

# EFFECTS OF GENDER DIFFERENCE AND INSTRUCTION IN SELF-MONITORING STRATEGY ON STUDENTS' ACHIEVEMENT IN SELECTED SCIENCE CONCEPTS

*Dr. C. C. Obi and M. C. Oghenejode*

## **Abstract**

This study sought to determine the effects of self-monitoring strategy on students' achievement in some selected science concepts. The study also examined the interaction effect of instruction in self-monitoring and gender on students' achievements. Three hypotheses were formulated to guide the study using the non-equivalent control group design, with intact classes and a pre and post test as well as an experimental and a control group. Data was analyzed using Analysis of Covariance to test the hypotheses at .05 level of significance. It was discovered that a significant difference exists between the experimental class (those exposed to self-monitoring strategies) and the control class in favour of the experimental class. However, neither gender nor its interaction with self-monitoring strategy has any significant effect on achievement.

## **Introduction**

There has been growing concern over the study of integrated science in colleges throughout the country for some decades now. The problem of poor performance of students in this area is becoming persistent. A number of studies have shown very little zeal among the students' especially in their interest to study science-oriented materials. The competence to learn is not well motivated. For the females in particular, the aversion, low participation, poor achievement and under representation in study of science materials have been linked to several impediments such as the prevailing masculine image of science, and sex role stereotyping, (Okeke, 1990 and Njoku, (2005).

In our secondary school system integrated science though a primary science is a core subject meant to enable all learners alike to develop appropriate skills for further study of core science subjects in senior science classes (Njoku, 2000 and 2005). It is assumed that before a student gets through the secondary school, he/she must have been integrated in the study of science as such learning integrated science on a higher plane should not pose a problem. But the reverse is mostly the case.

Amongst several efforts at improving performance and teaching of integrated science are the recommendations of science educators, which include:

1. Use of discovery teaching tactics
2. Inclusive of problem solving activities
3. Involvement of student in open-ended field trips or laboratory experience (Olarewaju, 1994).

These are necessary because studies on the teaching of science have shown that students' understanding of science concepts was still disconnected, incoherent and inconsistent after passing through a science course (Hammer, 1994, Reif and Larkin 1991, Obi 2005). Some researchers have attributed the cause of this to the teaching methods used in science teaching (Balogun, 1982). But studies like Okebukola, (1994, and Okonkwo, 1996) have shown that science teachers employ mostly the expository method of teaching. The prevalence of the expository approach only serves to impede science teaching (Okebukola, 1994). Indeed, there is a need for alternative methods of teaching science in our schools. Hence, educators have noted the very little attention given to the area of instruction in self-monitoring strategy which learners can use to initiate, regulate and sustain their own learning capabilities themselves. The problem of this study put in a question form is, what is the effect of instruction in self monitoring strategy on achievement of integrated science students in the study of science content materials?

### **Purpose of The Study**

The main purpose of this study is to critically determine the effect of instruction in self-monitoring and gender on achievement of integrated science students in the study of science content materials. It is assumed that those studying integrated science in junior secondary class two must have done it as a subject at junior secondary class one level and have been also exposed to science in the primary school. Hence, they are aware of the nitty-gritty of the subject. It is expected of them to be very interested in this area of scientific studies and discoveries.

### **Significance of The Study**

In the field of learning generally, learners are viewed as active participants in the learning process. As such, instruction in self-monitoring strategy will seek to improve students' competence, motivate their interest, reduce the test anxiety and enhance their level of achievement. They will learn to manage their learning by themselves and seek redress from an authority when necessary.

### **Scope of the Study**

The study sought to determine the effects of instruction in self-monitoring strategies and gender on achievement of the second year integrated science students at the junior secondary school level in Delta North Education Zone of Delta State. The rationale for the use of these students is the fact that they have been exposed to first year secondary school experience; and as such have attained the formal operational level of thinking required for the learning of self-monitoring skills.

*Effects Of Gender Difference And Instruction In Self-Monitoring Strategy On Students' Achievement In Selected Science Concepts*

---

**Research Questions**

1. To what extent does the achievement of the second year integrated science students depend on instruction in self-monitoring strategy?
2. How does the post-test mean achievement scores of male and female students differ as a result of instruction in self-monitoring strategy?

**Hypothesis**

1. There is no significant difference in the post-test mean achievement Scores of students exposed to instruction and those not exposed
2. There is no significant difference in the post-test mean achievement scores of male and female students on the selected science concepts as a result of instruction in self-monitoring.
3. There is no significant interaction effect of gender and instruction in self monitoring on achievement in science.

**Method**

The study adopted the non-equivalent control group design which aimed at finding out the effects of instruction in self-monitoring strategy on achievement levels of second year integrated science students in the Delta North Education Zone. The design had one experimental group and one control group while intact classes were used for the study.

The Integrated Science Achievement Test (ISAT) whose items were drawn from areas where students have been observed to perform poorly was constructed by the researchers under the supervision of experts. The validity was established by three experts in science education. The internal consistence estimate of 0.92 was calculated using the Cronbach Alpha procedure while the Kendal co-efficient  $r$  of 0.904 was obtained in the determination of the inter rater reliability estimate of the scoring guide for the test. In order to determine stability over time, the Pearson  $r$  of 0.90 was obtained. Hence the instrument is very reliable.

**Data Analysis**

The Analysis of covariance (ANCOVA) was used to test the hypothesis at .05 level of significance. The homogeneity of regression assumption that underlies the use of ANCOVA was also tested and found to be 1.59 which was significant at .231 and therefore not significant at .05 level

**Table 1: Means and Standard Deviations of students on Integrated Science Achievement Test (ISAT)**

Experimental Groups/Control	Pre-Test	Post-Test	Pre-Test Post-Test Mean gain
Mean	11.19	26.07	14.88
N	72	72	
Std Deviation	3.31	4.71	
Mean	11.08	14.05	2.97
Std Deviation	2.22	2.48	
M	66	66	

**Table 2: Means and Standard Deviations of Students Scores on ISAT by Gender levels**

Experimental Groups	Gender of Students	Mean X	SD	N
Treatment	Male	25.85	4.58	34
	Female	26.26	4.58	38
Control	Male	13.55	2.12	33
	Female	14.55	2.12	33
Total		14.05	2.48	66
Total	Male	19.79	7.15	67
	Female	20.82	7.12	71
Total		20.32	7.13	138

**Table 3: Summary of 2-way Analysis of covariance (ANCOVA) of the Effects of Treatments and Gender on Achievements in ISAT**

Source	Type III Sum of Squares	df	Mean square	F	Sig
Corrected Model	5178.452	4	1294.613	96.976	.000
Intercept	2457.373	1	2457.373	184.076	.000
Pre-test	180.478	1	180.478	13.519	.000
Experimental	4914.212	1	4914.212	368.112	.000
Gender	29.159	1	29.159	2.184	.142
Experimental X Gender	0.811	1	0.811	0.061	.804
Error	1775.519	138	13.350		
Total	63928.000	138			
Corrected Total	6953.971	137			

**Research Question I:** To what extent does the mean achievement scores of students in the selected science concepts depend on instruction in self-monitoring strategy?

Table 1 shows that students exposed to treatment i.e. experimental group had pre-test and post-test means scores of 11.19 and 26.07 and a standard deviation of 3.31 and 4.71 respectively with a mean gain of 14.88 while the mean gain of the control class is 2.97. The results seem to suggest that the experimental group performed better.

*Effects Of Gender Difference And Instruction In Self-Monitoring Strategy On Students' Achievement In Selected Science Concepts*

---

**Research Question 2:** To what extent does the post-test mean achievement scores of male and female students on the selected science concepts differ as a result of instruction in self-monitoring strategy?

Table 2 shows that the post-test mean of male is 25.85 while that of their female counterpart is 26.26. The result seems to suggest that the female students performed better.

**Hypothesis 1**

**H<sub>01</sub>:** There is no significant difference in the post-test mean achievement scores of students exposed to instruction and those not exposed.

**Table 3** shows that the F-value of 368.112 is significant at .05 level of significance. Hence this hypothesis was rejected. This implies that a significant difference exists between the experimental group and the control group in favour of the experimental group.

**Hypothesis 2**

**H<sub>02</sub>:** There is no significant difference in the post-test mean achievement scores of male and female students on the selected science concepts as a result of instruction in self-monitoring strategy.

Table 3 also shows that the F-value of 2.184 was not significant at 0.05 level of significance. Hence, this hypothesis was accepted. This means that the observed difference between male and female students was just by chance.

**Hypothesis 3:**

**H<sub>03</sub>:** There are no significant interaction effects of gender and instruction in Self-monitoring on students' achievement in science.

**Table 3** also shows that the F value of 0.061 is significant at .804 but not significant at .05 level of significance. Hence the hypothesis was accepted.

**Discussion of Results**

Evidence from the study on the effects of Gender difference and Instruction in self-monitoring strategy on students' achievement in Integrated Science, shows that gender is not a significant factor in students' achievement in integrated science.

The finding is in agreement with similar studies by Okeke (1990 and 2001) and Njoku (2005) who reported that there are no significant gender effects on the achievement of science students. This is accounted for by the instruction in self-monitoring skills which has equipped both gender with relevant learning strategy as both sexes needed to excel in the study of integrated science.

However, the effect of monitoring strategy on students' achievement is significant. This is in agreement with evidence from previous research findings by Obi (2005) and Okebukola (1994) where the experimental class performed better. Their findings give evidence that instruction in monitoring strategy permits students to be in control of a wider variety of their learning which makes room for better achievement. As such instruction in self-monitoring enables students to acquire appropriate learning skills which enhance achievements. Like many other studies the interaction effect of gender and instruction is not significant.

### **Conclusion**

The results of this study have shown that instruction in self-monitoring strategy enhances students' achievement in selected science concept but gender has no significant effect on students' achievement.

### **Recommendations**

1. Students should be equipped with necessary self-monitoring strategies for better achievement.
2. Self-monitoring strategies should be incorporated into teacher education programmes to improve the competencies needed by teachers.
3. Curriculum planners should include curriculum guides that specify the relevant learning strategies for students.
4. Various agencies of government and non-governmental agencies should provide necessary funds needed for effectiveness in research on self-monitoring and other learning strategies.
5. Ministries of Education and relevant professional associations should organize workshops and seminars to assist students learning through self-monitoring and other self-regulatory processes.

### **References**

- Balogun, T.A. (1982). Science society and science teaching effectiveness in Nigeria *Journal of science teachers association of Nigeria* 21(1), 14 – 20.
- Hammer, D. (1994). Epistemological beliefs in introductory physics. cognition and instruction. 12, 152 – 183.
- Njoku, Z. C. (2000). Images of Females in science. A gender analysis of Science and technology activities in Nigerian schools text books. *Journal of primary education* 15 (1) 3 – 12.
- Njoku, Z. C. (2005). Effects of instruction using gender inclusive science Kits on girls interest; participation and achievement in primary School. Institute of education Journal, University of Nigeria, Nsukka (16 (1) 1 – 9.

***Effects Of Gender Difference And Instruction In Self-Monitoring Strategy On Students' Achievement In Selected Science Concepts***

---

- Obi C. C. (2005). Relative effectiveness of concepts mapping and schematic modeling on student's achievement physics *Nigerian Journal of teacher education and teaching* 1 (1) 105 – 115.
- Okeke, I. (1990). A is to comprehension. *Educational psychology*, 19, 35-41
- Okebukola, P.A.O. (1994). Using concept maps to tackle difficult concepts in biology *Journal of science teachers association of Nigeria*. 11 (2) 23 – 32.
- Okonkwo, M.A.O. (1996). The relative effectiveness of selected instructional Styles on student's achievements in physics" in Enaohow, J. O. and Umeoduagu J. N. (eds) *Science, technology and mathematics (STM) Education in contemporary Nigeria*, Onitsha: Kemensuo Education Publishers.
- Reif, F. and Larkin, J.H. (1991). Cognition in science and issues in the use of concept maps in science assessment. *Journal of research in science teaching* 33 (6) 569 – 670.