

**EFFECTS OF TWO SOLUTION STRATEGIES OF MATHEMATICAL PROBLEMS ON STUDENTS INTEREST IN ALGEBRA: IMPLICATION FOR SECONDARY MATHEMATICS EDUCATION, IN THE 21<sup>ST</sup> CENTURY**

**BY**

**DR. D.O. ONOH**

**DEPARTMENT OF SCIENCE AND COMPUTER EDUCATION  
FACULTY OF EDUCATION  
ENUGU STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY (ESUT),  
ENUGU**

**Abstract**

*The study determined the effects of two solution strategies of mathematical problems students interest in Algebra. Data were collected from 248 JS 1 students using Mathematics Interest Inventory (MII). Mathematics incomplete solution strategy (MISS) on different topics was used for the study. Interest inventory were adopted to ascertain students level of interest in Algebra. Result from the study revealed among others that there is no significant difference in the in the mean interest scores of students taught using MISS and those thought using mathematics complete solution strategy (MCSS). Also, female students developed more interest than their male counterparts in Algebra. It is recommended that mathematics teacher at all levels are encourage to use MISS in teaching students since it arouses more interest in students. Further seminars and workshops should be organized for practicing teachers on the use of MISS in teaching and learning Algebra.*

**Introduction**

The role of mathematics towards realizing the nation's scientific and technological aspiration is unquestionable. In the words of Jegede (1984), the importance of mathematics education in Nigeria's education system and the nation's technological development has been recognized. The level of scientific advancement of the developed countries, for instance, United States of America (U.S.A), France and Germany have placed these countries in an enviable position in world Socio-economic affairs. Nigeria, aspiration to attain a parallel socio-economic status with these nations has in recent time accorded mathematics, science

and technology unprecedented recognition and emphasis. This is adequately reflected in the new system of education, which is geared towards self realization, scientific and technology progress (Federal Government of Nigeria, FGN, 1998). Also Ezeilo (1975) noted that there can be no real development technologically without a corresponding development in mathematics both as conceived and practiced, while Kline (1964) noted that the progress of science could be determined by the extent to which mathematics has entered into its method and contents. Mathematics, became the celebrated key to knowledge, the queen, servant and midwife of the sciences (Onoh, 2000).

Other methods of teaching should be designed to arouse the interest of the pupils, to help them understand more clearly, thus assist learning. This is because when, for instance, mathematics incomplete solution strategy (MISS) is employed, the learning process may become a great adventure because it is based on curiosity, interest of students (Chauhan, 1985). MISS is a method in which a mathematics problem is solved half way and the students are allowed to complete the solution at their own time. The mathematics complete solution strategy (MCSS), is a strategy where a mathematics problem is solved completely from the beginning and finally arrive at an answer (Kalejaiye, 1981). This suggests the need to look for alternative methods of teaching mathematics.

The researcher is of the opinion that for mathematics to adequately play desired roles, the strategy or method employed in the teaching and learning of mathematics must be suitable and be such that can create and sustain students interest in the subject. Njoku (1993) confirmed that there is a general decline in students interest in mathematics at secondary school level. This ugly development has been a serious concern to mathematics educators, government and society in general especially when the importance of the subject of the development of science and technology are considered. Hence, interest in considered as a factor in this study.

Also, Ukeje (1979) stated that boys and girls are gifted, he is of the opinion that none is superior to the other in academic attainment. However, many studies have revealed that academic difference exist between male and female (Tavris, 1992, Hewson, Harole, Smentek

and Trokin, 1994), Belington, (1993) Peter and Peter (1996). Boys and girls in junior and senior high school appear not to like mathematics. Agwagah (1993) stated that the consistent trend of some studies has been that male students tends to achieve significantly higher scores in mathematics than their female counterparts due to disparity of interest. This shows that findings on sex as a factor in mathematics interest are contradictory. It would be of interest to find out whether the result of this study would indicate differential findings for those exposed to MISS and MCSS or not.

Consequently, since students interest are not highly noticed in mathematics, and for effective learning to occur, there is need to search for better or alternative strategies of presenting mathematical tasks to students so as to enhance students interest. Therefore the effects of two solution strategies (MCSS) (MISS) in solving mathematics problems by students were examined.

### **Purpose of the Study**

The major purpose of this study was to investigate the effects of two solution strategies of mathematical problems on JS I students interest in some algebraic concepts.

Specifically, the study sought to;

1. Find out if differences exist in students interests in algebra when MISS are used in teaching.
2. Find out if differences exist in the interest of male and female students in algebra when MISS are used.
3. Find out the interaction effect of MISS and gender on students interest in algebra.

### **Research Questions**

The following research question was formulated to guide the study.

1. What are the mean interest scores and standard deviations scores of students who are taught Algebra using MISS and those taught using MCSS in pre-mathematic interest inventory (PREMII) and post mathematics interest inventory (POSTMII)?
2. What are the mean interest score and standard deviation scores of Male and Female student taught using MISS and those taught using MCSS a measured by PREMII and POSTMII?

### **Hypotheses**

The following hypotheses were tested at .05 level of significance.

1. There is no significant difference in the mean interest scores of students taught using MISS and those taught using MCSS in the POSTMII.
2. There is no significant different in the mean interest scores of male and female students taught using MISS and those taught MCSS in the POSTMII in Algebra.
3. There is no significant interaction effect in the mean interest scores of Male and Female students taught using MISS and those taught using MCSS in the POSTMII.

### **Research Method**

The study used the non-equivalent control group design, in which intact classes were assigned to experimental conditions. The study sample consisted of 248 JS 1 students from eight intact classes randomly selected from two secondary schools one female and one male school,

in Enugu-North Local Government Area of Enugu State.

Data were collected using researcher developed Mathematics Interest Inventory (MII). Lesson plans and mathematics incomplete solution strategy prepared by the researcher were used during the classroom instruction. This MISS were based on algebraic concepts development of number system, counting system, four rules of calculations, integers, fractions and decimals. The MII was validated by four experts in the Department of science and Computer education, Enugu State University of Science and technology, ESUT, Enugu and trial tested on a sample of JS 1 students from a school in Udi Local Government Area. An estimate of internal consistency was established for the two sections of the instruments using Kuder-Richardson (KR – 20) formula for the objective section and the inter-rate reliability for the essay section. The reliability Coefficients obtained for the two sections were 0.61 and 0.73 respectively.

### **Experimental Procedure**

In each secondary school, experimental group was taught with MISS while the control group was taught with the MCSS. Experimental treatment lasted for a period of six (6) weeks. The students were taught by their regular teachers under the supervision of the researcher. These teachers had one week training on the research. These teachers also administered the mathematic achievement test before and after the experimental treatment. The research questions were answered using mean and standard deviation. The hypotheses were tested at .05 level of significance using the analysis of covariance (ANCOVA) technique.

**Results**

The findings of the study are presented in the following tables:-

**TABLE 1: Mean Scores and Standard Deviations of the Subjects in PREMII and POSTMII**

Statistics	Experimental Group		Control Group	
	PREMII	POSTMII	PREMII	POSTMII
Mean	64.33	64.91	64.57	65.31
Standard Deviation (SD)	10.29	9.64	9.16	10.20

The data presented in table 1 shows that the experimental group obtained a mean score of 64.33 and standard deviation of 10.29 in PREMII while the control group obtained a mean score of 64.57 and standard deviation score of 9.16 in the same test. In post mathematics interest inventory (POSTMII), the experimental

group obtained a mean of 64.91 standard of 8.82 deviation of 9.64 while the control group obtained a mean 65.31 and standard deviation of 10.20.

**TABLE 2: Mean scores and standard deviation of subjects in PREMII and POSTMII with respect to sex.**

Statistics	Male		Female					
	Experimental		Control		Experimental		Control	
	PREMII	POSTMII	PREMII	POSTMII	PREMII	POSTMII	PREMII	POSTMII
Means	65.22	62.59	63.28	64.34	63.75	66.91	65.16	67.96
Standard Deviation (SD)	9.42	9.94	11.17	9.91	11.22	8.82	8.77	10.99

Table 2 reveals that the male experimental group obtained a mean score of 65.22 and standard deviation of 9.42 in PREMII where as females obtained a mean score of 63.75 and standard deviation of 11.22 in the same PREMII. For the male experimental group, they obtained a mean score of 62.59 and standard deviation score of 9.44 in the POSTMII while their female counterparts obtained a mean score of 66.91 and standard deviation of 8.82 in the same test.

The results in table 2 show that the female control group obtained a mean score of 65.16 and standard deviation of 8.77 in the PREMII while the male control group obtained the mean score of 63.28 and standard deviation score of 11.17 in the same test. In the POSTMII, the female control group obtained a mean score of 67.06 and a standard deviation of 10.99.

Table 3: Analysis of Covariance (ANCOVA) results for the POSTMII with reference to method and sex.

Source of Variation	Sum of Squares	DF	Mean Square	F Calculated	Significant	Decision
Covariates	344.002	1	344.002	3.841	0.051	NS
Pre-mat	344.002	1	344.002	3.84	0.051	NS
Main effects	373.439	2	186.719	2.085	0.127	NS
Method	27.929	1	27.929	0.312	0.577	NS
Sex	366.532	1	366.532	4.093	0.044	NS
2-way interactions	50.359	1	40.359	0.562	0.454	S*
Method x sex	50.359	1	50.359	0.562	0.454	NS
Explained	1089.759	4	272.440	3.042	0.18	NS
Residual	19164.415	245	89.553			
Total	20254.174	246	92.909			

Covariate raw regression coefficient pre = -0.106

Where NS\* = Not significant @ P > 0.05

S\* = Significant @ PS. 0.05

Table result in table 3 suggests that the calculated value of F for method is 0.312, which is significant at 0.577. This is greater than .05 level on which the work is based. Method therefore, is not significant. The null hypothesis is, therefore, not rejected.

Hence, there is a significant difference in the mean interest scores of male and female students taught using MISS and those taught using MCSS as measured by POSTMII.

Results from table 3 shows that the F calculated value was 0.562 which analysis was shown to be significant at 0.454 levels. This is higher than .05 level of significance on which this study is based. Two –way interaction is, therefore, significant. Thus, the null hypothesis is therefore, not rejected. Hence there is a significant interaction effect in the mean interest scores of male and female students taught using MISS and those taught using MCSS in the POSTMII.

### Discussion of the findings

Results of research question one showed that in POSTMII, the experimental group obtained a mean of 64.91 and standard deviation of 9.64 while the control group obtained a mean of 65.31 and standard deviation of 10.20 in the same test. It was observed that the experimental group and control subjects obtained equal interest from both strategies. this finding is consistent with Russell and Homes (1940) who discovered that methods employed in teaching could affect negative or positively the interest of the learners.

Furthermore, results from research question two revealed that in the POSTMII, the female control group obtained a mean score of 67.06 and a standard deviation of 10.99. in the male experimental group, they obtained a mean score of 62.59 and standard deviation score of 9.94 in the POSTMII while their female counterparts obtained a mean score of 66.91 and standard deviation of 8.82 in the same test. It was observed that the females had 66.34 while their male counterparts obtained 67.06.

The result from that females showed that they developed more interest than their male counterparts in

the study. Also, results from research question three indicated that there was no significant difference in the mean interest scores of students taught using MISS and those taught using MCSS as measured by POSTMII. Table 4 shows that there is a significant difference in the mean interest MCSS as measured by POSTMII.

Further, the results presented in table 5 revealed that there is a significant taught using MISS and those taught using MCSS in the POSTMII.

#### **Implication of the study.**

Based on the findings of this study, the following implications were deduced.

1. Since using MISS in teaching problem solving in mathematics improved students interest. There is need that teachers start now to learn and adopt the use of this strategy in teaching problem solving to their students in various classes.
2. There is also need for seminars and workshops. For mathematics teachers so that new discoveries made in recent research can be imparted to practicing mathematics teachers especially one like MISS which can be used in teaching many topics in both the junior and senior secondary school mathematics curriculum.
3. Interest is developed more in teaching algebra when MISS is need teach students generally.

#### **Conclusion**

The finding of this study indicated that the use of MISS does develop student interest in algebra. Thus, females developed more interest than their male counterparts. Strategy was a significant factor for interest in algebra.

#### **Recommendations**

Based on the findings of the study, the following recommendation were made:

1. mathematics teacher at the level should start now to use MISS in teaching students since it develops more interest in students
2. students are encourage to learn and use MISS since it helps them to draw conclusion in problem solving.
3. seminars and workshop should organized for practicing teaching on the MISS in teaching and learning MISS in teaching and learning mathematics.
4. Tertiary institution preparing mathematics education programme to enable mathematics students lean the use of MISS.

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