

Classroom Practices Reality of Mathematics Female Teachers that Contribute to the Development of Mathematical Proficiency

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Abstract: The present study examines the classroom practices reality of mathematics female teachers that contribute to the development of the mathematical proficiency depending on the different approaches of teaching. To empirically investigate the above problem the study employed the exploratory quantitative research design. The current study sample consisted of all the female mathematics supervisors at Makkah Educational Area, i.e., 24 according to the Department of General Education Statistics 1434–1435 School Year (Second Semester). Purposive sampling procedure was used to select twenty four (24) school supervisors because they had the needed information. Structured questionnaire was used to collect data from the study participants. SPSS software version 21 was used to carry out the data analysis where descriptive statistics and independent t-test. The t-test was performed on raw scores across the entire sample. The results show that there are no significant differences between teaching methods when assessing procedural fluency, strategic competence and adaptive reasoning. Students' progress in conceptual understanding is significantly better when teachers teach with a problem-based curriculum. In order to develop aspects of self-efficacy, the results show that pupils would better benefit from a traditional curriculum.

Key words: mathematical proficiency, classroom practices, female teachers, mathematics reality, teaching methods

1. Introduction

1.1 Problem of the Study

Classroom practices have impact on the mathematical proficiency among the students. According to Samuelsson (2008) the influence of learning environment among the students plays a major role especially in the field of mathematics teaching and learning and hence proficiency. Therefore the present study will determine the classroom practices the reality of female teachers on teaching mathematics among the students.

1.2 Study Questions and Hypotheses

The following are the research questions that will be answered in the study:

- (A) What classroom practices or approaches that contribute to the development of mathematical proficiency?
- (B) Does the choice of the teaching approach influence the student's proficiency in mathematics?

The research hypothesis in the study will be:

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There is a significant relationship between classroom practices or approaches and the student's proficiency in mathematics.

1.3 Terminology

Classroom Practices: Classroom practices refer to the skills and techniques used in the classroom by teachers that help the students to be orderly, organized, attentive and able to solve or understand how to carry out different tasks given to them by the teachers so that they can be academically productive (NRC, 2012).

Mathematical Proficiency: This can be defined as the performance on the National Assessment of Education progress assessment and is usually measured using the average scores of the students (NRC, 2012). To achieve the mathematical proficiency students must develop the conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition when it comes to mathematics.

1.4 Limits of the Study

The following are the limitation of the study:

- The study will only involve female teachers' schools and therefore the results of the study will be generalized to mathematical female. There will be no comparison of the study findings between the gender and understand the impact of gender on the mathematical proficiency.
- The sample size of the study was also small because only 24 school supervisors took part in the study. Therefore, the results of the study were limited to the school supervisors and thus the findings of the study cannot be generalized to the total population.

2. Theoretical Framework

Mathematics is a fundamental human endeavor that empowers individuals to describe, analyze and understand the globe and how to carry out various activities to the class and the day to day activities.

Teaching approaches adopted in the classroom influences the outcome of the students in different ways (Granström, 2006). He went further and stated that the practices which allows the students to be allowed or encouraged to participate actively in the subjects discussions with their teachers and classmates improves the students' performance and opportunities to understand and succeed very well in mathematics.

According to the Oppendekker and Van Damme (2006) efficient practices should stress good teaching where communication is effective and building relationships between teachings and students are maintained. Boaler (1999, 2002) reports that practices such as working through textbook exercises or discussing and using mathematical ideas were important vehicles for the development of flexible mathematical knowledge.

The factors which are related to the mathematical proficiency include Conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition.

According to NRC (2005 and 2012) conceptual knowledge is important because it is an essential foundation of the mathematical proficiency. All students to be proficient in mathematics must have a deep and flexible knowledge of a variety of procedures. They must also be able to make critical judgments when it comes to solving the mathematical problems so that they can be able to procedures or strategies that are appropriate for use in particular situations (NRC, 2012; Star, 2005).

Conceptual understanding can be described as the student's comprehension of the mathematical concepts, operations and relationships. In this concept the students have the ability to understand more than facts and the methods and hence they are able to deal with the mathematical problems with ease. Procedural fluency refers to

the skills possessed by the students where they are able to carry out procedures flexible, accurately, efficiently and without any challenges. This concept helps the students to carry out the mathematical computation without referring to the tables or getting assistance from their peer. Procedural fluency can be described as more than just memorizing facts or procedures of mathematics (NGA Center & CCSSO, 2010). It is the foundation of the conceptual understanding, strategic reasoning, and problem solving because it helps the students to understand the procedures to be used when solving the problems in question (NCTM, 2000, 2014).

Strategic competence is a concept which allows the students to have the ability to formula, represent and solve the mathematical problems (Kilpatrick et al., 2001).

Adaptive reasoning can be described as the ability of the students to think logically, reflect and explain the mathematical procedures and formulas they have used in solving mathematical problems. Productive disposition is the ability where the students are able to see mathematics positively and see it as a subject which is worthwhile and very important in the day to day situations (Kilpatrick et al., 2001).

3. Study Procedures

The study will employ quantitative exploratory to determine and explore classroom practices reality of mathematics female teachers that contribute to the development of mathematical proficiency. This approach will help the researcher to achieve the study objectives and answer the research question.

3.1 The Study Population and Sample

The target population of the study will be school supervisors. According to Mertens (2005, p. 4) he indicated that the target population is the group of the persons whom the results of the study will be used. The sample size of the study will be 24 school supervisors.

Qualitative sampling methods will be employed in this study to obtain the study results. Purposive sampling is the qualitative technique which is applied in the study. This technique is the most appropriate method for this study because it will enable the researcher to achieve the study objectives. The purposive criterion for the study is school supervisors who have the knowledge about classroom practices and mathematical proficiency among the students. The reason why the researcher was able to choose purposive sampling because the methods were best fit with the research problem of the study, purpose or aim of the study, and primary research question of the study.

3.2 Study Tool: Questionnaire

According to Saunders et al. (2009) questionnaires are the most common data collection tools which have been used by scholars, researchers in the business economic and management studies across the globe. This is because the advantages of using the questionnaire out way other forms of data collection such as interview schedules. Questionnaires can be easily conducted and are not time consuming hence they are often used in the study (Pedhazur & Schemelkin, 1991). Because of the limited time and resources questionnaires have been helpful since it enables the researchers to conduct their study easily without any difficulty whatsoever because it can be administered in various ways. Researcher administered questionnaires refers to the process where the researcher is able to administer the questionnaire him/herself to the participants.

Apart from the method being easy to be administered, questionnaires enables the participants to give honest answers regarding the study, ensures anonymity of the research subjects. Anonymity enables the participants to use codes in the study rather than their names thus giving them the freedom to participate in the study freely and honestly since they know that the information will be kept confidential between the researcher and him/herself making reliability of the questionnaire to be high. Questionnaires also make the participant to feel comfortable since he has the room and freedom to give the response that he deems to be proper. The questionnaires are very important because of the high response rates as compared to other methods of data collection.

The Likert scale will also be used to measure the responses classroom practices on the mathematical proficiency where strongly agree, agree, neither, disagree and strongly disagree responses will be used.

3.3 Statistical Treatment

SPSS version 21 will be used to conduct analysis. Descriptive analysis will be conducted to compute the Mean and standard deviations for the study variables. The findings will be reported with the help of appropriate tables and charts along with an interpretation of the results.

4. Results of the Study and Discussion

This section of study presents the results and findings of the quantitative analysis that was carried out and analyzed using the SPSS 21 software. The data was collected from the sample of 24 study participants (school supervisors) from different schools.

The first section of the study comprised the demographic information where data collected on the gender, age, number of years in school supervision. The above information was analyzed using the descriptive statistics where frequencies, percent, measure of central tendency (mean) and dispersion (standard deviation) were calculated. Cross tabulation was also used where chi-square analysis was conducted to determine if there is any relationship between various variables in the study and the demographic data.

Items	Frequency	Percent
Supervision Bureau		
Bihar	1	4.17
East	5	20.83
West	5	20.83
Center	5	20.83
South	4	16.67
North	4	16.67
Age		
26-35 years	10	41.7
36-45 years	9	37.5
46-55 years	2	8.3
Above 60 years	3	12.5
Total	24	100.0
Number of years in school supervision and experience in mathematics		
1-2 years	2	8.3
2-3 years	5	20.8
3-4 years	3	12.5
4-5 years	4	16.7
Above 5 years	10	41.7
Total	24	100.0
Highest education completed		
Bachelor's degree	9	37.5
Graduate	14	58.3
PHD	1	4.2
Total	24	100.0

Demographic Information

Female supervisors from east, west and center were the majority with 20.83% (5 each) in each division. Majority of the respondents were aged 25–35 years with 41.7%, followed by those who are aged 36–45 years with 37.5%. Most school supervisors had above 5 years of experience and supervision with 41.7% and majority of them were graduates with 58.3%.

Table 1 Teaching Approaches					
Items		Frequency	Percent		
Which approaches do you use in your school?	Traditional approach	10	41.7		
	Problem based	14	58.3		
	Total	24	100.0		
Which approach is the best in improving the mathematical proficiency?	Traditional approach	3	12.5		
	Problem based	21	87.5		
	Total	24	100.0		

Majority of the supervisors agreed that problem based approach is being used in their schools with 58.3% while 41.7% of the respondents agreed that traditional approach is being used in their schools. 87.5% of the respondents agreed that problem based approach is the best approach that improves the mathematical proficiency. All the schools supervisors agreed that classroom practices affect the mathematical proficiency of the students.

Table 2 Descriptive Statistics of the Mathematical Fronciency variables						
	Ν	Minimum	Maximum	Mean	Std. Deviation	
Productive disposition	24	2	5	4.33	.816	
Procedural fluency	24	3	5	3.96	.550	
Conceptual understanding	24	2	5	4.08	.776	
Strategic competence	24	3	5	4.21	.588	
Adaptive reasoning	24	3	5	4.17	.637	

 Table 2
 Descriptive Statistics of the Mathematical Proficiency Variables

Measurement scale: 1- Strongly disagree; 2- Disagree; 3- Neutral; 4- Agree; 5- Strongly agree.

From the above descriptive statistics it is evident that mathematic proficiency among students can be determined by productive disposition with a mean of 4.33 and SD of 0.816; strategic competence with a mean of 4.21 and SD = 0.588; adaptive reasoning with a mean of 4.17 and SD = 0.637; conceptual understanding with a mean of 4.08 and SD of 0.776; and procedural fluency with a mean of 3.96 and SD of 550.

Table 3	Independent t-test between	Method of Teaching and M	Mathematical Proficiency	v Variables
Table 5	mucpendent t test setween	memore or reaching and	stathematical f fonciency	variables

	Which approaches do you use in teaching	N	Mean	Std. Deviation	Std. Error Mean	t-test	df	Sign.
Productive disposition	Traditional approach	10	4.20	1.033	.327	668	22	.511
	Problem based	14	4.43	.646	.173			
Procedural fluency	Traditional approach	10	3.80	.632	.200	-1.203	22	.242
	Problem based	14	4.07	.475	.127			
Conceptual understanding	Traditional approach	10	3.70	.823	.260	-2.213	22	.038
	Problem based	14	4.36	.633	.169			
Strategic competence	Traditional approach	10	4.10	.568	.180	755	22	.458
	Problem based	14	4.29	.611	.163			
Adaptive reasoning	Traditional approach	10	4.30	.483	.153	.862	22	.398
	Problem based	14	4.07	.730	.195			

From the independent t-test it is evident that there is a significant mean difference between the method or approach of teaching and the conceptual understanding of the mathematics among the students with a t-value = 2.213 at p < 0.05. This indicates that the school supervisors agreed that problem based learning is more effective when it comes to the conceptual understanding of mathematics.

5. Discussion

This study was designed to empirically investigate the classroom practices reality of mathematics female teachers that contribute to the development of the mathematical proficiency depending on the two different teaching approaches on students' mathematical proficiency, productive disposition, conceptual understanding, procedural fluency, strategic competence and adaptive reasoning.

The study found out that there is a significant mean difference between the method or approach of teaching and the conceptual understanding of the mathematics among the students. The study is supported by many researchers who argue that different teaching methods draw attention to different learning outcomes (Boaler, 2002; Samuelsson, 2008). The current study provides support for this view. In this study, it is obvious that different teaching approaches have different impacts on different aspects of students' mathematical proficiency. Problem-based learning is significantly better for improving students' performances in conceptual understanding (see Table 3).

The study also found out that problem based learning is very important because it plays an important role in ensuring that students are efficient in mathematics. The finding is supported by Rohrer (2009) who stated that effective teaching practices are very important because it provide experiences that help students to solve the mathematical problems. This is because the teaching methods (problem based) help students to connect procedures with the underlying concepts and provide students with opportunities to rehearse or practice strategies that will help them to understand the mathematical problems. The method also helps them to justify the procedures they have used in solving the problems (Rohrer, 2009).

In conclusion, the study was able to achieve the study objectives and answer the research question that classroom practices or approaches that contribute to the development of mathematical proficiency and the choice of the teaching approach influence the student's proficiency in mathematics. Problem based learning approach is an effective approach in teaching and development of mathematical proficiency among the students.

6. Recommendations

The study has been able to achieve the research questions and test the hypothesis of the study. The following are the recommendations of the study in relation to the problem of the study:

(1) The classroom practices affect the mathematical proficiency among the students. Therefore it is important for the teachers to use practices that have positive effect on the students such as problem based learning. This is supported by Rohrer (2009) who stated that effective teaching practices are very important in ensuring that students are proficient in mathematics.

(2) Problem based learning approach is effective when it comes to the conceptual understanding of the students on the mathematic subject. Therefore it is important for the schools to adopt the problem based teaching approach.

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