EFFECT OF SMARTBOARD ON THE ACHIEVEMENT AND RETENTION OF SENIOR SECONDARY SCHOOL SS2 STUDENTS IN MICROSOFT WORD PROCESSING IN ENUGU STATE

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Abstract

This study investigated the 'Effect of Smart-Board on the Academic Achievement and Retention of SS II Computer Science Students in Microsoft word processing in Enugu State'. The objectives of the study were to determine if the medium of instruction affects the achievement and the retention ability of students in word processing. The study adopted a pre-test/post-test quasi-experimental control group design. A total number of 102 students from a population of 520 SS II Computer Science students were selected. The experimental group was exposed to Smart-Board classroom instruction on computing (smart-class) and the control group was exposed to the conventional teaching method. Two research questions were raised and two hypotheses were also formulated and tested at 0.05 levels of significance. Two test tools developed by the researcher and validated by experts were used to elicit information from the students. The two groups formed have 50 students as Control group taught using the conventional method of instruction on computing and 60 students as an experimental group exposed to Smart-Board classroom instruction on computing. Research questions were answered using Mean and Standard Deviation while ANOVA statistic at 0.05 level of significance was used to test the hypotheses. The analysis was carried out with the aid of Statistical Package for Social Science version 20 (IBM SPSS 20). The result obtained via ANOVA analysis revealed that there is a statistically significant difference between the group means of students taught word processing using Smart-Board and those taught using conventional. Hence, the hypothesis was rejected. However, further analysis carried out indicated that there is no statistically significant difference between the group means of male students and female students that were exposed to smart-board. Hence, the hypothesis was accepted. As such, the use of Smart-Board is gender-friendly. Based on the findings some recommendations were made.

Introduction

Every nation invests in education because it can produce unquantifiable benefits for individuals, organizations and society as a whole. Computer Science Education is very vital in the development of any society, as such no nation hope to develop without embracing Computer Technology. Pool in Afolabi (2021) opines that computer illiteracy is now regarded as a new dimension of illiteracy. This has triggered strong desires to equip schools with computer facilities and qualified personnel necessary to produce technologically proficient graduates in the developed countries of the world who are skilled to manipulate and manoeuvre through the ever dynamic economy of the 21st century driven by ICT. Computer science as a discipline is a relatively new discipline compared with chemistry or biology and unique because of its relevance and wide application in many areas of study such as physics, biology, engineering, law, and many more. Computer science has strong connections to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers, though finding a solution requires both computer science expertise and knowledge of the particular application domain. The computer can be viewed in two ways; as an area of study and as a tool. Computer science as an area of study is defined as the body of knowledge dealing with the design, analysis, implementation, efficiency and application of a process that transforms information (Nitza & Roman, 2017). Computer science is a discipline that spans theory and practice. It requires thinking in both abstract terms and concrete terms. Hence, unlike other subjects, it is practically orientated and requires visualization, demonstration and instant practice of learning processes for a body of knowledge to be retained. Where facilities and resources are available, a qualified and motivated computer science teacher will deploy methods that centre on the learner. Such an approach emphasizes practical activities and has the pupils experimenting, solving problems, discussing with each other and involved in practical hands-on activities. This approach stimulates curiosity, imagination and critical thinking. It keeps the lessons exciting and captivating to the young people. The fact is that in Enugu State secondary schools, teachers of computer science out of conservative mentality or lack of innovative instructional facilities such as Smart-Board treat their classrooms' activities just like linguistic subjects hence have resorted to verbalizing their lessons, relying heavily on the use of only one medium; the chalkboard otherwise called the conventional method. This approach has restricted computer science to a theoretical concept void of practical computing and encourages rote learning, poor retention of the body of knowledge and poor achievement in real life computing. This development as can be witnessed in Kaduna State and its environs has prompted secondary schools graduates and even graduates of higher learning to seek help in computer commercial centres where they register to acquire practical skills in computing. This is a pointer to the necessity of investigative study on the classroom activities of computer science in secondary schools hence this study was undertaken. Nitza and Roman (2017) declared that the interactive nature of the Smart-Board offers many practical uses for providing an introduction or review of the material, while the large work area invites collaboration through social interaction and communication. Not only is the Smart-Board a great technological device that engages students, but it also provides an invitation for students to feel comfortable to collaborate and gather opinions and ideas related to the content being taught. A Smart-Board combines the functionality of a whiteboard, computer, and projector into a single system. It operates as part of a system that makes use of an interactive whiteboard, a computer, projector and interactive software commonly called Smart notebook or collaborative software. The components are connected wirelessly, via USB or special cables. A projector connected to the computer displays images on the Smart-Board. Smart-boards have made their way into more and more schools most especially private secondary schools. The Smart-Board is used to enhance one's learning and encourage interactive participation from students.

Methodology

This study adopted the use of the factorial method that involved pre-test, post-test quasi-experimental control group design to determine the effect of the Smart-Board approach on students' academic achievement and retention in Microsoft word processing. In the design, Experimental and Control Groups were pretested before treatment to equate the groups using an Entry Behaviour Test in Computer (EBTC). This was followed by two weeks teaching period with Smart-Board for the Experimental group and a Conventional approach for the Control group. Achievement and Retention Test in Computer (ARTC) commonly referred to as post-test was used to determine the academic achievement and retention of the students. The scores of the experimental groups and control groups were analyzed using SPSS version 20 to determine the effects of teaching methods on the students. The population of this study comprised all SS II computer science students drawn from both private and public secondary schools in the Enugu Urban of Enugu State. There were 520 students out of which 300 students were females while 220 students were males. The sample for this study consisted of 102 SS II computer science students. A purposive sampling technique was used to select four schools from the population under study. The size of the sample was because Computer science is an elective subject and not compulsory. An intact class of 27 boys and 25 girls of SS II computer science students in the experimental and 26 boys and 24 girls of SS II computer science students in the control groups were used in each of the selected four schools as supported by Bichi (2010). To ensure the validity of the instruments, the test items were given to two experienced secondary school computer science teachers. They checked the structure of each item including the language used. They also examined the mental processes that each item elicited concerning accepting or rejecting the item based on the low or high standard of the item. They examine too, the extent to which the test item reflected the objectives of the lesson topics relating to NERDC standard. Their critique and suggestions were used to modify the final version of the instruments.

The reliability coefficient of the instrument was determined using the test-retest reliability method. The instruments were first administered at FGC, Enugu and then readministered on the same respondents (20 students) after two weeks due to its proximity to the researchers and also the common characteristics the elements share with those in the main study area. Achievement and Retention Test in Computer (ARTC) was administered on 10 of them while the Entry Behaviour Test in Computer (EBTC) was administered on the other 10 to establish the reliability coefficient of the instruments. The results of the first test and second test were compared to ascertain the reliability of the instruments by analysing the scores of the 10 students from the two different administrations for each set of the tests- ARTC and EBTC for its internal consistencies using Cronbach's Alpha with reliability coefficients of 0.87 and 0.87 for ARTC and EBTC respectively. This according to Malhotra and Birks (2007) is high and satisfactory. The school and students used for establishing the reliability of the instruments did not take part in the major study. Two (2) research instruments were used for data collection in this study. They were EBTC and ARTC. The EBTC was a 50-item 4- option multiple-choice objective test designed to measure skills that have been identified as being critical to the commencement of the experimental studies (Smart-Board versus chalkboard) on students. The ARTC was a 50-item 4-option multiple-choice objective test designed to measure students' understanding and retention of the computer contents of the chosen topics in a computer package (MS Word) for the study after treatment. The EBTC test items provided the basis on which it was determined if both the experimental group and control group have equivalent entry knowledge in computing before the commencement of treatment. It afforded also the premise to justify the comparison of the treatment group on an equal level.

Smart-Boards put simply, are a sophisticated replacement for the traditional overhead projector. Over the years, this cutting edge technology has proved popular for students of all ages. The interactive board turns a typical classroom into a fun learning environment. It enriches classrooms in several ways by providing hands-on collaboration and creating the perfect learning setting. A study by Solvie (2001) investigated the correlation between the use of an interactive whiteboard in the delivery of literacy lessons and student attention and participation in a first-grade classroom. She believed that to be developmentally appropriate for first-grade students, lessons need to engage students, be understandable and involve them in visual, auditory and kinesthetic ways. Gaining the attention of the students to engage them in the reading task is very important. Preparing them for the instruction and maintaining attention throughout the lesson is critical if there is to be gained from the lesson. Though her study found no significant increase in attention to task, the students appeared more enthusiastic and interested. A study of primary students' perceptions of interactive whiteboards by Hall and Higgins (2005) found that students and teachers had a favourable view of the use of interactive whiteboards. They believed that the reason may relate to their versatility, that they are mostly a mixture of earlier technologies such as the chalkboard, whiteboard, TV, VCR, DVD, overhead projector and the computer. Students in the study described the traditional white marker board as boring and argued that the versatility of the interactive whiteboard allowed for access to more resources such as the Internet, software, standardized practice tests and peer work. The students also liked the multimedia aspects of the interactive whiteboard, particularly the visual and audio aspects, and and being able to touch the board. All of the pupil groups alluded to the multimedia aspects of the interactive whiteboard as being particularly engaging and attention-holding. Hall and Higgins believed that increased engagement, motivation and attention span may lead to a positive impact on students when properly used by the teacher. This, they asserted, supports prior research. All of the pupil groups maintained that the interactive whiteboard makes lessons more fun. However, some students seemed preoccupied with the learning games and the authors cautioned that though the games add an element of fun to the lesson, teachers must strike a balance between meaningful uses and that of gratifying entertainment. What the students did not like about the interactive whiteboard were technical problems and lack of skills by teachers and students. Technical issues such as freezing, software malfunction and recalibration of the board were among those listed by the students as being problematic. Another problem that troubled the students was that of being able to see the board, because the projection was not bright enough as there was too much sunlight coming through the windows, or that the board was not properly placed in the room because of the availability of electrical or network outlets. Prior research supports that good technical support has a distinct positive influence on the use of technology in schools, they assert. Blue and Tirotta (2011) listed three characteristics that transform the smartboard into an efficient pedagogical tool: a. Divergent learning is the ability to skip from pages on the screen to the internet in a structured and fluid manner. This ability simulates the associative organization of the student's brain and contributes to the organization and clarity of the lesson as perceived by the student. b. Smart-Boards serve as a cognitive tool that expands students' minds and facilitate supported joint thinking. Since some of the mental load is transferred from the students to the board, they are free to engage in higher thinking processes. c. Interactive learning smart board enables interactions between study contents and the students themselves, both face-to-face and online. Moss, Jewett, Levaaic, Armstrong, Cardini and Castle (2007), designed a study to determine the impact of the London challenge portion of the school interactive Whiteboard Expansion project (SWE). The project was designed to equip one core subject department in each London Secondary school with interactive whiteboards. As the result of the study, they found that interactive whiteboards integrate well into the whole class teaching environment that is preferred in secondary classrooms, and use varies amongst different teachers and subjects. They determined that the process of changing pedagogy in a school is long. For implementation to be successful, discussion of pedagogy is just as important as discussion of the technology. They also found that though the newness of the technology was welcomed at first, the increase in motivation was temporary. Their statistical analysis also showed no influence on student achievement in the first year of the implementation. Moss, et al. found that interactive whiteboard technology led to an increased pace of delivery, increased use of multimedia resources and a change in whole class teaching to one more interactive. Teaching interaction and multimedia presentations can be viewed from two different perspectives they believed, a surface view and a deep understanding of the contributions to pedagogy. The technical and physical aspects of the technology appear on the surface. Using only the physical features of the interactive whiteboards lead to interactivity in this case. A deeper approach view however, assesses the effect of the technology on a broader pedagogical approach. This means assessing the pedagogical input on student understanding of key concepts relevant to the lesson. In a discussion of the pedagogical aspects of the interactive whiteboard, the authors asserted that advanced and careful lesson planning: allowed teachers to use the interactive whiteboard to generate efficient and effective learning. It gave the teachers greater freedom during the lessons to attend to individual needs of students and to differentiate instruction. Realtime assessment and grading allowed teachers to meet the needs of the students as the lesson progressed. Another benefit of the interactive whiteboard discussed was the ability to store and edit lessons, allowing teachers to catalogue lessons by topics save lessons for future planning and access and use the lessons from year to year. The more effective teachers maintained that their teaching styles had changed because of the interactive features of the board. Teachers in one study applauded the interactive whiteboard for its influence on pupils thinking skills and mental development. Other noted features discussed were activities that encouraged active, thinking approaches, lesson progression in learning and attainment, concept illustration, sequencing and lesson recall. Enhanced teacher motivation was evident as the teachers found preparation and delivery more interesting and enjoyable with many veteran teachers reporting that the interactive whiteboard had re-motivated them in the classroom. Two socio-cultural aspects of the interactive whiteboard were also discussed. One feature that surprised the teachers was the interaction within the class when a pupil was at the board. Teachers witnessed an intense interest in what the pupil did on the board and the whole class discussion that followed the activities on the screen. Another was the collaboration among the teachers. Evidence suggested that many schools are developing strategies for group presentation of lessons and sharing lessons on school networks. The growth of shared material is leading to an enhancement of teaching and learning that would not develop naturally within schools, they maintained. Tanner and Jones (2007) wrote of conflicts between new strategies on direct teaching and questioning of the whole class and the introduction of the interactive whiteboard into the mathematics classrooms. Conflicts, they believed, exist between the emphasis on teaching at a brisk pace and allowing students time to think about their answers; emphasis on the need to build on methods and the need to meet objectives; emphasis on the ability to recall facts and constructively using students errors; and allowing time for reflection on the lessons learned and lively interactive teaching. They believed that prior to the introduction of the interactive whiteboard, students' interaction with technology had been relatively autonomous with little teacher involvement. The introduction of the interactive whiteboard might be seen as a means of allowing teachers to resolve some of the problems with technology integration and support interactive teaching methods in whole class situations. There are concerns, however, that interactive whiteboards could have a negative effect by removing student autonomy and restoring the teacher-centred classroom (Tanner & Jones 2007). The extent to which teachers use these new tools as interactive depends mainly on individual teaching styles. The technology itself does not necessarily encourage a more interactive approach. Tanner & Jones believed, during its infancy, the technology is often assimilated into existing methods with only superficial changes in practice. Technology access is controlled by the teacher, and in the early stages of use is often treated as a blackboard substitute. During this period, interaction is often reduced. However, they wrote, an embedding effect was observed and a year or so later classroom interaction became more open. In a critical review of the literature, Smith, Higgins, Wall and Miller (2005) found that teachers and students exhibited a preference for the use of the interactive whiteboard over traditional instruction. They questioned, however, whether the enthusiasm has led to effective methodology. They argued that though the technology is expensive, in the hands of the right teacher it could and should be used in creative and imaginative ways above and beyond that of traditional boards or projection technology. They wrote that the uniqueness of interactive whiteboard technology “lies in the possibility for an intersection between technical and pedagogic interactivity” (Smith, Higgins, Wall & Miller, 2005). Smith, Higgins, Wall and Miller (2005) presented the findings of a two-year study that evaluated the use of interactive whiteboards by students in two grade levels of 12-15 schools from six Local Education Authorities. They reported that the introduction and training on interactive whiteboards were highly rated and had a strong impact on the classrooms. Teacher and student responses were extremely positive, and both groups were convinced that teaching and learning had improved. In the first year of the project, scores on national tests in mathematics and science showed a statistically significant improvement. That difference was not, however, found in the second year of the study. Based on structured classroom observations, they found the interactive whiteboards appeared to make a difference in classroom interaction, some were short-lived and others appeared over time as the technology became embedded. After a year's experience, follow-up questions were more focused on the whole class, rather than on an individual pupil, suggesting that pupils' responses were being used to involve others. In interviews, the teachers in the study were highly positive about their teaching and training on the interactive whiteboard. All of the teachers interviewed felt that the interactive whiteboard aided in achieving their teaching goals, citing factors such as available resources, stimulating presentations and flexibility. 99% of the teachers felt that the student was more motivated to learn when lessons were taught on the interactive whiteboard. 85% of the teachers felt that student attainment was higher. 87% felt that the interactive whiteboard had boosted their confidence in using technology. 81% of the teachers reported that their workload had increased as a result of using the interactive whiteboard, but felt it would decrease as they developed and saved their resources. 56% of the teachers noticed no effect on gender about the board, but 44% did report noticeable differences, more often as a positive impact on boys. Hall and Higgins (2005) found the perceptions of those involved in the study were visibly affected, with both teachers and students overwhelmingly convinced that the technology had a positive impact. The views were particularly strong in lesson enjoyment and engagement, but the most glaring positives were those of pupils' attention and motivation. They reported that in terms of student achievement, the impact of the interactive whiteboard was more difficult to identify. The benefits of the board did not show the second-year gain experienced in the first year of the study. Swan, Schenker and Kratcoski (2008) onducted a study that aimed to verify if the use of smart boards leads to improved academic achievement for students in the English Language and Mathematics. Achievement tests in reading and math which are used at the level of the state of Ohio, USA were used to compare students' achievement from the third grade to eighth grade in basic education in one of the state schools. Dozens of students whose teachers use smart-board and students whose teachers did not use smart-board shared in this study. Results showed slightly higher achievement for students who have used the smartboard and especially in the fourth and fifth grades students, the study recommended further studies to ascertain the impact of smart-board more clearly and strongly. Smith, Hardman and Higgins (2006) conducted a study in which they sought to determine the impact of smart-board to increase the interaction between teacher and student in reading, writing and arithmetic quotas, but to achieve this (184) classes have been viewed over two years to a sample of teachers of primary school has been teaching using smart-board and without it, and by using a computerized show form. The study found that smart-board led to some changes in the interaction between teachers and students. Marzano and Haystead (2009) conducted a study aimed to determine the effect of smart-board on the academic achievement of students where it included 85 teachers and classrooms teachers who used smart-board to teach a series of lessons, which have been taught later to a different group of students without the use of technology where the results indicated that the use of smart board was accompanied by an increase of 16% in student achievement scores, there were statistically significant differences in favour of the use of smart-board. Torff and Tirotta (2010) conducted a study to determine the extent to which the use of interactive whiteboard technology (IWB) was associated with upper elementary students' selfreported level of motivation in mathematics. The study's participants included 773 students (241 students in 4th grade, 260 in 5th grade, and 232 in 6th grade). There were 32 participating teachers: 19 who indicated they were IWB users (the treatment group) and 13 who indicated that they were not extensive users of the IWB (the control group). The treatment group included 458 students and the control group had 315 students. The results of the study revealed that the students in the treatment group reported higher levels of motivation relative to control students. Students with teachers who were more supportive of IWB technology reported higher motivation levels (compared to students of teachers who were less supportive). Wall et al. (2005) conducted survey research in which 80 students filled out templates with questions that asked them what they thought of the IWB and what they were likely to share with others about this technology. A total of 1568 responses were analyzed; 883 of the statements were judged to be positive, 494 statements were scored as neutral, and 191 were judged to be negative. Positive statements were then broken down into subcategories, with ‘‘motivation” and ‘‘fun” each noted in over 120 responses. The researchers concluded that students deemed the IWB to be motivational and fun, especially when students were able to see their work projected on the IWB The knowledge of computers has the advantage of aiding students’ communication both in and outside school. It can also make them self-employed upon graduation from secondary school. It has also been revealed in the foregoing literature that the Smart-Board device aids classroom teaching and learning activities. The literature so far reviewed has shown that no study has been conducted on the effects of Smart-Board utilization on the academic achievement and retention of SS II computer science students in Enugu State. Hence, there is a need to carry out this study to fill the gap in the literature. The growing relevance of computer literacy and the domineering influence of computer and related technologies in the 21st century has made it imperative that increased attention be given to the study of computer science at all levels of education, especially in secondary schools. It has been observed that most secondary schools in Enugu Urban of Enugu

State especially public schools lack adequate computer laboratories, computer gadgets and ICT instructional materials such as the Smart-Board.

Research Questions

The following research questions were posed to guide the study

1. Does the medium of instruction influence the achievement and the retention ability of students in word processing?

2. What is the difference in the effect of smartboard on male and female students' achievement in word processing?

Hypotheses

The following null hypotheses (Ho) were formulated in this study and tested at a 0.05 level of significance:

HO1: There is no significant difference between the mean achievement scores of students taught Microsoft word processing using Smart-Board and the students taught using the conventional method. HO2: There is no significant difference between the mean achievement score of male and female students who were exposed to Microsoft word processing smart-class.

RESULTS Research Question 1: Does the medium of instruction influence the achievement and the retention ability of students in computer science? The pre-test and post-test mean achievement and standard deviation of the students in computer science based on teaching methods are shown in Table

1. Table 1:

Results of t-test Analysis of the Posttest Mean Achievement Scores of the Experimental and Control Groups---

Groups	Test	N	X	Var.	SD	Mean Gains
C	EBTC (Pretest)	50	32.04	31.14	5.58	2.62
	ARTC (Posttest)	50	34.66	22.92	4.79	
E	EBTC (Pretest)	52	31.40	35.07	5.92	8.75
	ARTC (Posttest)	52	40.15	13.27	3.64	
Total	EBTC (Pretest)	102	31.71	32.92	5.74	5.75
	ARTC (Posttest)	102	37.46	25.43	5.04	

Table 1 shows the mean and standard deviation scores of the students taught using the conventional method and those taught using Smart-Board, in pre-test and post-test exercise code-named Entry Behaviour Test in Computer (EBTC) and Achievement and Retention Test in Computer (ARTC) respectively. Those taught with Smart-Board belong to the experimental group (Group E) while those taught with conventional method belong to the control group (Group C). From Table 1, it can be seen that the students taught using the conventional method had a mean

score of 32.04 and a standard deviation of 5.58 in the pre-test while in the posttest, the students scored a mean mark of 34.66 and a standard deviation of 5.74. For the students taught using the smart-board, it was observed that they had a mean score of 31.40 and a standard deviation of 5.92 (approx. 6.00) in the pre-test while in the post-test the students scored a mean achievement of 40.15 and a standard deviation of 3.64. Comparing the pre-test and post-test gain of the two groups, it can be seen that the students taught with the conventional method obtained a mean achievement gain score of 2.62 while those taught with the smart board had a mean achievement gain score of 8.75. Thus, though both the control and experimental groups obtained a pre-test/post-test gain score that of the experimental group was higher than that of the control group. The range of standard deviation of those taught using smart-board (2.28) in the pre-test/post-test exercise is wider compared with those taught using conventional method (0.79).

Research Question 2: What is the effect of smart-class on male and female students in computer studies?

Table 2: Post-Test Mean Achievement and Standard Deviation in Computer Science based on Gender

Groups Test	N	X	Var.	SD	Mean Gains
Female Pretest	25	31.32	38.81	5.90	8.76
Posttest	25	40.08	16.41	4.05	
Male Pretest	27	31.48	36.14	6.05	8.74
Posttest	27	40.22	10.87	3.30	
Total Pretest	52	31.40	35.07	5.92	8.75

Posttest	52	40.15	13.27	3.64

From the descriptive Table 2, the means of female students and male students in EBTC (Pre-test) are 31.32 and 31.48 respectively. On the ARTC (post-test), the means of female students and male students are 40.08 and 40.22 respectively. The mean gain of female students is (40.08 - 31.32) 8.76 while that of male students is (40.22 - 31.48) 8.74. Based on their means gains or achievements, it was deduced that computer science smart-class had equivalent effect on both genders. More so, the standard deviation of female students in the posttest is very close when compared with that of male students.

Hypothesis 1:

There is no significance difference between the Mean achievement scores of students taught Microsoft word using Smart-Board and the students taught using conventional method.

Table 3: Results of ANOVA Analysis of Mean Achievement Scores of Control and Experimental Groups based on Media of Instruction in Computer Science

Groups	Sum of Squares	Df	Mean Square	F-value	Sig.
Between Groups	769.354	1	769.354	42.742	0.000
Within Groups	1799.989	100	18.000		
Total	2569.343	101			

Significant at P< 0.05

Referencing ANOVA Table 3, there is statistically significant difference between the group means of students taught computer science using Smart-Board and those taught using Conventional method as determined by One-Way ANOVA (f (1,100) = 42.742, p= 0.0000000027). Hence, the hypothesis was rejected. Hypothesis 2: There is no significance difference between the Mean achievement scores of male and female students who were exposed to computer science Smart-class.

Hypothesis 2: There is no significance difference between the Mean achievement scores of male and female students who were exposed to computer science Smart-class.

Table 4: Results of ANOVA Analysis of Mean Achievement of Experimental Group based on Gender

Groups	Sum of Squares	Df	Mean Square	F-value	Sig.
Between Groups	0.263	1	0.263	0.019	0.890
Within Groups	676.507	50	13.530		
Total	676.769	51	---	---	---

Significant at P< 0.05

Referencing ANOVA Table 4, there is no statistically significant difference between the group means of male students and female students that were both exposed to smart-class on computer science as determined by One-Way ANOVA (f (1,50) =0.019, p= 0.890). Hence, the hypothesis was accepted.

DISCUSSION OF THE FINDINGS

Results from Table 1 showed that the mean achievement scores of the students in Experimental group were higher than that of the mean achievement scores of students in the control group. This was further confirmed by the result in Table 4.3 which revealed that, there is statistically significant difference between the group means of students taught computer science using smart-board and those taught using conventional method as determined by One-Way ANOVA (f (1,100) = 42.742, p= 0.0000000027). Therefore, it was confirmed that students exposed to computer science smart class performed better than those taught using the conventional method. This implies that the smart-board approach was more positive and effective in enhancing and facilitating achievement and retention ability of students in computer science than the conventional method. The finding of this study seems to support the findings of previous researchers (Ukwueze (2014), Solvie (2019) & Kent (2017). Table 2 dealt with the effect of smartclass on students in computer science based on their genders. Based on the descriptive report on Table 2, computer science smart-class does not discriminate between female and male students. This finding was further strengthened by ANOVA analysis on Table 4 which showed that there is no statistically significant difference between the group means of male students and female students that were both exposed to smart-class on computer science as determined by One-Way ANOVA ($f(1,50) = .019$, $p = 0.890$). As such, both male and female students have the ability to retain computer concept and perform better when exposed to computer science smart-class.

CONCLUSION

The findings of this study revealed that based on the data collected via the research instruments: EBTC and ARTC, and analysis carried out using SPSS, the following conclusions were drawn from the study on the effects of smart-board utilization on the academic achievement and retention of SS II computer science students in Enugu State:

1. Students exposed to computer science smart-class performed better than those taught using the conventional method. This implies that the smart-board approach was more positive and effective in enhancing and facilitating achievement and retention ability of students in computer science than the conventional method.

2. Computer science smart-class does not discriminate between female and male students. This implies that both male and female students have equivalent capacity to retain computer concept and perform better when exposed to computer science smart class.

RECOMMENDATIONS

Based on the findings from this study the following recommendations were made:

1. New methods of instructional delivery and presentations such as smart-class should be adopted in teaching computer science in secondary schools by the ministry of education, proprietors and proprietress.

2. Enugu state government, Educations Zones and the school administrators should make it a matter of great priority to provide adequate personnel to train the staff and teachers on the effective use of the Smart-board and related technologies.

3. Seminars, symposium and conferences should be conducted by the state government and major stakeholders in the education industry, school authorities and professional bodies to expose the students and the teachers to smart-class.

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