International Journal of Innovative Research and Advanced Studies (IJIRAS)
Volume 8 Issue 6, June 2021

ISSN: 2394-4404

Effect Of Problem-Based Learning On Achievement Of Secondary School Computer Studies Sudents In Nnewi Educaiton Zone

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Abstract: ***The study investigated the effect of problem-based learning on achievement of secondary school computer studies students. Two research questions and three hypotheses guided the study. The quasi-experimental design was adopted. The population of the study was 4, 765 senior secondary school year two (SS2) students offering computer studies in Nnewi Education Zone, out of which 101 students were selected for the study using random and purposive sampling techniques. The instrument for data collection were Computer Studies Achievement Test (CSAT) validated by two lecturers in Departments of Science Education and Educational Foundation, from Nnamdi Azikiwe University, Awka and one experienced secondary school computer studies teacher. The reliability of the instrument was established using Kuder-Richardson Formula 20 to be 0.73. The data for the study was obtained by administering the instruments as pretest and posttest. The data obtained were analyzed using mean and standard deviation to answer the research questions and analysis of covariance to test the hypotheses. The result of the study showed that there was a significant difference between the mean interest and achievement scores of students taught computer studies using problem-based learning and those taught using conventional method in favour of problem based learning. There was also a significant difference between the mean achievement scores of male and female students taught computer studies using PBL in favour of the female students. It was recommended that computer studies teachers should adopt the use of problem-based learning instructional strategy to sustain students' interest and improve achievement.***

Keyword: Problem-based, learning, achievement, computer, virus

I. INTRODUCTION

The advancement in science and technology has made the world a global or digital village. Every discipline and human practice involves the use of computer at one level or another. Nearly every machine comes with a computerized section. The dawn of the age of computer is felt by young and old alike. The place of computer in the life of men therefore has become indisputable. Much so, nearly every profession demands computer literacy and competency in its use. Countries of the world are today introducing computer studies at every level of education in order to ensure that the products of their educational systems meet the demands of the contemporary society.

It is no wonder, there was a review of the 9-year Basic Education Programme in Nigeria in 1999, to restructure and re-align the existing primary and junior secondary school curricula. The review sought to meet the targets of the 9-year Basic Education Programme in the context of National Economic Empowerment and Development Strategies (NEEDS) and the Millennium Development Goals (MDGs). The restructuring of the 9-year Basic Education Curriculum saw the introduction of Computer Studies/ICT at the Upper Basic Education Curriculum (JSS1 to JSS3). This effort by the Federal Government of Nigeria depicts the importance of Computer Studies today. However, students' according to the Chief examiner (2018), students lack competency in the use of computers, thus, their performance in Computer Studies have remained poor.

ISSN: 2394-4404

Achievement is the outcome of education. It depicts the extent to which the goal of instruction has been achieved (Hattie, 2009). It is the extent to which learners have accomplished the objectives of instruction. Computer Studies at the junior secondary level lacks the needed facilities for effective teaching of the subject as have been observed in most schools. Students may sometimes obtain good grades in Computer Studies in internal examinations but lack the operational skills. This continues to the senior secondary level of education. The West African Examinations Council (WAEC) Chief Examiners' Report (2017) showed that students lack competency and mastery of computer terminologies. The lack of computer laboratories and the inadequate computer gadgets and accessories in existing laboratories have been implicated. It has been recommended by the Chief Examiner that one way to cob this problem is by allowing students to practice and learn by solving Computer Studies-related problems. Such problem-solving could be in the form of typing in Microsoft Word environment, drawing with photo-paint, computing simple statistics using Microsoft Excel and efficient operation of the computer presentation packages.

Problem-based learning, as a strategy for learning, consists of carefully selected and designed problems that demand from the learner, acquisition of critical knowledge, problem-solving proficiency, self-directed learning strategies and team participation skills (Maloney, 2004). It reduces teacher's instruction where learners are seen as active listeners unlike when they are passively involved in classroom activities as in the case of lecture method. Problem-based learning is an example of constructivist learning strategy which poses significant contextualized real-world situations and provides resources, guidance, and instruction to learning as they develop content knowledge and problem-solving skills ((Maloney, 2004).

The first task for the teacher in problem-based learning is to guide the student to identify the problems and help them to link it with previous knowledge (Anyafulude, 2014). The students discuss the problem cooperatively among themselves in a small group, explain what they know, pose questions, generate hypotheses, develop initial plans and organize their knowledge, attempt to solve the problems with several modifications, derive learning goals and organize further work (Aidoo, Boateng, Kissi & Ofori, 2016). Finally, the results may be 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 (Azu & Osinubi, 2011). Problem-based learning is a form of inquiry-based learning which explains the environment in which learning is driven by a process of inquiry conducted by the students.

Problem-based learning is an instructional strategy in which the teachers construct authentic problems relating to the content of learning. The problems are given to the students who go in small groups to solve them. Problem templates may be provided which contain the problems, and space for recording solutions may be given to the students. In the computer laboratory, the students, relying on their group effort, will solve the problem, dialogue about what is the correct answer and record it. After the solutions to the problems have been recorded, groups are allowed by the teacher to further digest the process and steps to the solution of the problem as a way of internalizing their learning and ensuring that every group member is carried along. Every group may be allowed at their leisure time to further look into the problems a second time and see whether the provided solutions at the initial time may change.

Problem-based instructional strategy has been found to have a positive effect on students' academic achievement (Anyafulude, 2014). However, the challenge of using problem-based learning is that students' groups may cooperate positively towards solving the problem or not cooperate at all (Ballantine & Larres, 2007). Thus, learning may or may not take place based on the nature of interaction among groups that are given the problem to solve. Research studies geared towards the influence of small groups to solve problems on the achievement of students when problem-based learning is employed are lacking. Also, gender related issues when problem-based learning is adopted have remained inconclusive. There is need therefore to further examine the influence of gender on students' achievement.

PURPOSE OF THE STUDY

The purpose of the study is to investigate the effect of problem-based learning on achievement of secondary school computer studies students in Nnewi Education Zone. Specifically, the study determined:

- ✓ Difference in the mean achievement scores of students taught computer studies using problem-based learning and those taught using conventional method.
- ✓ Difference in the mean achievement scores of male and female students taught computer studies using problem-based learning.

RESEARCH QUESTIONS

- ✓ What is the difference in the mean achievement scores of students taught computer studies using problem-based learning and those taught using conventional method?
- ✓ What is the difference between the mean achievement scores of male and female students taught computer studies using problem-based learning?

HYPOTHESES

The following hypotheses were tested at 0.05 level of significance.

- ✓ There is no significant difference in the mean achievement scores of students taught computer studies using problem-based learning and those taught using conventional method.
- ✓ There is no significant difference between the mean achievement scores of students taught computer studies using problem-based learning.
- ✓ There is interaction of teaching methods and gender on achievement of students in computer studies.

II. METHOD

The design adopted for the study was quasi-experimental. The area for the study was Nnewi Education Zone. The population of the study consisted of 4, 765 senior secondary school two (SS2) computer studies students in 52 secondary schools in Nnewi Education Zone of Anambra State. The sample for the study comprised 101 Senior Secondary School Two (SSII) Computer Studies students. The multi-stage sampling was used. First, simple sampling (balloting without replacement) was used to obtain two Local Government Areas in Nnewi Education Zone. Purposive sampling was used to select two schools that each has a functional computer laboratory. The schools were randomly assigned to the experimental groups. In each of the schools, Computer Studies students were used.

The instruments for the study are teachers' score inventory and diary and Computer Studies Achievement Test (CSAT). CSAT was validated by two lecturers: one each in the Science Education department and the Educational Foundation Department of Nnamdi Azikiwe University, Awka, and to an experienced Computer Studies teacher in a secondary school. The reliability of the CSAT was established using the Kudder-Richardson Formula 20 (KR-20) to be 0.73.

The experiment was conducted in two phases. The first phase was for the training of the teachers for the experimental groups on the problem-based learning strategy. The second phase involved the teaching of the students. Phase one was conducted in one week. There were three (3) contacts of 2 hours per contact. The second phase, which involved the treatment of the subjects, was carried out in six weeks. In the first week, the students were given the CSAT as pretest. The average scores of the students in first, second and third terms were used to assign students into the ability groups. The homogeneous ability groups comprised students with similar scores within the range of 0-10 of one another's while the heterogeneous ability groups comprised students with dissimilar scores that differ by more than 10. There was no feedback on the pretest. After the pretest and grouping, the treatment began, using the problem-based learning strategy for the two experimental groups (the first group with heterogeneous ability-grouped students and the second group with homogeneous ability-grouped students). The weekly activities for the experimental groups are as outlined in the Computer Studies problems template.

The students, in each week, went to the laboratory after their normal Computer Studies classes with the template given them by the teacher. In the laboratory, they were to solve the problems created by the teacher. After solving the problems, they were to write the solutions down, using the template as a guide. The teacher did not provide any further guide once the students were in the laboratory. They were to find solutions to the problems by consulting among their ability-group members and relying on their group effort. The computer systems were internet-enabled for them to possibly seek information on how to solve their problems. After successfully solving any problem, the students submitted their templates on which they had recorded their answers to the teacher.

After each week's problem and problem solving, the students were invited, by their groups(both homogeneous and heterogeneous), to the laboratory within the same week at different times to further discuss the problem and try to finish up what they possibly could not achieve within the time frame for the initial laboratory exercise. Students were allowed to engage in extensive discussions and argument within this second invitation. The teacher noted the correct solutions provided by the students and laid emphasis on them in the subsequent week's lesson during their normal Computer Studies classes.

Data relating to research questions were analyzed using mean. The hypotheses were tested, using analysis of covariance. The ANCOVA procedure was used to eliminate any initial group difference in the entry abilities of the participants that extraneous-variable control measures could not properly address. For the hypotheses**,** the null hypothesis is rejected if the Pvalue is less than 0.05; otherwise, it is not rejected.

III. RESULTS

RESEARCH QUESTION 1: What is the difference between the mean achievement scores of students taught computer studies using problem-based learning and those taught using conventional method?

Source of Variation	N	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD	Gain in Mean
PBL	49	35.82	9.59	70.61	8.01	34.79
CM	52	31.15	12.27	50.58	9.48	19.43
Difference in mean		4.67		20.03		15.36

Table 1: Difference between the Pretest and Posttest Mean Achievement Scores of Students taught Computer using Problem-based Learning and Conventional Method

Table 1 shows that the students taught computer studies using problem-based learning has pretest mean achievement score of 35.82 and posttest mean score of 70.61 with gain in mean score of 34.79, while those taught using conventional method has pretest mean score of 31.15 and posttest mean score of 50.58 with gain in mean 19.43. The difference between the gained mean achievement scores of the students taught computer studies using PBL and conventional method was 15.36 in favour of the PBL.

RESEARCH QUESTION 2: What is the difference between the mean achievement scores of male and female students taught computer studies using problem-based learning?

Gender	N	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD	Gained Mean
Male	22	36.14	9.63	70.45	8.00	34.31
Female	27	35.56	9.74	70.74	8.17	35.18
Difference in mean		0.58		-0.29		-0.87

Table 2: Difference between the Pretest and Posttest Mean Achievement Scores of Male and Female Students taught Computer Studies using PBL

Table 2 shows that male students taught computer studies using problem-based learning has gained mean achievement score of 34.31 while female students has gained mean interest score of 35.18. The difference between the gained mean

achievement scores of the male and female students taught computer studies using PBL was 0.87 in favour of the females.

HYPOTHESIS 1: There is no significant difference between the mean achievement scores of students taught computer studies using problem-based learning and those taught using conventional method.

Source of variation	SS	Df	MS	F	P-value	Decision
Corrected Model	10349.322[a]	2	5174.661	68.145	.000	
Intercept	30626.228	1	30626.228	403.314	.000	
Pretest	222.558	1	222.558	2.931	.090	
Method	9085.719	1	9085.719	119.649	.000	Significant
Error	7441.767	98	75.936			
Total	385000.000	101				
Corrected Total	17791.089	100				

Table 3: ANCOVA on Significance of Difference between Students' Achievement taught Computer Studies using PBL and those taught using Conventional Method

Table 3 shows that at 0.05 level of significance there was a significant main effect of the treatment on students' achievement in computer studies, F (1, 98) = 119.649, P (0.000) < 0.05. The null hypothesis was rejected. Therefore, there is a significant difference between the mean achievement scores of students taught computer studies using problem-based learning and those taught using conventional method in favour of problem-based learning.

HYPOTHESIS 2: There is no significant difference between the mean achievement scores of students taught computer studies using problem-based learning.

Source of variation	SS	Df	MS	F	P-value	Decision
Corrected Model	15.442[a]	2	7.721	.116	.891	
Intercept	15070.538	1	15070.538	226.093	.000	
Pretest	14.449	1	14.449	.217	.644	
Gender	1.236	1	1.236	.019	.892	Not Significant
Error	3066.190	46	66.656			
Total	247400.000	49				
Corrected Total	3081.633	48				

Table 4: ANCOVA on Significance of Difference between the Mean Achievement Scores of Male and Female Students taught Computer Studies using PBL

Table 4 shows that at 0.05 level of significance there was no significant influence of gender on students' achievement in computer studies, F (1, 47) = 0.019, P (0.892) < 0.05. Therefore, the null hypothesis was not rejected. Thus, there is no significant difference between the mean achievement scores of students taught computer studies using problem-based learning.

HYPOTHESIS 3: There is interaction of teaching methods and gender on achievement of students in computer studies.

Source of variation	SS	Df	MS	F	P-value	Decision
Corrected Model	10478.250[a]	4	2619.563	34.389	.000	
Intercept	30506.871	1	30506.871	400.482	.000	
Pretest	227.416	1	227.416	2.985	.087	
Method	9009.806	1	9009.806	118.277	.000	
Gender	47.916	1	47.916	.629	.430	
Method * Gender	76.610	1	76.610	1.006	.318	Not Significant
Error	7312.839	96	76.175			
Total	385000.000	101				
Corrected Total	17791.089	100				

Table 10: ANCOVA on Interaction Effects of Teaching Methods and Gender on Achievement in Computer Studies

Table 5 shows that at 0.05 level of significance there was no significant interaction effect of teaching methods and gender on students' achievement in computer studies, F (1, 96) = 1.006, P (0.318) < 0.05. Therefore, the null hypothesis was not rejected. Thus, there is no significant interaction of teaching methods and gender on achievement of students in computer studies.

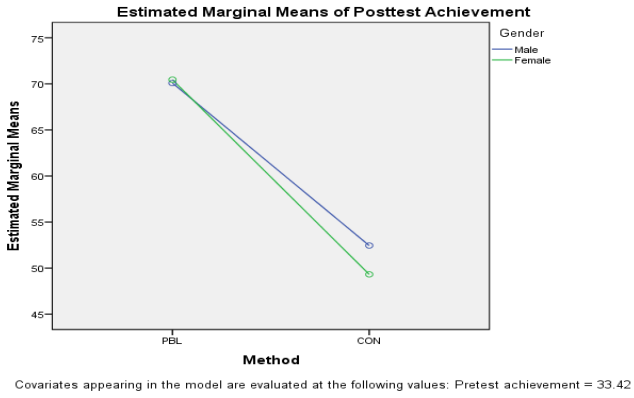

Figure 1: Plot of interaction between teaching methods and gender on students' achievement in computer studies

Figure 1 shows that the plot of interaction between teaching methods and gender on students' achievement in computer studies is disordinal and significant.

IV. DISCUSSION

The findings of the study showed that there is a significant difference between the mean achievement scores of students taught computer studies using problem-based learning and those taught using conventional method in favour of problem-based learning. Students in the problem-based learning group solved one related problem after the other. The developed the skills of problem solving and the more problem they solve, their more their understanding of the concepts taught in computer studies was widened. The understanding helped them in solving test questions resulting in improved achievement.

In finding solutions to related problems, students' learning experience was drawn closer to reality. Applying the knowledge gained in academic exercises that feels like real life problems facilitated enhanced learning with a resultant improvement in students' achievement. When students' achievement increased especially when they received positive feedback about questions rightly solved, they are motivated to further enhance achievement by striving to solve other questions right. The confidence in the ability of the students improved their achievement of students in computer studies when taught using problem-based learning.

ISSN: 2394-4404

The finding of the study is in line with the finding of Etiubon and Ugwu (2016) that students taught with problem-based learning approach had higher mean-achievement scores than their counterparts taught with expository approach. The findings of the study is also in accordance with the finding of Aidoo, Boateng, Kissi and Ofori (2016) that students taught using PBL achieved significantly better than those taught using traditional instruction.

There was no significant difference between the mean achievement scores of students taught computer studies using problem-based learning. Also, no significant interaction of teaching methods and gender on achievement of students in computer studies was observed. The findings of the study is in line with the findings of Etiubon and Ugwu (2016) that gender had no significant influence on the students' mean-achievement scores when taught with problem-based learning approach.

V. CONCLUSION

The findings of the study showed that problem-based learning significantly enhanced students' achievement in computer studies. The study concludes that problem-based learning approach is effective for improving students' achievement in computer studies.

VI. RECOMMENDATIONS

- ✓ Computer studies teachers should adopt the use of problem-based learning instructional strategy to improve achievement.
- ✓ Seminars and workshops should be organized by educational administrators in order to acquaint computer studies teachers on how to integrate problem-based learning in the learning process of computer studies.

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