METAMORPHOSING INSTRUCTION IN MATHEMATICS EDUCATION AT TERTIARY LEVELS TO ATTAIN 21ST CENTURY SCHOLARSHIP IN NIGERIA

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ABSTRACT

This study investigated the constraints in mathematics instruction at the various levels of education in Nigeria. The design for this study was Ex post facto. A total of one hundred and ninety eight students on mathematics education project works were investigated from three tertiary institutions in Rivers state of Nigeria. Random sampling was used to select data based on schools with qualified graduates in mathematics as teachers and schools that will be comparable in terms of performance in external examinations. Data were collected using a questionnaire (based on making teaching and learning public, accessible and evaluated) that was developed by the researchers. The research questions were answered using mean and standard deviation while the hypotheses were tested using t-test statistics and analysis of variance at 5% level of significance. The result of the study revealed that teaching and learning of mathematics consistently generates interest among scholars over the years. There was a significant difference on the instructions made public than those that were not. There was significant difference on the accessibility of research-based instruction on mathematics teachers. There was significant difference in the levels of mathematics instructions on teaching and learning. In the light of the findings, it was recommended among others that teachers should be encouraged to adopt metamorphosing instruction in mathematics education to facilitate students' achievement of mathematics concept. Based on the findings, it was also recommended that workshops, seminars, and conference should be organized regularly for these teachers to help them improve on their skill levels. The study recommended among others that researchers on classroom instructions in mathematics education should be made accessible by teachers for utilization in teaching for improvement in student enthusiasm and achievement in mathematics.

Keywords: Mathematics education, instruction, Teaching and Learning, scholarship, metamorphosing, 21st century.

INTRODUCTION

Transforming mathematics instruction into a scholarly enterprise means not only transmitting knowledge but extending it as well. Numerous characteristics identified by empirical literature have been noted to impact positively on learning outcomes in students (Hattie & Helmke, 2009). These include maximizing the time available for learning through good organization and rule setting, presenting information in a clear and well-structured way, engaging in meaningful sophisticated discourse, and teaching/learning strategies and offering a supportive learning environment. These characteristics which are indicative of learning experiences of students transform into scholarship.

Mathematical scholarship involves more tasks that play a document role in mathematics instruction than in other subjects (Neubrand, 2002)). Both teachers and students can capitalize on tasks as key instruments of mathematics instruction. For teachers, tasks are an important means of Orchestrating instruction in two ways. The way a task is embedded in a lesson and the methods used to approach it influence students motivation and interest. Tasks can thus function as effective teaching tools and students' learning activities are directly impacted by order tasks with adequate cognitive potential used to create meaningful learning opportunities in the classroom (Zaslavsky, 2007). Teachers can thus use tasks to influence students understanding of mathematical concepts and procedures, their construction of complex conceptual networks, and ultimately their image of mathematics. On their part, students tend to gauge the demands made of them in mathematics lessons in terms of the tasks set. They are often introduced to lesson content through task, they see their mathematical activity in terms of their engagement with tasks and they experience competence in solving those tasks.

Another area of importance for scholarship in mathematics instruction is in the mathematics teacher's diagnostic skills. The teachers need these skills to gauge their students' learning motivation and prior knowledge in mathematics as key student characteristics relevant to learning and achievement (Dunnebiev, Grasel & Krolak-Schwerdt, 2009). Teachers' diagnostic skills are therefore highly relevant for the progress of the students in their classes. According to Anders, Kunter, Brunner, Krauss and Baumert (2010), mechanisms are thought to underlie the assumed positive effects. First, teachers with good diagnostic skills are able to accurately assess student characteristics relevant to learning and achievement on both the individual and the class level. Second, they are able to judge the difficulty of instructional material and its potential for cognitive activation. These evaluations, and the associated processes of adaption, are expected to result in teachers providing individual learning support for their students, on the one hand and developing the potential for cognitive activation in their lesson on the other. In so doing, teachers create opportunity structures for scholarship to thrive.

Mathematical scholarships involve tasks that play a more dominant role in mathematics instruction than other courses. In spite of the importance of mathematics in nation building stressed over the years at various levels of education in Nigeria there are numerous challenges in mathematics instruction (Ogunkunle & Charles-Ogan, 2013). Most researchers have been focusing on students' characteristics and provision of infrastructural facilities, thereby neglecting the teachers who are involved in the teaching process.

Ogunkunle (2007) stated that the widespread utility of mathematics in scientific and technological applications has made mathematics education a key predictor of scientific competitiveness. Hence the teaching and learning of mathematics should portray an active and dynamic classroom with the students thinking, exploring and usefully applying knowledge acquired in the process especially in the competitive setting in the knowledge economy (Ogunkunle & Charles-Ogan, 2013). However, can this active and dynamic classroom scenario with its associated instructional imperatives be achieved? This study tends to investigate the constraints in mathematics instruction at the various levels of education in Nigeria.

Aim and objectives of the study

The main aim of the study was to investigate the constraints of metamorphosing instruction in mathematics education at tertiary levels to attain 21st century scholarship in Nigeria. Specifically the objectives of this study are to:

(1) Examine the teaching and learning of mathematics among scholars based on gender.
(2) Determine the accessibility of students project work with respect to research based instruction in mathematics.
(3) Identify levels of mathematics instructions on teaching and learning.

Research Questions

1) Is there any significant difference on the teaching of mathematics among scholars based on gender?
2) What is the difference in students' project work accessibility with respect to research based instruction?
3) What is the effect of the level of mathematics instruction on teaching and learning?

Hypotheses

HO_1 There is no significant difference on student's project work accessibility and research based instruction.

HO_2 There is no significant difference on the levels of mathematics instruction based on the teaching and learning.

Methodology

The design for this study was Ex Post Facto. A total of one hundred and ninety-eight students on mathematics education project works were investigated from three tertiary institutions in Rivers State of Nigeria. Random sampling was used to select data based on schools with qualified graduate mathematics teachers and schools that will be comparable in terms of performance in external examinations. Data were collected using a questionnaire (based on making teaching and learning public, accessible and evaluated) that was developed by the researchers.

The data collected were analysed using mean, standard deviation, t-test and analysis of variance at 5% level of significant.

RESULTS AND DISCUSSION

Research Question One: Is there any significant difference on the teaching of mathematics among scholars based on gender?

Table I: Mean and standard deviation of teaching among scholars based on gender.

Variable	N	Mean	Standard deviation
Male	96	35.55	7.35
Female	102	38.27	7.72
Total	198	73.82	15.07

The table 1 above showed the overall mean score of male scholar teachers is 35.55 with a standard deviation of 7.35, while the overall means score of female (scholars) teachers is 38.27 with a standard deviation of 7.72. This showed that female (scholars) teachers scored higher than males (scholars) teacher in the teaching process.

Research Question 2: What is the difference in students' project work accessibility with respect to research based instruction?

Table 2: Mean of students' project work accessibility with respect to research based instruction

Group	N	Mean	SD
Project – work accessibility	102	23.54	5.48
Research based instruction	96	46.78	17.85
Total	198	70.32	23.33

The table 2 above showed the overall mean score of Project – work accessibility is 23.54 with a standard deviation of 5.48, while the overall means score of Research based instruction is 46.78 with a standard deviation of 17.85. This implies that there is a significant difference between Project – work accessibility of 102 and Research based instruction of 96.

HO_1: There is no significant difference in students' project work accessibility and research based instruction

Table 3: t-test analysis of students' project work and research based instruction.

Group	N	Mean X	SD	Df	t-cal	t-crit	Remark
Project – work accessibility	102	23.54	5.48				
Research based instruction	96	46.78	17.85	196	21.48	1.96	Significant

Table 2 indicated that the calculated t-value of 21.48 was greater than the corresponding critical value (t-crit) of 1.96, at the 0.05 level of significance; the null hypothesis was therefore rejected. This showed that there was a significant difference in students' project work accessibility and research based instruction.

Research Question 3: What is the effect of the levels of mathematics instruction on teaching?
HO_2: There is no significant difference on the levels of mathematics instruction based on the teaching and learning.

In response to this, an analysis of variance (ANOVA) was used to analysed the level of mathematics instruction based on the teaching and learning.

The findings were presented in table 4. Analysis of variance (ANOVA) output for significant difference of mathematics instruction in teaching and learning.

Table 4: Analysis of variance (ANOVA) output

Source	Sum of squares	df	Mean squares	Fcal	Fvalue	Decision
Mathematics instruction	1,185.56	2	395.19	7.108	0.000	Reject
Error	16,456.72	195	55.60			
Corrected total	17,642.28	197				

Significant at PC .05

The result in table 4 showed that the ANOVA analysis yielded F(3,195) = 7.108 and F value of 0.000. This result was deemed to be statistically significant since the obtained F value (0.000) was less than 0.05 levels of significance. Therefore, there was a significant difference in the level of mathematics instruction in teaching and learning.

CONCLUSION

In conclusion, metamorphosing instruction in mathematics education at tertiary levels to attain 21st century scholarship in Nigeria laid emphasis on the need to adopt metamorphosing instruction in mathematics education for utilization in teaching. The conclusion drawn from this study showed that there was significant difference on the accessibility of research-based instruction on mathematics teachers and also there was significance in the levels of mathematics instructions on teachers.

RECOMMENDATIONS

In the light of the findings, it was recommended among others that:

(1) Only qualified mathematics teachers with pedagogical skills should be engaged in teaching of mathematics.
(2) Teachers should be encouraged to adopt metamorphosing instruction in mathematics for better understanding of mathematics concept by students.
(3) Government should provide funds and organize workshops, seminars and conferences regularly for teachers to improve their skills.
(4) Researchers on classroom instructions in mathematics education should be accessible to teachers using teaching for improvement of students' enthusiasm and achievement in mathematics.

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