

Effect of Simulation on Students' Interest in Programming Language in Secondary Schools in Enugu Education Zone of Nigeria

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Abstract—The researcher investigated the effect of simulation method on students' interest in programming language in secondary schools in Enugu education zone of Nigeria using quasi-experimental design. The instrument for data collection was pretest - posttest non equivalent control group. The population for the study comprised all senior secondary school class 2 (SS2) science students in a single sex school in Enugu Education Zone of Enugu State. Data were collected from a sample of 225 students selected from four secondary schools two boys' schools and two girls' schools. A reliability coefficient of 0.89 was obtained from the instrument through test retest. Mean and standard deviation scores were used to answer the research questions, while two-way analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significant. The findings show that students taught using simulation method achieved higher than those taught with traditional method. It was recommendations that ministry of education should revisit the instructional materials used in teaching.

Index Terms—Interest, programming language, secondary school, simulation.

I. INTRODUCTION

The difficulty of understanding programming concepts at secondary school level is a thing of concern. The nature of this subject has made it difficult for students to comprehend when taught in a traditional classroom setting. According to [1], programming language is defined as a vocabulary or a set of grammatical rules for instructing a computer to perform specific tasks. It is designed to communicate instructions to a machine, particularly a computer. It can be used to create programs to control the behavior of a machine or to express algorithms. This term usually refers to high-level languages, such as BASIC, C, C++, FORTRAN, and Pascal programming language. Each language has a unique set of keywords (words that it understands) and a special syntax for organizing program instructions.

At secondary level, a child is expected to develop in-depth knowledge on specialized subjects. This requires the development of teaching methods tailored to transmit knowledge. According to [2], no nation can rise above the quality of her education system. Teachers of subjects like Computer programming need to be skilled in their specific areas in order to be able to teach these subjects. The type of teaching method that a teacher adopts has a significant effect

on students' interest in the subject.

Interest has a role to play on individual learning pattern. Interest is the feeling of a person whose attention, concern, or curiosity is particularly engaged by something. Therefore, interest can guarantee a student's attention, encourage and support his learning style. In order words, teachers need to engage the students in an experiential learning environment so that they are able to experience learning with elements of enjoyment [3]. A teaching method brings in some type of reality into teaching environment will aggravate the interest of the student thereby ensuring that they have more information about the environment that cannot be acquired from a traditional teaching setting. This can be achieved through the use computer simulation.

A simulation is a form of experiential learning scenario where the learner is exposed to real world experience defined by the teacher [4]. This type of real world scenario represents a reality within which students interact and the teacher controls the parameters used to achieve the desired learning outcome. For instance, a situation where students are assigned roles as buyers and sellers of some goods and asked to strike deals to exchange the goods, they are learning about market behavior by simulating a market. During a simulation, the teacher acts more as a facilitator, helper, or resource person and less as an expert, or judge [5]. Simulation is like a laboratory experiment where the students themselves are the test subjects [6].

When difficult topics are simulated, it encourages higher degree of students' interest. This can be attributed to the fact that simulation exercises teaching approach that is totally different from traditional approaches. As noted in [7], if computer simulation is used in teaching, it will make science accessible, make thinking visible, help students learn from each other and help students develop autonomous learning. Above all, it will encourage student-student interaction rather than the traditional teacher-student interaction pattern. Also, simulation provides a structure through which students develop the knowledge, skills, and values that define an aspect of a profession [8].

However, it is important to determine whether male and female students show equal interest with the use of simulation method in the teaching of programming language. As noted in [9] gender is the physical and behavioral difference that distinguishes individual organisms according to their functions in the reproductive process. Against this background, therefore, the researcher tends to investigate the effect of simulation method of instruction on students interest in programming language.

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A. Statement of the Problem

In Nigeria, the traditional method of teaching is predominant. Teaching and learning especially programming language is so abstract that students do not have any interest in the subject. The traditional classroom settings do not permit students to express the knowledge and ideas acquired. The high level of abstraction associated with this teaching method has impacted negatively on the interest and hence the knowledge of the students.

B. Purpose of Study

The main purpose of this study is to determine the effect of simulation on students' interest in programming language in secondary schools in Enugu education zone. Specifically, the study tends to determine;

- 1) The effect of Simulation Method of Instruction (SMI) on students' interest in programming language.
- 2) The effect of SMI and Traditional Method of Instruction (TMI) on male and female students' interest in programming language.

C. Research Questions

The following research questions guided the study

- 1) What are the mean achievement score of student taught with SMI and those taught using traditional method?
- 2) What is the mean achievement score of male and female student taught with SMI and those taught using traditional method as measured by Programming Language Achievement Test (PLAT)?

D. Research Hypotheses

The three hypotheses tested at 0.05 level of significance:

H_{01} : There is no significant difference in the mean achievement scores of students taught with SMI and those taught with traditional method.

H_{02} : There is no significant difference in the mean achievement score of male and female students taught with SMI and those taught with traditional method as measured by (PLAT).

H_{03} : There is no significant difference in the interaction effect of gender and teaching method on the students' means achievement scores.

II. METHODS

Quasi experimental design was used for the study. It utilized pre-test, post-test design. This design was used because of non-randomization of subjects. The research subjects were not randomized because of the problems of re-arrangement or re-grouping of intact classes. The population of the study consists of 827 science students from all government owned single sex schools in Enugu Education Zone [9]. The study has sample size 225 science students consisting of 105 girls and 120 boys. The study utilized stratified and simple random sampling technique. The sample was stratified into male and female schools. Then simple random technique was used to select two male and two female schools. The reason for using single sex schools was to avoid gender intrusion since gender is a factor in the study. All the SS2 science class students were used as research subjects in

each of the sampled schools. Therefore, in each school, one intact class was assigned to Simulation Method of Instruction (SMI), while the other intact class was assigned a Traditional Method of Instruction (TMI). Programming Language Achievement Test (PLAT) was used as instrument for the study. The instrument consisted of 50 multiple choice objective test developed by the researcher. The measuring instrument was based on programming language content of qualitative analysis subdivided into algorithm tests, tests for flowchart and tests for code writing. The instrument was validated by three experts, one from computer science and the other two from measurement and evaluation. The reliability of PLAT was determined by administering the test to community secondary school Iheaka in Nsukka education zone of Nigeria using test retest method. The correlation coefficient of the two sets of scores yielded 0.89 using the Cronbach Alpha statistic for test of internal consistency. All the research questions were answered using mean and 2-way analysis of covariance (ANCOVA) used to test the null hypotheses at 0.05 level of significance.

III. EXPERIMENTAL PROCEDURE

Regular computer teachers were used for the study. These teachers received one week training from the researcher on the use of simulation method of instruction. At the end, they were given lesson notes as a guide. The instructional methods used for this study are the Simulation Method of Instruction (SMI) and Traditional Method of Instruction (TMI). The SMI was for the experimental group while the TMI was for the control group. In the presentation of the SMI, the teacher presented the programming procedures which involve the following sub-headings: the development of algorithms, representing the algorithms in flowchart, writing the codes and running the program. A program was simulated in power point slides showing the control structures in programming language and what the user want the system to achieve. The teacher used explanation and demonstration to teach students from simple to complex. On the other hand, the instructional method used for TMI includes content development, teachers' activities, and students' activities. The research subjects were given pretest to both SMI group and TMI group. The teaching commenced on the two groups and after administering the pretest, the treatment lasted for a period of four weeks after which a posttest was administered to the research subjects. The pretest was reshuffled to give the questions a different look, before it was used for the posttest. The subject teachers did the supervision. The Data collected for pretest and posttest for the two groups were used to answer the research questions and test the hypotheses.

A. Results

Data from Table I indicates that the group taught with simulation method of instruction (SMI) obtained the mean score of 58.89 for the pretest and the mean score of 73.22 for the post-test.

However, TMI obtained the mean score of 50.30 and 66.00 for the pretest and posttest respectively. Therefore, the mean score for students taught with SMI is higher than that of TMI.

This shows that students taught with SMI method show more interest in the subject than students taught using the traditional method.

TABLE I: MEAN RATINGS OF THE RESPONSES ON THE EFFECT OF SIMULATION METHOD ON STUDENTS INTEREST IN PROGRAMMING LANGUAGE ($N = 225$)

Group	Pre-test		Post-test		$N = 225$
	Mean	SD	Mean	SD	
SMI	58.89	9.62	73.22	7.82	125
TMI	50.30	10.19	66.00	5.65	100

TABLE II: MEAN RATINGS OF THE RESPONSES ON THE ACHIEVEMENT SCORE OF MALE AND FEMALE STUDENTS TAUGHT USING SMI AND THOSE TAUGHT USING TMI AS MEASURED BY PROGRAMMING LANGUAGE ACHIEVEMENT TEST (PLAT)

Group	Gender	Pre-test		Post-test		$N = 225$
		Mean	SD	Mean	SD	
SMI	Male	60.89	10.63	73.78	4.91	80
	Female	55.00	0.00	70.50	0.00	55
TMI	Male	50.50	0.70	52.50	3.53	40
	Female	51.29	9.65	54.86	8.09	50

Table II indicates that male students achieved higher result (60.89 pre-test) and (73.78 post-test) than their female counterpart with 55.00 and 70.50 in pre-test and post-test respectively when taught with SMI. Female students achieved higher result 51.29 in pre-test and 54.86 post-test while male had 50.50 and 52.50 in pre-test and post-test respectively when TMI was used. The table showed that both male and female students expressed more interest in the subject when SMI was used in teaching.

TABLE III: ANCOVA ON INTERACTION EFFECT OF STUDENTS' MEAN ACHIEVEMENT SCORES BY INSTRUCTIONAL METHOD AND GENDER.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	445.568 ^a	5	89.114	2.815	0.002
Intercept	130.606	1	130.606	4.125	0.003
GROUP	6.893	1	6.893	0.218	0.000
PRETEST	322.709	1	322.709	10.193	0.000
METHODS	0.411	1	0.411	0.013	0.001
GENDER	15.205	1	15.205	0.480	0.001
METHODS * GENDER	116.765	1	116.765	3.688	0.002
Error	411.590	13	31.661		
Total	101525.000	19			
Corrected Total	857.158	18			

For H_{01} , the data in Table III indicates that the method is significant at 0.001, which is less than 0.05 set for the study. Since the computed level of significance is less, the H_{01} is rejected. It is therefore safe to conclude that there is a significant difference between the mean achievement scores of science students taught with SMI and those taught with TMI.

For H_{02} , Table III showed that gender is significant at 0.001, which is less than 0.05 set for the study. This implies a rejection of the null hypothesis. Hence, there is a significant difference in the achievement of male and female students taught with SMI as measured by Programming Language Achievement Test (PLAT)

IV. SUMMARY OF THE FINDINGS

- 1) Students taught with SMI show more interest in programming language than those taught with TMI.
- 2) Both male and female students put more interest in programming language when taught with SMI.
- 3) There is a significant difference in the mean achievement of students based on method of instruction and gender.

A. Discussion

The study generated information on the effect of simulation method on student's interest in programming language in Enugu education zone of Nigeria. The finding pertaining to research question 1 revealed that students taught with SMI show more interest in programming language than those taught with TMI. The findings are in line with [10] who noted that the style of teaching employed by a teacher is a factor in motivating learners. The findings is also in line with [11] who asserted that the level of an individual interest have powerful influence on learning.

For research question two which sought to find the influence of SMI on male and female students in programming language. The findings revealed that there is a difference in favour of SMI. This means that both male and female students achieve higher when taught with SMI in line with [12], who discovered that gender composition has a significant relationship with students' academic performance and that gender composition has a significant influence on secondary school students' academic performance.

For one and two, the findings revealed that method and gender is significant. There is a significant difference in the mean score of students taught with SMI and those taught with TMI. The researcher is of the view that SMI helps to create meaningful learning.

B. Educational Implications

It is alarming that teaching and learning in Nigerian schools are still carried out using traditional methods. In Africa, especially in Nigeria, classrooms with chalk board are still very popular. They do not have access to proper and functional computer equipped classrooms. With this type of teaching deficiency, the Nigerian student will find it difficult to relate what is taught with real life scenarios.

C. Recommendations

- 1) The Ministry of Education in Nigeria should re-visit the instructional methods.
- 2) Government should sponsor teachers for workshops and training especially with regards to the use of simulation in everyday teaching.
- 3) Teachers should strive to change from the traditional and archaic method of instruction and avail themselves of the opportunity to learn new technology of teaching.

REFERENCES

- [1] B. David, *Introduction to Programming Language*, London: Kogan 2013, ch. 5.
- [2] Federal Republic of Nigeria, *National Policy of Education*, Abuja, Federal Government Printers, 2005, pp. 49-55
- [3] K. Muhammad and K. Fadzliyat, "Engaging learners' comprehension, interest and motivation to learn literature using the reader's theatre," *English Teaching: Practice and Critique*, vol. 9, no. 3, pp. 132-159, May 2010.

- [4] J. P. Hertel and B. J. Millis, *Using Simulations to Promote Learning in Higher Education: An Introduction*, Sterling VA: Stylus, 2002, ch. 5.
- [5] Wikipadia. (May 2014). Definition of simulation. [Online]. Available: <http://www.wikimediafoundation.org>
- [6] J. Slotta, "Designing the web-based inquiry science environment (wise)," *Journal of educational technology*, vol. 2, no. 6, pp. 15-20, 2002.
- [7] M. Les, "Simulations: Bringing the benefits of situated learning to the traditional classroom," *Journal of Applied Educational Technology*, vol. 3, no. 37, pp. 120 -124, 2006.
- [8] Wikipadia. (July 2010). Definition of gender. [Online]. Available: <http://www.wikimediafoundation.org>
- [9] Post Primary Schools Management Board Enugu, *Number of students admitted in 2013/2014 session*, 2014.
- [10] M. A. Adewuyi, "Teacher and student related variables as correlated of achievement in mathematics in Oyo State of Nigeria," Unpublished M.Ed Dissertation. Dept. Mathematics University of Ibadan.
- [11] S. Hidi and K. A. Renninger, "The four-phase model of interest development," *Journal of Educational Psychologist*, vol. 4, no. 1, pp. 111-120.
- [12] M. Fabunmi, "The role of gender on secondary school students' academic performance in Edo State, Nigeria," *West African Journal of Education*, vol. 24, no. 1, pp. 90-93, 2004.



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