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# THE RELATIONSHIP BETWEEN SCORES OF MATHEMATICS KNOWLEDGE AND TEACHING PRACTICE OF DIPLOMA MATHEMATICS STUDENTS: A QUEST FOR QUALITY ASSURANCE.

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## Abstract

The purpose of the study was to determine the relationship between scores in mathematics knowledge and teaching practice of Diploma mathematics students. A sample of 39 students was used. Two research questions and two hypotheses were asked and formulated respectively. An ex-post facto correlation design was used. The data were analyzed using Pearson's product moment correlation and simple regression analyses. The findings revealed that mathematics knowledge scores was not a good predictor of teaching practice scores. Again Mathematics knowledge had no significant relationship with teaching practice scores of students. Recommendations based on the findings of the study are that mathematics knowledge should include ways that specialized mathematics knowledge can be developed and the subject should be taught encouraging active engagement, social interaction, mini teaching and student teachers should be encouraged to attend regular workshops and seminars to acquaint themselves with requisite skills.

## Introduction

Mathematics is important to everyday activities in all aspects of life and this cannot be over emphasized. Mathematics is a precision tool used in understanding the physical as well as the scientific and technological world. Due to its importance, mathematics was made compulsory at both primary and secondary school levels of education in Nigeria. In spite of this importance the failure rate of students in the various examinations are always high.

Many research findings have highlighted the various factors that are responsible for these failures. Onah (2006), Odili (2006) and Obodo (2005) observed that students fail mathematics because of the way they are taught in schools in Nigeria, while Mefor (2011) identified lack of qualified teachers to be among the problems that have caused students' poor performance in mathematics. Given this scenario the performance of students in mathematics has been poor for a long time. This situation is of concern with the attendant implication to scientific and technological development in Nigeria. Thus there is a need for exploration of more effective and effectual strategies which mathematics teachers can adopt to bring about improved performance of their students in mathematics. According to Herrera (2001) the method of teaching in schools and colleges should be done in a meaningful manner and that it should conform to widely acclaimed standard advocated by the national council of teachers of mathematics (NCTM).

A number of factors may influence the teaching of mathematics but teachers play an important role in the teaching process. Mathematics teachers stand out as one of the most important factors determining the quality of mathematics and its contributions to national development. At every level of Education, learners who go to school look on their teachers for the acquisition of the necessary skills to enable them become what they want to be. Thus, students often look on their teachers' personal qualities, educational qualifications and professional competence. It is on this note that the role of Teacher Education in training mathematics teachers to help students achieve the objective of instructions in their various fields of endeavor, stands paramount. How should the mathematics teacher present himself in order to get his message across? What strategies of teaching are effective? In order to answer the above questions there is the need to train mathematics teachers. Teacher Training is policies and procedures designed to equip prospective mathematics teachers with knowledge of the subject, attitude, behavior and skills required to perform their tasks effectively in the class rooms. In order for the teacher to be effective in class he needs to be trained in the methods of teaching mathematics and the teacher must also demonstrate these methods in real life situations. To find the effectiveness of these mathematics teachers, we need to provide teaching practice for student teachers; we need to know that the student teacher has acquired new knowledge, attributes, and skills from the knowledge of mathematics. Therefore there is this need

to develop more empirical evidence on how mathematics knowledge relates to the teaching of mathematics in class. Again the common belief in society is if a mathematics teacher knows mathematics very well he or she is the best person to teach mathematics. What about the methodology of teaching mathematics? Fennema and Franke (1992) determined the components of mathematics teacher's knowledge as (1) knowledge of mathematics (2) knowledge of mathematical representations (3) knowledge of students (4) knowledge of teaching and decision making. They said it is important to have the knowledge of the subject and its representation because mathematics is seen as a composition of a large set of highly related abstraction and if the teacher does not have the methods of translating these abstractions into a form that enables learners to relate the mathematics to what they already know, they will not learn with understanding.

Based on Shulman (1987), the content, methods and teaching practice are important to the teacher for his training to be effective. Kahan, Cooper and Belhea (2003) concluded that students would learn more mathematics if their teachers knew more mathematics. Content knowledge only in the subject area does not suffice for good teaching. A number of studies investigated different aspects of content knowledge, skills for teaching and practical. Jones and Moreland (2004) described the frameworks and cognitive tools that have been developed to enhance practicing teachers teaching methods in primary school technology education. An Kulm and Wu (2004) compared teachers teaching skills and knowledge of mathematics in United States and Chinese middle schools. Mcduffy (2004) examined the reflective practice of two elementary pre-service teachers during their teaching internship and found limits in teaching skills, knowledge and lack of confidence. These impeded service teachers' reflection while in teaching practice. Stacey, Helme, Steinle, Baturo, Irwin, and Bana (2001) investigated pre-service elementary school teachers' content knowledge and teaching skills knowledge of decimal numeration.

Given research findings on this topic there is need to develop more empirical evidence on how the knowledge of mathematics relates to the teaching practice. Therefore teachers with lack of understanding of fundamental mathematics knowledge will face the challenges of teaching. The purpose of this study is to examine the relationship between mathematics knowledge and teaching practice.

**Statement of the problem**

Teaching and learning of mathematics have some major setback due to lack of knowledge of mathematics and teaching practice. It is only recently that substantive progress was made in understanding mathematics knowledge and how they play out in practice and how they can be developed. This development would put into practice expectations of improving teaching and learning mathematics effectively for quality assurance. However it is often not clear whether the knowledge of mathematics has made any difference or whether specific teaching problems can be solved through teaching practice. There is no data which describes objectively the way in which teachers in schools carry out their understanding of mathematics knowledge in the classroom. Research needs to be done to continue finding out if knowledge gained from mathematics is utilized during teaching practice. Again observations on knowledge gained and the outcome of teaching practice can show which aspects are irrelevant or effective.

Due to the above it is imperative to examine the relationship between mathematics knowledge and teaching practice. Therefore it is necessary in this study to investigate the relationship between mathematics knowledge and teaching practice of Diploma mathematics students for quality assurance.

**Research Question**

The research questions provide a guideline to this study.

a) What is the relationship between the scores in mathematics knowledge and teaching practice?
b) Can mathematics knowledge scores predict the scores obtained in teaching practice?

**Research hypotheses**

The following research hypotheses were formulated and tested at 0.05 level of significant

Ho1: There is no significant relationship between students' scores in mathematics knowledge and teaching practice.

Ho2: Mathematics knowledge score cannot significantly predict the scores obtained in teaching practice of students.

 

## Method

Research design:- The ex-post facto correlation design was used in this study because all the research variables had already existed before the commencement of the study and the researcher neither controlled nor manipulated the research variables. The pre-existing scores in mathematics knowledge and teaching practice were used.

Population and sample: - The population of the study consisted of all sixty mathematics Diploma II 2010/2011 students of the institute of Education, ABU Zaria but the sample of 39 students were used because some students were dropped due to incomplete results.

Instrumentation: - No instrument was used but data was collected from the coordinator of the programme.

Data analysis: - Data collected was analyzed using Product Moment Correlation and Simple Regression analyses.

## Results

Ho:1 There is no significant relationship between students' scores of mathematics knowledge and teaching practice.

Table 1: Correlation analysis of students scores of mathematics knowledge and teaching practice.

| Variable | N | Mean | S.D | r | df | P-value |
|---|---|---|---|---|---|---|
| Mathematics knowledge | 39 | 56.70 | 6.77 | .061 | 37 | .714 |
| Teaching practice | 39 | 72.38 | 88.41 | | | |

The correlation coefficient is .061 which shows a very low correlation between the scores of mathematics knowledge and teaching practice. The calculated P-value of .714 is greater than the 0.05 level of tolerance. Therefore there is no relationship between the scores of mathematics knowledge and the teaching practice. Thus, the null hypothesis was accepted.

Ho:2 Mathematics knowledge scores cannot significantly predict the scores obtained in teaching practice of Diploma students.

Table 2: Regression analysis of mathematics knowledge scores and teaching practice scores of Diploma students.

| Variable | N | r | $r^2$ | $E = 1 - \sqrt{1 + 1^2}$ |
|---|---|---|---|---|
| Mathematics knowledge | 39 | .061 | 0.0037 | 0.002 |
| Teaching practice | 39 | | | |

The calculated $r^2$ value was very low and the E-value was also very low. Therefore $H_o$: 2 was accepted. The decision was that mathematics knowledge cannot predict the scores in teaching practice of students.

## Discussions

Therefore the analysis and interpretation of the data collected during the study showed that the two hypotheses formulated were accepted based on the facts above. In these cases the student teachers do not need mathematics knowledge to perform well in their teaching practice or vice-versa.

A number of studies have identified different factors responsible for poor achievements in mathematics. Many researchers have attributed poor achievements of students in mathematics, science and their applications to methods of training employed by teachers who handle the teaching of the subjects. It is also assumed that the kind of training received by a teacher can have influence on his/her quality of teaching.

In this study the scores of mathematics knowledge did not correlate significantly with their teaching practice scores. Hence going by their scores, it shows that the understanding in mathematics knowledge did not translate into their teaching practice. The findings of this study are consistent with previous research results. Stanford project shows that inexperienced teachers have incomplete and superficial level of pedagogical content knowledge (Shulman, 1987). Again a novice teacher relies on unmodified subject matter knowledge more often directly extracted from the text or curriculum materials (Cochran, DeRuiter & King, 1993). The results of the studies of Brown and Borko (1992) suggested that novice teachers are sometimes not developmentally ready to assume the roles required of them as good mathematics teachers. Mcduffy (2004) also examined the reflective practices of two elementary pre-service teachers during their student teaching internship and found limits in mathematics knowledge and lack of confidence impeding the pre-service teachers' reflection while teaching. Again Sanchez and Lineares (2003) attempted to identify the influence of teacher candidates' subject matter knowledge in the different aspects of concepts they emphasized and in the use of a representation repertoire to structure learning activities. Hill and Ball (2004) showed in their studies that practicing teachers do not possess the breath and depths of knowledge needed to teach mathematics effectively. Again practicing teachers do not have a deep conceptual understanding of mathematical concepts. This leads to teachers' inability to impact or respond to students questions and to extend mathematics lessons beyond basic skills (Wilson, Floden & Ferrine-Mundy, 2001).

All these findings lead to important questions. How do student teachers attach meaning to what is necessary and sufficient to teach mathematics? Is it also possible for student teachers to believe that they know mathematics well enough to teach but at the same time believe that they lack the skills necessary to teach mathematics? Finally how do students teacher view their capabilities to attain these necessary skills to teach mathematics.

Student teachers have missed the link of mathematics knowledge and teaching practice. Therefore understanding mathematics knowledge has the propensity to improve their teaching which may ultimately impact on the mathematics learning of their future students.

It has been asserted that the student teachers' mathematics knowledge scores is not dependable, despite the effort being made to stimulate their skills and strategies for teaching. The major cause of the non relationship may be attributed to the use of inappropriate instructional strategies during their teaching practice. Mathematics knowledge is important because it provides a valuable resource for developing assignments that address Teaching practice which actually requires knowing the most useful ways of representing and formulating the subject so as to make it comprehensive to others.

**Recommendations**

Based on the findings of this study, it is hereby recommended that student teachers should be exposed to mathematics knowledge emphasizing on active engagement, interaction and mini teaching. Student teachers should be encouraged to attend regular workshops and seminars to acquaint themselves with requisite skills.

Curriculum planners should ensure that curriculum implementation put into practice mathematics knowledge which should be evaluated properly demonstrating the skills of teaching.

Mathematics knowledge should introduce instructional activities such as games into their training process. Teacher-training institutions will be able to use the results of this study to support their staff in updating and improving their curriculum. This will allow for innovations in the methods and materials that are similar to those that worked well in the classroom. Mathematics educators should also find ways that specialized mathematics knowledge can be developed.

**Implication**

This work has raised a critical question for the field of mathematics education. That is, how does mathematics knowledge shape the work student teachers do in enacting lessons during their teaching? It is necessary to use a subject-specific framework for mathematics knowledge and investigating student teachers knowledge in class. This will give mathematics educators a window into the ways in which student teacher knowledge influences the students they teach in other to give them opportunities to learn mathematics.

 

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