional Lecture Method. As shown in (Table 6) revealed F (1, 48) = 6.1370 p=0.02. With p <0.05, the null hypothesis was rejected. Therefore, there was significant difference in the mean achievement scores of senior secondary school students taught biology using GimKit Gamification Software and those taught using traditional Lecture method.

HO_2: There is no significant difference between the mean retention score of senior secondary school student taught Biology using GimKit Gamification software and traditional lecture method in Minna, Niger state?

Table 7: Summary of Analysis of Variance (ANOVA) comparison of the retention mean scores of the experimental group taught Biology using (GimKit) with traditional Lecture Method.

Groups	Sum of Squares	Df	Mean Square	F	Sig
Between groups	1144.653	1	1144.653	14.920	.000
Within groups	3682.567	48	76.720		
Total	4827.220	49			

Significant at p <0.05

Table 7 shows the results of the analysis of variance on retention test of students taught biology using GimKit Gamification Software and traditional Lecture Method. As shown in (Table 4.6) revealed F (1, 48) = 14.920 p=0.00. With p <0.05, the null hypothesis was rejected. Therefore, there was significant difference in the mean retention scores of senior secondary school students taught biology using GimKit Gamification Software and those taught using traditional Lecture method.

HO_3: There is no significant difference between the mean achievement scores of senior secondary school male and female student taught Biology using GimKit Gamification software?

Table 8: ANOVA Analysis of Achievement of Male and Female Students Taught Biology Using GimKit Gamification Software.

Groups	Sumof Squares	df	Mean Square	F	Sig
Between groups	9.899	1	9.899	0.14	0.71
Within groups	1260.1	18	70.006		
Total	1270	19			

Not Significant at p > 0.05

Table 8 shows the results of the analysis of variance on achievement of male and female students taught Biology using GimKit Gamification Software. The table revealed F (1, 18) = 0.14 P= 0.71 With P > 0.05 the null hypothesis was accepted. Therefore, there was no significant difference in the mean achievement scores of senior secondary school male and female students taught Biology using GimKit Gamification Software.

HO_4: There is no significant difference between the mean retention scores of senior secondary school male and female students taught Biology using GimKit Gamification Software?

Table 9: ANOVA Analysis of Retention of Male and Female Students Taught Biology Using GimKit Gamification Software.

Groups	Sumof Squares	Df	Mean Square	F	Sig
Between groups	0.129	1	0.129	0.002	0.96
Within groups	1043.07	18	57.948		
Total	1043.2	19			

Not Significant at p > 0.05

Table 9 shows the results of the analysis of variance on retention of male and female students taught Biology using GimKit Gamification Software. The table revealed F (1, 18) = 0.002 P= 0.96. With P > 0.05 the null hypothesis was accepted. Therefore, there was no significant difference in the mean retention scores of senior secondary school male and female students taught Biology using GimKit Gamification software. An

indication that Gamification Instructional Package can make both male and female student retain knowledge equally.

Findings of the Study

1. There was significant difference in the mean achievement scores of senior secondary school students taught biology using GimKit Gamification Software and those taught using traditional Lecture method.
2. There was significant difference in the mean retention scores of senior secondary school students taught biology using GimKit Gamification Software and those taught using traditional Lecture method.
3. There was no significant difference in the mean achievement scores of senior secondary school male and female students taught Biology using GimKit Gamification Software.
4. There was no significant difference in the mean retention scores of senior secondary school male and female students taught Biology using GimKit Gamification software.

IV. DISCUSSION OF FINDINGS

The study looked into the Effect of GimKit gamification software on the achievement and retention of senior secondary school biology student in Minna, metropolis, Niger state. One of the findings of this study revealed that there was significant difference in the mean achievement scores of students taught biology using GimKit Gamification Software and those taught using traditional Lecture method. This finding is in line with findings of Ololube and Agu (2018) result which says that students in the experimental group (taught using Computer Assisted Instruction) outperformed those in the control group (taught using Lecture method), indicating that Computer Assisted Instruction (CAI) had a significant positive impact on students' academic achievement. This finding is also in support of Hamzat et al (2017) who revealed that Compute Animation Instructional Package significantly improved students' achievement in practical biology. The researchers recommend that biology teachers should employ computer animation instructional packages to teach the practical aspects of photosynthesis among other biology topics.

The findings of this study also revealed that there was significant difference in the mean retention scores of students taught biology using GimKit Gamification Software and those taught using traditional Lecture method. Finding that emanated from this study revealed a significant difference between the retention of students taught using GimKit Gamification Software and those with Lecture Method. The difference was found to be in favour of those taught using GimKit Gamification Software. This is in support of the findings of Olorundare and Ojo (2019) who revealed that the students in the experimental group had a significantly higher mean score in the retention test than those in the control group.

Similarly, the findings unveiled that there was no significant difference in the mean achievement scores of male and female students taught Biology using GimKit Gamification Software. The result shows that GimKit Gamification Software has no influence on the gender of students when taught Biology using the Software. This assertion is in support of Adegbenro and Olusegun (2018) who revealed that no significant difference existed in the achievement between male and female students taught using computer-based instructional materials.

Lastly, the findings of the study disclosed that there was no significant difference in the mean retention scores of male and female students taught Biology using GimKit Gamification software. Based on the F-value of $F(1, 18) = 0.002$ $P= 0.96$ with $P > 0.05$ on table 4.8, hypothesis four was retained. This finding is in agreement with the view of Adegbenro and Olusegun (2018), who stated that there was no significant difference in retention between male and female students taught using computer-based instructional materials in biology.

V. CONCLUSION

Based on the findings of the study, on the Effects of GimKit gamification software on the achievement and retention of senior secondary school Biology students' in Minna Metropolis, Niger State, it could be concluded that GimKit gamification software helps to improve the achievement of student. The study further highlighted the positive influence of GimKit gamification software on academic achievement of student in Biology. From the findings of the study it could be concluded that there is significant difference in the academic achievement of students taught Biology using GimKit gamification software and those taught with lecture method. Hence, GimKit gamification software improves the academic achievement of the study than the conventional method.

Similarly, it could be deduced from the findings of the study that GimKit gamification software enhance the level of retention than those taught with lecture method. It could also be concluded from the findings that emanated from the study that there no significant difference in the achievement scores and retention level of male and female students taught Biology using GimKit gamification software. Hence, the use of the GimKit gamification software is not gender bias.

VI. RECOMMENDATIONS

Based on the findings, the following recommendations are proffered:-

1. The Ministry of Education should encourage the use of GimKit gamification software in teaching Biology in Senior Secondary School to improve the Achievement and Retention of students.
2. School Authority and teachers should be enlighten on the importance of GimKit gamification software in teaching.
3. The students should also be enlighten on the importance of GimKit gamification software of learning to their careers.

VII. REFERENCES

Aslan, A., & Zhu, C. (2017). Starting Teachers' Integration of ICT into Their Teaching Practices in the Lower Secondary Schools in Turkey. *Educational Sciences: Theory & Practice*, 18(1), 23-45.

Aydın Aslan and Chang Zhu (2015). Pre-Service Teachers' Perceptions of ICT Integration in Teacher Education in Turkey. *TOJET: The Turkish Online Journal of Educational Technology*. 14(3), 34-56.

Aydin, M. K., Gurol, M., & Vanderlinde, R. (2016). Evaluating ICT integration in Turkish K-12 schools through teachers' views. *Eurasia Journal of Mathematics, Science & Technology Education*, 12(4), 747-766.

Boulton, H. (2017). Exploring the effectiveness of new technologies: Improving literacy and engaging learners at risk of social exclusion in the UK. *Teaching and Teacher Education*, 63, 73–81.

Brynjolfsson, E., & McAfee, A. (2017). The business of artificial intelligence. *Harvard Business Review*, 95(1), 53-62.

Cakir, R., & Yildirim, S. (2017). Constructivism in technology education. In M. J. de Vries (Ed.), *Handbook of technology education* (pp. 125-143). Springer.

Chun-Mei, C., Chien-Hua, S., Hsi-Chi, H., & Tsu-Chuan, S. (2018). Factors influencing teachers' innovative teaching behaviour with information and communication technology (ICT): the mediator role of organisational innovation climate. *Educational Psychology*, 39(1), 65-85.

Cobb, P., & McClain, K. (2017). Constructivism in mathematics education. In B. J. Fraser, K. G. Tobin, & C. J. McRobbie (Eds.), *Second international handbook of science education* (pp. 463-477). Springer.

Dicheva, D., Dichev, C., Agre, G., & Angelova, G. (2015). Gamification in education: A systematic mapping study. *Journal of Educational Technology & Society*, 18(3), 75-88.

Driver, R., & Easley, J. A. (2017). Constructivism in science education. In B. J. Fraser, K. G. Tobin, & C. J. McRobbie (Eds.), Second international handbook of science education (pp. 97-111). Springer.

Ertmer, P. A., & Newby, T. J. (2018). Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. *Performance Improvement Quarterly*, 31(2), 43-71.

European Commission. (2017). Survey of schools: ICT in education. Brussels: European Commission. doi:10.2759/94499.
Fomsi, E.F. & Orduah, S.E. (2017). Gender differences in the use of ICT among teachers in model primary schools in rivers state, Nigeria. *British Journal of Education*, 5(4), 88-94.
Haji, S.A., Moluayonge, G.E., & Park, I. (2017). Teachers' Use of Information and Communications Technology in Education: Cameroon Secondary Schools Perspectives. *The Turkish Online Journal of Educational Technology*, 16(3), 147-153.
Hassan, M., Rosnain, I. M., Ahmad, F. M. A., & Su, L. W. (2016). Teachers' acceptance of ICT and its integration in the classroom. *Quality Assurance in Education*, 24(1), 26-40.
Huang, T. C., & Wu, W. H. (2018). Constructivist-based inquiry approach: A case study of teaching chemistry. *International Journal of Science and Mathematics Education*, 16(4), 679-698.
Japhet, E. L. & Usman A. T. (2018). Factors that influence teachers' adoption and integration of ICT in teaching/learning process. *Educational Media International*, 55(1), 79-105.
Jonassen, D. H. (2019). Constructivism: A theoretical foundation for instructional design. In Reiser, R. A., & Dempsey, J. V. (Eds.), *Trends and issues in instructional design and technology* (pp. 9-22). Pearson.
Kaarakainen, M. T., Kivinen, O. & Vainio, T. (2017) Performance-based testing for ICT skills assessing: A case study of students and teachers ICT skills in Finnish schools. *Universal Access in the Information Society*. doi: 10.1007/s10209-017-0553-9.
Kalpana, V., & Maheswari, M. (2017). Effectiveness of gamification in teaching mathematics to middle school students. *International Journal of Pure and Applied Mathematics*, 116(13), 171-178.
Kamau, L.M., Kimani, P., & Muthoni, P. (2016). Factors that influence teachers' perceptions of Information and communication technology (ICT) in mathematics teaching in Kenyan secondary schools. *International Journal of Education and Practice*, 4(4), 154-166.
Khawaji, S.A.N. (2018). English Teacher's Perception and Practices towards Technology Implementation. International Journal of Language and Literature, 4(2), 123-133.
Liu, C. C., & Chen, Z. H. (2017). The impact of gamification on learning programming in higher education. *Interactive Learning Environments*, 25(7), 904-918.
l Use of ICT in Secondary Schools: A Case of Ghana. *Contemporary Educational Technology*. 10(3), 272-288.
Majuto, M. & Gilbert, M.G. (2015). The use of ICT between male and female teachers in Secondary Schools in Tanzania, a Case of Dodoma Municipality. *International Journal of Social Sciences,* 4 (3), 51 -67.
Meenakshi K. (2020)_ Importance of ICT in Education. *Journal of Research and Method in Education (IOSR-JRME),* 1(4), 03-8.
Muhammad A., Iftikhar A. B., Namra M., Zahida H. & Abdul K. (2018). Comparison between Public and Private Secondary Schools regarding ICT facilities in computer labs. *Journal of ISOSS*. 4(1), 1-6
Mulhim, E. (2015, December). The current use of ICT by novice female teachers in Saudi primary schools and their perceived training needs. *30th ASCILITE Conference. Macquerie University, Sydney*.
Mustafa, M.N. (2015). The effects of gender differences in ict application: Bridging the gap of knowledge and skills among teachers. *Australian Journal of Basic and Applied Sciences*, 8(10), 81-86.
Ntshakala T, Eyono-Obono S. A (2019). Framework of the Factors Affecting the Adoption of ICT for Physical Education. *International Journal of Social, Behaviour, Educational Economic, Business and Industrial Engineeting*, 7(7), 75-89.
Ola, J. L., Anders, D. O., & Göran, F. (2017). Same but different? An examination of Swedish upper secondary school teachers' and students' views and use of ICT in education. *International Journal of Information and Learning Technology*, 34(2), 122-132.
Pachemska, T.A., & Pachemska, S. (2014). Factors affecting the frequency of ICT usage in primary schools teaching. *The Eurasia Proceedings of Educational & Social Sciences*, 1, 461-468.

Pei-Yu, W. (2015). Examining the Digital Divide between rural and urban schools: Technology vailability, teachers' integration level and students' perception. *Journal of Curriculum and Teaching*, 2(2), 127-139.
Shin, W. S. (2015). Teachers' use of technology and its influencing factors in Korean elementary schools. *Technology, Pedagogy and Education*, 24(4), 461-476.
Sipila, K. (2016). Educational use of information and communications technology: teachers' perspective. *Technology, Pedagogy and Education*, 23(2), 225-241.
Twining, P. & Henry, F. (2014). Enhancing ICT teaching in English schools: Vital Lessons. *World Journal of Education*, 4(2), 12-36.
Uluyol, C. & Sahin, S (2016). Elementary school teachers' ICT use in the classroom and their Vitanova motivators for using ICT. *British Journal of Educational Technology*, 47(1), 65-75.
UNESCO. (2017). Science, technology and innovation for sustainable development. Retrieved from http://www.unesco.org/new/en/natural-sciences/science-technology/
Voogt, J. (2015). A comparative analysis of international frameworks for 21 century competences: Implications for national curriculum policies. *Journal of Curriculum Studies*, 44(3), 299-321.
Wang, Q., Chen, W., & Liang, Y. (2017). The effects of gamification-based language learning on motivation and learning performance. Educational Technology & Society, 20(3), 211-222.
Wastiau, P. & Pagano, P. (2015). The 'Teacher Effect' on the use of ICT in the classroom. European Schoolnet, 1, 1-4.
Yuan, M. X. (2016). The theory of constructivism and the reform of teacher education. *Journal of Yangzhou Teacher College*, 24(2), 41-49.