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EFFECT OF PROBLEM SOLVING STRATEGY ON SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN COMPUTER STUDIES IN ABAKALIKI METROPOLIS

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ABSTRACT

The study investigated effect of problem solving strategy on secondary school students' achievement in computer studies in Abakaliki Metropolis. Two research questions and three hypotheses guided the study. The study adopted quasi-experimental design, specifically the pretest posttest non-randomized control group design. The population of the study comprised 9,101 senior secondary school two (JS2) students offering computer studies in Abakaliki metropolis of Ebonyi state. A sample of 107 JSS2 students obtained through multi-stage sampling procedure was involved in the study. Computer Studies Achievement Test (CSAT) validated by three experts was used as instrument for data collection. The reliability of the CSAT was established using Kuder-Richardson Formula 20. The value obtained was .70. The experimental group was taught using problem solving strategy while the control group was taught using conventional method. The data obtained were analyzed using mean, standard deviation to answer research question and Analysis of Covariance (ANCOVA) was used to test the hypotheses. The findings showed that the use of problem solving strategy significantly improved JSS2 computer studies students' achievement more than conventional method in Abakaliki metropolis. Also, gender had no significant influence on students' achievement when taught using problem solving strategy. The researcher recommended among others that computer studies teachers should adopt problems solving strategy in order to actively engage students in the learning process and help them develop the skills of problem solving that can be applied in other academic exercises. From the recommendations from the findings conclusions were made.

Keyword: Problem-solving, achievement, Computer Studies and Conventional Method

Introduction

The role of computer in scientific and technological development has been established because it is used in almost all fields of human endeavour such as education, medicine, agriculture and engineering. Computer has changed lives in many ways and is expected to also change schools and education in general. As the world lives in Information and Communication Technology era, and in a swiftly changing economy, schools should equip students with computer knowledge that will allow them to fully participate in the rapidly changing economy that is more reason Computer Studies is on the subjects being taught and learn in secondary school.

Computer studies are not about learning how to use the computer, but it is much more than computer programming. It is the study of ways of representing objects and processes. It involves defining problems; analyzing problems; designing solutions; and developing, testing, and maintaining programs. Ononye et. al. (2021) stated that computer studies involve teaching and inculcating in the learner the basic skills required to independently manipulate the computer to achieve educational goals. Obiakor (2019) stressed that, computer studies as a subject is aimed at making students acquire skills and competencies required in this digital word of competitiveness. Such basic skills and competencies upon graduation make them conversant with term and practices embedded in the world of computer. Ekebosi (2019) opined that computer studies is a subject organized to enable people understand the function, uses and limitations of the computer and to provide an opportunity for the study of the modern methods of information processing. In the context of this study, computer studies is a lower and basic level of computer science subject for secondary school students which help them to learn and know the basic knowledge and skills of computer science at their level and age.

The intention of Nigeria to include computer studies into the secondary school curriculum dates back to 1988 when the National Policy on Computer Education was enacted and launched (Onah,2018). The policy on computer education suggested the following as some of the computer curriculum context at the secondary school level: A basic appreciation of how the computer works, an understanding of the basic principle of operating the computer, hands-on experience using the pre-programmed packages which are relevant to the interest of the students as teacher aids in different subjects. According to the National Policy onEducation (2018)it is expected that by the end of secondary education, the child would have acquired reasonable competence in software such as word processing, spreadsheet, database and analysing programs that allow learners interact with the computer the way they desire.

Also, one of the major merits of it is that it recommended the introduction of computer studies at all secondary schools in Nigeria.The committee on the policy recommended a total lifting of restriction on computer studies in a way that computerliteracy program can begin right from primary school. According to the committee, computer studies should be introduced at any level provided the necessary facilities and resources areadequately provided for effectiveimplementation to achieve the objectives of the subject.

The objectives of computer Studies at the secondary school level of education according to Federal Ministry of Education (FME, 2019) is to enable the learner to: Acquire basic computer skills such as the use of the keyboard, mouse and system, use the computer to facilitate learning electronically; develop reasonable level of competence on ICT applications that will engender entrepreneurial skills. Realising the objectives of computer studies as stipulated in the curriculum requires appropriate teaching methods, techniques, approaches and strategies. School subjects differ in content and difficulty level at which students learn them. One teaching method may not be suitable for learning all the subjects in school especially computer studies, consequently the need to explore the effect of some teaching methods on the achievement of students rather than use of conventional teaching method which only allows the teacher communicates ideas to learners through direct verbal discourse sometimes called talk and chalk making the teaching process teacher centered.

The teacher-centred technique which still goes on in schools seems to make teaching/learning of computer studies clumsy, uninteresting and ineffective and hence very difficult to achieve its objectives in students' achievement in computer studies (Okoli&Ekebosi, 2019). There is need to search for appropriate teaching methods that will meaningfully supplement the conventional method already in use. Thus, government invested significant fund into providing schools with computer and internet connection. Today, most schools have computers installed in their laboratories. However, introducing computer into schools generated new opportunities and challenges and it is difficult to find conclusive evidence on the positive effect of computer on students' learning outcomes. The learning outcomes will be achieved with use of the computer studies if the appropriate teaching strategy like innovative once are employed.

Okoliand Ekebosi(2019) averred that lack of use of innovative teaching strategies in teaching computer studies had led to poor achievement in the subject among secondary school students. To confirm this BECE Chief examiner report (2019-2021) reported weaknesses as thus; BECE Chief examiners' report (2019) confirmed

that students' poor achievement in computer studies come as a result of weaknesses in the areas of ICT gadget, computer virus, database, worksheet, search engines, computer problem solving skill, internet and spreadsheet package. Similarly, BECE Chief Examiners' Report (2020) attributed the poor achievement of students in computer studies to lack of qualified teachers to handle the subject in the classroom and poor instructional strategies used in presenting the technical and practical content areas of the subject to students in the computer base classroom/laboratory. Finally, BECE Chief Examiners' Report (2021) attributed the poor achievement of students in computer studies to mostly use of teaching strategy and weaknesses in the areas of ICT gadget, computer virus, database, worksheet, search engines, computer problem solving skill, internet and spreadsheet package. Despite all these weaknesses and poor achievement in the subject the BECE Chief examiners in 2021 suggested of use of innovative teaching method in teaching and instruction in computer studies in secondary school. There are many teaching strategies but at course of this study problem solving strategy will be of area of focus.

Problem solving strategy is an instructional approach that takes students through the process of working through details of a problem to reach a solution (Anyafulude, 2014). Problem solving strategy involves the following stages: Identify the problems, be clear about what the problem is, understand everyone's interests, list the possible solutions (options), evaluate the options, select an option or options, document the agreement(s) and agree on contingencies, monitoring, and evaluation. One benefit of these stages in problems solving is that students tend to develop the skills of critical thinking. When solutions to the problems are correctly deciphered students can apply them in solving problems and this could result in enhanced achievement. In this study, the first task of the teacher in using problem solving strategy is to guide the students to identify the problems and help them to link with previous knowledge. The teacher also solves a related problem as an example to guide the students and give the students a similar problem. The students in a small group discuss the problem cooperatively, explain what they know, pose questions, develop initial plans and organize their knowledge, attempt to solve the problems with several modifications, derive learning goals and organize further work. Finally, the results are presented to larger groups through the guidance of the teacher, instructor or facilitator and the students are allowed to reflect on the learning that has taken place. Problem solving strategy has been show to engage students more fruitfully and reduces rote learning as is common with conventional teaching methods.

Ntibi and Neji (2018) averred that the experimental groups taught with problem-solving method had a higher mean score than the control group taught with conventional method in Physics and Chemistry. Similarly, Orji and Ogbuanya (2018) that that the experimental group taught using problem based strategy achieved higher in achievement scores than the control group for electronic works achievement test at the posttest and follow-up test stages. In the same vain Akpogho, et. al. (2018) reported that there was a significant difference between the post-test mean scores of the students taught science subject using problem-solving skill method and those taught using the conventional method in favour of those taught using problem-solving skill. Ojaleye and Awofala (2018) posted that there was a statistically significant main effect of treatment on students' achievement in algebra and that the students' achievement in algebra was enhanced when problem solving method and learning based strategies were used than when traditional teaching method was used in problem skill theory (PST) irrespective of gender.

Ojaleye and Awofala (2018) observed a statistically significant main effect of gender on students' achievement in algebra between students taught the mathematical concept with problem-solving method and those taught with traditional teaching method but no significant interaction effect on treatment group and gender while Anyafulude (2014) reported that problem-based strategy significantly improved female students' achievement more than male counterparts and Abungu, et. al. (2014) posited that there was significant difference in the mean scores between boys and girls in the experimental group in favour of the boys. More so, Jegede and Fatoke (2014) observed that the effect due to gender on students' achievement in chemistry was not significant while Olufemi and Ibukun (2013) that gender had no significant influence on students' achievement in biology. Ezeike and Okigbo (2021) reported and observed that problem solving strategy is an effective instructional strategy for enhancing students' achievement. The strategy enables students to develop skills of problem solving which helps them to become independent learners. The strategy of problem solving ensures significant improvement of students' achievement in chemistry irrespective of gender.

With all these numerous importance of problem solving skills method, how effective it has beenin other subjects, fields which is outside computer studies, weaknesses and poor achievement of students in computer studies in secondary school as reported by BECE Chief Examiner Report from 2020-2022, the researcher investigated if problem solving strategy will enhance secondary school students' achievement in computer studies

in Abakaliki metropolis just as it deeds to other subject in different areas and scope aside from computer studies as reported from empirical and theoretical studies reviewed.

Research Questions

1. What is the difference between the mean achievement scores of students taught Computer studies using problem solving strategy (PSS) and those taught using conventional method (CM)?
2. What is the difference between the mean achievement scores of male and female students taught computer studies using PSS?

Hypotheses

1. There is no significant difference between the mean achievement scores of students taught Computer studies using problem solving strategy (PSS) and those taught using conventional method (CM).
2. There is no significant difference between the mean achievement scores of male and female students taught computer studies using PSS.
3. There is no significant interaction effect of teaching methods and gender on students' achievement in computer studies

Research Method

The design adopted for the study quasi-experiment, specifically, the pretest posttest non-equivalent control group design. The area of the study is Abakaliki metropolis of Ebonyi state. The population of the study consists of 9,101 JSS2 students offering computer studies in all the public secondary schools in Abakaliki metropolis. The total sample for the study is 107 junior secondary school year two (SS2) computer studies students. The sample was obtained through multistage sampling procedure. First, the two towns out of the three towns in Abakaliki metropolis were selected at random (balloting without replacement). Secondly, all the public schools in each of the two selected towns were stratified into coeducational and single sex schools. Thirdly, one coeducation school was purposively selected from the list of coeducational schools in each selected town. The reason for selecting the schools is because they have similar school characteristics. The two schools were randomly categorized into experimental and control groups. The instruments for data collection are Computer Studues Achievement Test (CSAT) developed by the researcher. Both instruments were validated by lecturers from the Department of Science Education, and Educational Foundations (Measurement and Evaluation Expert), both from Nnamdi Azikiwe University, Awka, and one experienced secondary school Computer studies teacher. The reliability of the CAT was established using Kuder-Richardson formula 20 (KR-20) to be .70. The experiment was conducted in two phases. In the first phase, the two regular

computer studies teachers in the experimental group school were trained by the researcher on how to use the problem solving strategy. The training lasted for one week in three contacts. In the second phase of the experiment, students in the experimental and control groups were given a pretest using the CSAT. There was no feedback or revision and corrections after the pretest. The treatment using problem solving consisted mainly in the teachers probing the students with questions that are related to all the contents to be taught. Before each question, the teacher solved one similar question to give the students guide on how to approach the problem on their own. The approach that was used by the teacher in the problem solving classroom was that of Wood (1975) stated as follows: Begin with a task embedded in a familiar setting, Introduce problem-solving techniques that might be applicable, Allow students to create their own paths to a solution, Emphasize collaborative learning and problem solving, Help develop collaborative working skills, Provide different roles for individuals in a group setting, Identify, confront and discuss misconceptions. The step to step procedures are used to teach the computer concepts of Computer Virus, Search Engine, Spreadsheet Packages and Spreadsheet features and terminologies. The researcher chose these topics because they are appropriate for the students' level and are enshrined in the JSS2 syllabus. More so, these topics were selected because they fall within the period they were taught to students as contained in the JSS2 scheme of work for the term and will also prepare them for the external examination class they are about to go into.

The same content was taught in the control group using conventional method where no group activity was conducted and no problem solving of questions emphasized. After the four weeks of teaching the control and experimental group schools, the teachers in both schools administered the instruments as posttest. Data collected was analyzed using mean and standard deviation for research questions. The hypotheses were tested using Analysis of covariance (ANCOVA). Where P value is less than or equal to 0.05, the null hypothesis was rejected but where it is greater than 0.05 the null hypothesis was not rejected.

Research Question 1: What is the difference between the mean achievement scores of students taught Computer studies using problem solving strategy (PSS) and those taught using conventional method (CM)?

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Table 1: Mean Achievement Scores of Students taught Computer Studies using Problem Solving Strategy and Conventional Method.

Source of Variation	N	Pretest Mean	SD	Posttest Mean	SD	Gained Mean
PSS	54	27.09	5.44	60.35	11.75	33.26
CM	53	29.38	6.00	45.49	6.8116.11	
Difference in Mean		-2.29	14.86	17.15		

Table 1 shows that the students taught computer studies using PSS has pretest mean achievement score of 27.09 and posttest mean achievement score of 60.35 with gained mean achievement score of 33.26, while those in the control group taught with conventional method had pretest mean achievement score of 29.38 and posttest mean achievement score of 45.49 with gained mean 16.11. The difference in the gain in mean achievement scores of both groups is 17.15 in favour of PSS

Research Question 2: What is the difference between the mean achievement scores of male and female students taught computer studies using PSS?

Table 2: Mean Achievement Scores of Male and Female Students taught Computer Studies using Problem Solving Strategy

Source of Variation	N	Pretest Mean	SD	Posttest Mean	SD	Gained Mean
Male	29	27.93	5.90	62.97	10.10	35.04
Female	25	26.12	4.79	57.32	12.96	31.20
Difference in Mean		1.81		5.65		3.84

Table 2 shows that the male students taught computer studies using PSS has pretest mean achievement score of 27.93 and posttest mean achievement score of 62.97 with gained mean achievement score of 35.04, while those in the females had pretest mean achievement score of 26.12 and posttest mean achievement score of 57.32 with gained mean 31.20. The difference in the gain in mean achievement scores of both groups is 3.84 in favour of males.

Hypothesis 1: There is no significant difference between the mean achievement scores of students taught Computer studies using problem solving strategy (PSS) and those taught using conventional method (CM).

Table 3: ANCOVA on Significance of Difference in Mean Achievement Scores of Students taught Computer Studies using PSS and Conventional Method

Source of Variation	SS	Df	MS	F	P-value	Decision
Corrected Model	5934.364a	2	2967.182	31.811	.000	
Intercept	10548.5651	10548.565	113.091	.000;		
Pretest	26.9331	26.933	.289	.592		
Method	5832.5531	5832.553	62.531	.000	S ;	
Error	9700.627	104	93.275;			
Total	316092.000	107				
Corrected; Total	15634.991	106				

Table 3 shows that at 0.05 level of significance, there was a significant main effect of the teaching methods on students' achievement in computer studies, F (1, 104) = 62.531, P(0.000) < 0.05. Therefore, the null hypothesis was rejected. Thus, there is a significant difference between the mean achievement scores of students taught computer studies using problem solving strategy (PSS) and those taught using conventional method (CM)

Hypothesis 2: There is no significant difference between the mean achievement scores of male and female students taught computer studies using PSS.

Table 4: ANCOVA on Significance of Difference in Mean Achievement Scores of Male and Female Students taught Computer Studies using PSS

Source of Variation	SS	Df	MS	F	P-value	Decision
Corrected Model	432.871a	2	216.435	1.604	.211	
Intercept	6899.698	1	6899.698	51.120	.000	
Pretest	4.962	1	4.962	.037	.849	
Gender	400.813	1	400.813	2.970	.091	NS
Error	6883.444	51	134.969			
Total	204003.000	54				
Corrected Total	7316.315	53				

Table 4 shows that at 0.05 level of significance, there was no significant main influence of gender on students' achievement in computer studies, F (1, 51) = 2.970, P(0.091) > 0.05. Therefore, the null hypothesis was not rejected. Thus, there is no significant difference between the mean achievement scores of male and female students taught computer studies

using PSS.

Hypothesis 3: There is no significant interaction effect of teaching methods and gender on students' achievement in computer studies

Table 5: ANCOVA on Significance of Interaction Effect of Teaching Methods and Gender on Students' Achievement in Computer Studies.

Source of Variation	SS	Df	MS	F	P-value	Decision
Corrected Model	6809.879a	4	1702.470	19.677	.000	
Intercept	11307.612	1	11307.612	130.693	.000	
Pretest	.422	1	.422	.005	.944	
Method	5414.361	1	5414.361	62.579	.000	
Gender	875.267	1	875.267	10.116	.002	
Method * Gender	.798	1	.798	.009	.924	NS
Error	8825.111	102	86.521			
Total	316092.000	107				
Corrected Total	15634.991	106				

Table 5 shows that at 0.05 level of significance, there was no significant interaction effect of teaching method and gender on students' achievement in computer studies, F (1, 102) = 0.009, P(0.924) > 0.05. Therefore, the null hypothesis was not rejected. Thus, there is no significant interaction effect of teaching methods and gender on students' achievement in computer studies.

Discussion of Findings

The finding of the study revealed that a significant difference exist between the mean achievement scores of students taught computer studies using problem solving strategy (PSS) and those taught using conventional method (CM). The observed result is attributable to the fact that problem solving strategy spurs the students to look at the academic tasks or problem and think critically about them. This simple cognitive exercise enabled the students to see the problem from different view point while at the same time deciphering several approaches to the solution of the problem. The students through these actions become fully engage in the learning process and take responsibility for their own learning. The resultant effect is improvement in achievement.

Students through problem solving are exposed to multiple intelligence owing to the trial and errors solutions by which they try to solve the problem. The process makes them spontaneously go through a metacognition phase through which they ask themselves if they have really learnt how to solve the problem and other similar problems. Thus, as they learn through problem solving, they avoid rote learning

and learn the concepts more meaningfully. Again, the process of problem solving being a personal cognitive process enabled the students to develop effective and useful strategies to solve everyday tasks or problems that are academically related thereby enhancing their academic achievement in computer studies.

The finding of the study is related to the findings of Ntibi and Neji (2018) that the experimental groups taught with problem-solving method had a higher mean score than the control group taught with conventional method in science subject including Physics and Chemistry. The finding is also in line with Ezeike and Okigbo (2021) who reported that problem solving strategy is an effective instructional strategy for enhancing students' achievement in many science subject including chemistry. The finding of the study also supports the finding of Orji and Ogbuanya (2018) that that the experimental group taught using problem based strategy achieved higher in achievement scores than the control group for electronic works achievement test at the posttest and follow-up test stages. The findings of Akpogho, Samba and Asemave (2018) that there was a significant difference between the post-test mean scores of the students taught using PSS and those taught using the conventional method lends credence to the finding of the study. The findings of Ojaleye and Awofala (2018) also supports the findings of the current study when they reported that there was a statistically significant main effect of treatment on students' achievement in algebra and that the students' achievement in algebra was enhanced when PBL and BL strategies were used than when TLM was used.

The finding of the study also revealed that no significant difference exists between the mean achievement scores of male and female students taught computer studies using PSS. This is because, the use of problem solving strategy uniformly affected students' participation in computer studies. All students both male and female were actively engaged in the learning process resulting in overall improved performance.

The findings of the study contradict the finding of Ojaleye and Awofala (2018) that there was a statistically significant main effect of gender on students' achievement in algebra. The findings of the study contravene the findings of Anyafulude (2014) that problem-based strategy significantly improved female students' achievement more than male counterparts. The finding of the study is also not in line with the findings of Abungu et, al. (2014) that there was significant difference in the mean scores between boys and girls in the experimental group in favour of the boys. The finding is inconsonance with Jegede and Fatoke (2014) that the effect due to gender on students' achievement in chemistry was not significant supports the finding of the

study. The finding of study is also in line with the finding of Olufemi and Ibukun (2013) that gender had no significant influence on students' achievement in biology.

Also, no significant interaction effect of teaching methods and gender on students' achievement in computer studies was observed. The findings of the study support the finding of Ojaleye and Awofala (2018) that there was no statistically significant interaction effect of treatment and gender on students' achievement in algebra.

Conclusion

The conclusion drawn from the findings of the study is that problem solving strategy is an effective instructional strategy for enhancing students' achievement. The strategy enables students to develop skills of problem solving which helps them to become independent learners. The strategy of problem solving ensures significant improvement of students' achievement in computer studies irrespective of gender.

Recommendations

Based on the finding and conclusion of the study, the following recommendations were made:

1. Seminars and Workshops should be organized by Science Teachers' Association of Nigeria and school heads on how to effectively plan computer studies lesson using problem solving strategy and its implementation in the classroom
2. Computer studies teachers should adopt problems solving strategy in order to actively engage students in the learning process and help them develop the skills of problem solving that can be applied in other academic exercises.

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