Factors Affecting Quality of Performance of Mathematics by Senior Secondary Students in Somalia. "A case – study Mogadishu – Secondary Schools"

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Abstract

Background: Mathematics is basically used to solve problems and mandatory to every student in Somalia and frequently used to different fields such as engineering and information communication technology (ICT). The majority of students believe that the subject is difficult to study, the reason with non-cognitive issues such as perception, attitude, expectation, interest.

Aim: The aim of this study is to explore the relationship between five cognitive factors such as teacher's professionalism, teacher's training, teacher's experience, student's perception, quality of textbook contributes the quality of performance of mathematics by senior secondary students.

Methods: Using cross-sectional survey method and cluster sampling technique six hundred questionnaires were disseminated; five hundred and eight-four were involved in data analysis. Data analyzed using structural equation modeling technique.

Findings: Results proposed teacher's professionalism, training, experience, curriculum, and student's perception have a significant to the quality and performance of mathematics by senior secondary student.

Conclusions: The recommendations of these findings and study limitations are discussed.

Keywords: Mathematics, Quality, Performance, , Curriculum, , Senior Secondary Students,

1 Introduction

Mathematics is the science that deals with the logic of shape, quantity, and arrangement(Allsopp, Kyger, & Lovin, 2007). Mathematics has usually been a complex subject for most students in secondary school(Ahmad & Shahrill, 2014).

Several factors contribute the problem deteriorating quality of performance of mathematics by senior secondary students such as teachers' experience, teachers' methods, teachers' motivation, quality of textbook, parental involvement, study time(Nenty, 2009). According to(Ashaari, Judi, Mohamed, & Tengku Wook, 2011) non-cognitive factors such as interest, attitude, motivation, perception, expectation and cognitive factors such as capability, value, difficult, interest and student's efforts may contribute quality of performance to a subject.

Mathematics plays a major role in learning other subjects besides, there are several reasons for low quality of performance of mathematics by senior secondary students one from student such as student's perception, student's effort, attitude, expectation towards the subject, two from the teacher such as teacher's method, experience, motivation, professionalism, trained, third from curriculum such as not participating curriculum development to the teacher, fourth from environment.

Besides, there are several studies that have investigated Students ' Perception of Factors Influencing Teaching and Learning of Mathematics in Senior Secondary Schools (Bala, Hyelni, & Umar, 2016), Impact of Motivation on Learning of Secondary School Students(Rehman & Haider, 2013), Female senior secondary physics students' engagement in science: a qualitative study of constructive influences(Oliver, Woods-McConney, Maor, & McConney, 2017), Secondary students' attitudes towards mathematics(Asante, 2012), Students' Perception of Factors Influencing Teaching and Learning of Mathematics in Senior Secondary Schools(Dauda, Jambo, & Umar, 2016), Problems of teaching and learning of geometry in secondary schools(Adolphus, 2011), Strategic competence of senior secondary school students in solving mathematics problem based on cognitive style(Syukriani, Juniati, & Siswono, 2017), Productive failure in mathematical problem solving(Kapur, 2010).

Lack of the previous study in the context quality and performance of mathematic by senior secondary students in Somalia, so this study examines the interrelationship of teacher's professionalism, training, experience, student's perception, curriculum and quality of performance of mathematics by secondary student

2 Theoretical framework and hypotheses

Student's achievement in a mathematic subject depends upon several factors such teacher's quality, student's perception towards the subject, curriculum and learning environment.

2.1 Teacher's professionalism

The terms "profession" and "professor" have their etymological roots in the Latin for profess. To be a professional or a professor was to profess to be an expert in some skill or field of knowledge

According to(Demirkasimoğlu, 2010) Teacher professionalism is described as being good at his/her job, fulfilling the highest standards and achieving excellence. Teacher professionalism is referred as teacher's responsibilities to manage and increase their own knowledge and actions for the profit of the students(Weber & Johnsen, 2012).

The teacher can advance their professionalism through direct and indirect activities(Hoesein, 2015). Regarding to(Richter, Kunter, Klusmann, Lüdtke, & Baumert, 2011) professional development could be carried out through a direct process such as a conference, seminar, or workshop and can also occur in indirect context such as discussion among coworkers, independent reading and research, observations of a colleague's work, or other learning from a peer.

2.2 Teacher's training

Training is defined as an act of teaching someone an especially skill. It may also refer to the teaching of a type of behaviors (Weddle & Hollan, 2010). According to (Akinfe, Olofinniyi, & Fashiku, 2012) students better perform when taught by a professionally trained teacher.

2.3 Teacher's experience

Several studies found that there is a positive relationship between teacher's experience and student's achievement in a subject (Gleeson & Davison, 2015; Makovec, 2018). Regarding (Reeve, Jang, Carrell, Jeon, & Barch, 2004) mentioned some areas of teacher's experience that includes;

1. Pedagogical studies
2. Contents studies
3. Instructional technology
4. Post teaching training amongst others

On pedagogical studies, the scholars stated an opinion that teachers are able to harmonize the minds and emotions of their students in class and his produces students with higher academic achievement they also describes instructional technology as the use of various media such as electronic, internet, interactive whiteboard, print and ICT

applications such as PowerPoint for creating presentations, MS word for writings documents creating , reading, sending email, Moodle for completing a learning activity or accessing information for a course, excel for creating spreadsheets or charts, using Mendeley as a reference manager software, installing the software on the computer, using Turnitin, spreadsheet to plot a graph, using photoshop, flash for creating graph, using SPSS for data analysis, creating web pages for e-portfolio, using ODK for data in transmitting vital information to students(Wastiau et al., 2013). Recent students revealed that teacher with both content knowledge and instructional ability achieves a higher percentage of students' outcome then teachers without such experience. They also identified that teachers post-teacher training is aimed at acquisition special skills and experience that will enhance quality service delivery which in turn has a direct impact on the students' achievement.

2.4 Student's perception towards mathematics subject

Many researchers describe the term perception. In the Cambridge advanced dictionary describes the term perception means belief or option, often held by many people and based on how things seem. According to (Farooq & Shah, 2008) There are five components in attitude which are emotion, goal, direction, strength, and consistency. Each attitude component is divided into positive, neutral and negative.

2.5 Quality of textbook

The term curriculum defined as the lessons and academic content taught in a school or in a specific course or program according to Cambridge advanced dictionary, the word curriculum referred as the group of subjects studied in a school, college, etc. The goal of a successful educational program and thus effective curriculum development should be to meet the needs and current demands of the culture, the society, and the expectations of the population being served(A, 2016). Without doubt, the most important person in the curriculum implementation process is the teacher. With their knowledge, experiences, and competencies, teachers are central to any curriculum development effort. Better teachers support better learning because they are most knowledgeable about the practice of teaching and are responsible for introducing the curriculum in the classroom(A, 2016).

The researcher will test the following hypotheses:

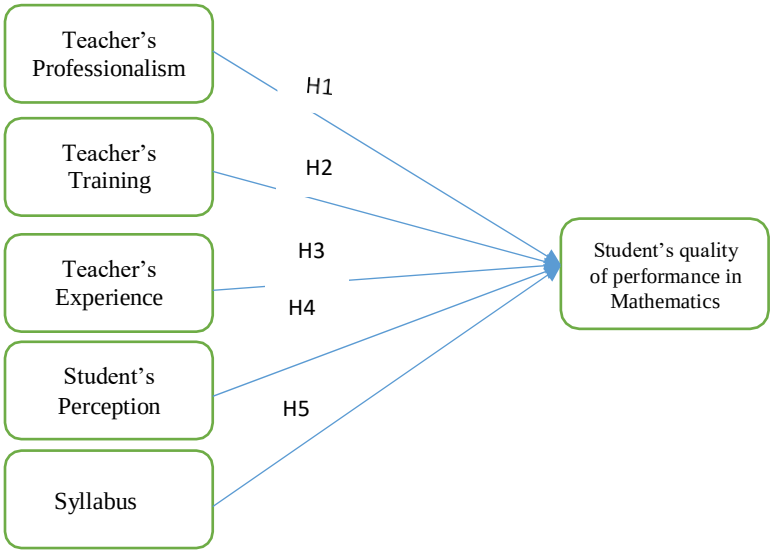
H1. Teacher's professionalism is positively related to the quality of performance of mathematics by in senior secondary students.

H2. Teacher's training is positively related to the quality of performance of mathematics by in senior secondary students.

H3. Teacher's experience is positively related to the quality of performance of mathematics by in senior secondary students.

H4. Student's perception is positively related to the quality of performance of mathematics by in senior secondary students.

H5. The curriculum is positively related to quality of performance of mathematics by in senior secondary students.



3 Methods

This section presents an overview of the research methodology applied in this study. The research is exploratory and descriptive in nature and adopts a qualitative research approach. The main purpose of research methodology is to produce reliable and valid data that is free from personal biases and errors.

3.1 Population and sample of the study

In this study, the population refers to senior secondary students of five schools in Mogadishu, according to the ministry education of Somalia identified that the number of students is around **29334**. This study included stratified sampling technique. Stratified sampling is a method

Of 600 distributed, 593 respondents returned the survey; 584 were usable for the purposes of this study and data was collected using kobo data collected.

3.2 Instrument

A survey questionnaire was developed as an instrument for data collection. Items used for teacher's professionalism, training, experience, student's perception towards the subjects, curriculum and students performance. Five-point Likert scale was used for those items where 5 represented strongly agree and 1 represented strongly disagree responses. In confirming reliability of the study, the items were adapted based on acceptable Cronbach's alpha reliability scored **0.895.**

3.3 Data analysis tool

The result was used to analysis Statistical Package for Social Science (SPSS), Amos SPSS and Excel spreadsheet. To determine the relationship between students' performance, teacher's professionalism, training, experience, student's perception towards the subject and curriculum. The simple regression model was developed and correlation analysis conducted at 95% confidence level.

4 Result and Discussion

4.1 Profile of respondent

Table 1 indicates the background of the respondents. Male respondents made up 53.8% of the sample study while females made up46.7%. The majority of the students were their age between 15 – 17 years made up 48.6%, between 18 – 19 years made up33.2%, between 19 – 20 years made up7.9%, less than 16 years made up 9.6% final more than 21 years made up 0.7%. Result obtained last year by each student was between 80 – 90Marks were25.3%, between 71 – 80 Marks were 16.4%,41 – 50 Marks were13.9%, 51 – 60 were 9.2%, 61 – 70 Marks were8.7%, more than 91 Marks17.8%, less than 40 Marks8.7%. The majority of the students' parent/guardians their education level in between none and university were 30.7% secondary,21.6 university, 22.9% none educators, 15.4% primary and final 9.4% diploma. The majority of the respondents' parent/guardians their basic source of income are business(40.4%), Salary(23.1%), labor(15.2%), abroad(14.2%), Farming(5.3%), fisher(0.5%), butcher(1.5%).

Students' profile *(n = 584)*

Characteristics	Frequency(n)	Percentage (%)
Gender		
Male	314	53.8
Female	270	46.7
Age group		
Less than 15 years	56	9.6
Between 15 and 17 years	284	48.6
Between 18 and 19 years	194	33.2
Between 19 and 21 years	46	7.9
More than 21 years	4	0.7
Result obtained last year by the students		
Less than 40 Marks	51	8.7
41 – 50 Marks	81	13.9
51 – 60 Marks	54	9.2
61 – 70 Marks	50	8.6
71 – 80 Marks	96	16.4
81 – 90 Marks	148	25.3
More than 91 Marks	104	17.8
The education level of students' parents/guardians		
None	134	22.9
Primary	90	15.4
Secondary	179	30.7
Diploma	55	9.4
University	126	21.6
Source of income for students' parents/guardians		
Business	236	40.4
Salary	135	23.1
Labor	89	15.2
Farming	31	5.3
Abroad	83	14.2
Fisher	3	0.5
Butcher	7	1.2

4.2 Teacher's effectiveness

Table 2 shows the effectiveness of the teacher. The majority of the students identified their teacher effectiveness was 55.3% high effect, middle effective (36.0%) and final low effective(8.7%). Most of the students explored that their teachers teach per week below 5 lessons(39.4%), between 5 – 10 lessons (46.4%), between 10 - 15 lessons(11.0%), between 15 – 20 lessons (2.9%) and final above 20 lessons (0.3%).

Items	Frequency	Percentage (%)
Effectiveness of teacher's in teaching		
High effective	323	55.3
Middle effective	210	36.0
Low effective	51	8.7
Teachers' teach students per week		
Below 5 lessons	230	39.4
5 – 10 lessons	271	46.4
10 – 15 lessons	64	11.0
15 – 20 lessons	17	2.9
Above 20 lessons	2	0.3

4.3 Reliability and validity of the study

A structural equation modeling approach was employed to identify the correlation among variables. Two types of validities were achieved convergent validity and discriminant validity. Table 3 indicates the range of factor loadings between 0.554 and 0.968 thus establishing convergent validity. According to(Byrne & van de Vijver, 2010) factor loadings must be more than 0.5. In convergent validity all average variance extracted (AVE) should greater than 0.5(Fornell and David F. Larcker, 1981) above the table 3 indicates the AVE between 0.538 and 0.650. The construct reliability is similar to Cronbach alpha and should be greater than 0.7(Hair, Black, Babin, & Anderson, 2010). All composite reliability was greater than 0.7 as the above table those are not meeting the criteria was removed from the analysis, in short, the convergent validity was achieved. Discriminant validity was also achieved (Fornell and David F. Larcker, 1981) by calculating the square root average variance extracted(AVE) as the below table 4 indicates.

Table 3 Factor loading, SMC, CR and AVE

Items	Factor loading	SMC	CR	AVE
Student's responses to teacher's professionalism.				
1- Teacher control/mange class well	0.824	0.679		
2- Teacher gives us assignment regularly	0.793	0.629		
3- I understand lesson note given by your teacher	0.860	0.739	0.881	0.650
4- Teacher encourage you to study the subject	0.744	0.553		
5- Is your subject lesson boring	0.968	0.937		
Do students perform better when taught by a professionally trained teacher?				
1- Teacher refer to the simple related topic when introducing new topic	0.759	0.576		
2- Teacher gives us adequate explanation while teaching	0.808	0.652		
3- Teacher friendly while teaching	0.619	0.383	0.835	0.562
4- Teacher identify student's problem while teaching	0.799	0.638		
5- Teacher attitude to teaching inspire you to become a teacher in future	0.589	0.346		
Does teacher's experience enhance better performance of students in Physics				
1- Teacher use projector where applicable while teaching	0.554	0.307		
2- Teacher make use of Physics instrument during Physics lesson where applicable?	0.598	0.358	0.791	0.544
3- Teacher encourages us the use of a practical workbook	0.586	0.343		
4- Teacher make use of charts where applicable when teaching	0.764	0.583		
5- Teacher improvise some teaching materials when not available	0.766	0.586		
Students' perception n subjects				
1. Physics is difficult subject to study	0.612	0.374		
2. Physics is an easy subject to study	0.675	0.455		
3. Male and female are different in learning Physics	0.606	0.367		
4. Lack concentration in class and confidence in Physics	0.802	0.643	0.872	0.538
5. Early marriage contributes to poor performance in Physics	0.835	0.697		
6. I always do my classwork and homework	0.832	0.692		
Curriculum				
1. Helps students become more confident in Physics	0.676	0.456		
2. Allows students to use the knowledge they bring to school and helps them connect Physics with situations outside the classroom	0.753	0.567		
3. Helps students find enjoyment in Physics	0.703	0.494		
4. Increases opportunities for the use of critical-thinking skills	0.798	0.636		
5. Helps students develop mathematical understanding and gives meaning to skills and concepts in all strands	0.816	0.665		
6. Allows students to reason, communicate ideas, make connections, and apply knowledge and skills;	0.772	0.595	0.932	0.605
7. Offers ability to solve problems, ability to apply concepts and procedures, and ability to communicate ideas	0.744	0.553		
8. Textbook is available for me	0.864	0.746		
9. Examples of textbook help me to solve the exercise	0.857	0.734		

Performance in subjects					
1. I am a good performance in Physics	0.802	0.643			
2. I am poor performance in Physics	0.810	0.656	0.801		
3. I am in middle performance in Physics	0.656	0.430		0.576	

Table 4: Square – the root of average extract variance

Construct	Professionalism.	Training	Experience	Perception	Curriculum	Performance
Professionalism.	**0.806**					
Training	0.635	**0.749**				
Experience	0.321	0.232	**0.737**			
Perception	0.215	0.345	0.725	**0.733**		
Curriculum	0.261	0.321	0.121	0.121	**0.777**	
Performance	0.213	0.347	0.321	0.321	0.211	**0.758**

4.4 Hypotheses testing results

Hypothesis 1. Suggests that there is a positive relationship between teacher's professionalism and quality of performance of mathematics by in senior secondary students. Teacher's professionalism contributes to the high performance of students in mathematics subject($\beta = 0.254; p < 0.01$), thus the hypothesis 1 accepted regarding the previous study(Akinfe et al., 2012).

Hypothesis 2. Proposes the relationship between a trained teacher and quality of performance of mathematics by in senior secondary students. A trained teacher had strongly contributed student's good performance in subject($\beta = 0.307; p < 0.01$), Hypothesis 2 supporting. This suggests that well-trained teacher is better than those not trained, a prior study supports(Jacob & Lefgren, 2007).

Hypothesis 3. Suggest a positive relationship between teacher's experience and quality of performance of mathematics by in senior secondary students. Teacher's experience contributes positively to the quality of performance of mathematics($\beta = 0.326; p < 0.01$), thus supporting hypothesis 3. Teacher's experience plays an important role in the student's achievement in mathematics, this supports previous studies(Harris & Sass, 2011), (Singh & Sarkar, 2015).

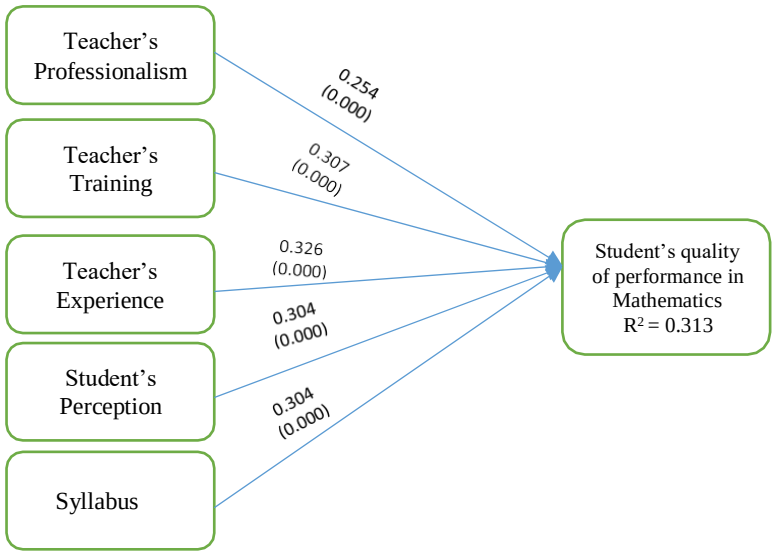
Hypothesis 4. Proposes a positive relationship between student's perception and quality of performance of mathematics by in senior secondary students. Student's believes contributes to student's achievement towards the subject($\beta = 0.304; p < 0.01$). This supports a prior study: (Njoroge & Orodho, 2014) and (Ashaari et al., 2011).

In this study, the student's attitude towards a mathematics subject was measured through responses given by students towards a set of statements or items in a specific perception component. The value of perception was scaled through their level of

agreement or disagreement on each item.

Hypothesis 5. Suggests a relationship between curriculum and quality of performance of mathematics by in senior secondary students. The curriculum contributes to the student's achievement towards the mathematic subject($\beta = 0.304$; $p < 0.01$). According to (Craig, 2009) curriculum development team has to consider a teacher as part of the environment that affects the curriculum. It's important the teacher should be a part of curriculum development, this identifies a student be better to the subject

Hypotheses	**Findings**
H1. Teacher's professionalism is positively related to the quality of performance of mathematics by in senior secondary students.	Supported
H2. Teacher's training is positively related to the quality of performance of mathematics by in senior secondary students.	Supported
H3. Teacher's experience is positively related to the quality of performance of mathematics by in senior secondary students.	Supported
H4. Student's perception is positively related to the quality of performance of mathematics by in senior secondary students.	Supported
H5. The curriculum is positively related to quality of performance of mathematics by in senior secondary students.	Supported



Fg2. Hypothesis test

5 Conclusion

5.1 Teacher's professionalism

The evidence suggests that teacher' professionalism is positively related to the quality of performance of mathematic by senior secondary students. The study indicates that students better perform when taught by the professional teacher this emphasis from previous study teacher's quality as relationship of student's academic performance (Akinfe et al., 2012) and Four ages of professionalism and professional learning(Hargreaves, 2000).

5.2 Teacher's Training

Since training play an important role to every action in the life, according to the study a well-trained teacher has a positively related to student's academic achievement this supports from the previous study such as An Evaluation of Teachers Trained Through Different Routes to Certification(Constantine et al., 2009) and Comparison of students' learning achievements in the subject of mathematics taught by trained teachers and untrained teachers at primary level(Adeeb & Naoreen, 2010)

5.3 Teacher's experience

The evidence suggests there is a positive relationship between student's academic achievement and teacher's experience enhances better performance of students in mathematics subject. The finding in this study with past researches Teacher quality and teacher mobility(Feng & Sass, 2017), according to (Fafunwa, 2018) found a positive relationship between teacher's experience and student's outcome.

5.4 Curriculum

After the civil war in Somalia 1991, minister of higher education startedto reform the curriculum and the schools implemented the national curriculum in 2014, in this study suggests the correlation between curriculum and student performance in mathematics with the support of the previous studies such as Classroom-level curriculum development(Shawer, 2010) and Mathematics teachers' beliefs and curriculum reform(Handal & Herrington, 2003).

5.5 Student's perception of mathematics

According to this study, students believe that mathematics is a complex subject means difficult to gain high marks with the study towards a theory of mathematics homework as a social practice (Landers, 2013) and Student's Attitude Towards Statistics course(Ashaari et al., 2011)

5.6 Quality and performance in mathematics

The study shows that students their performance are moderate, not high and low, with the support of the study active learning increases student performance in science, engineering, and mathematics (Freeman et al., 2014).

6 Contributions of the study

Based on the study, the research extends the research model in gaining insights into quality of performance of mathematics by senior secondary students. The study contributes new knowledge in the context of student's performance toward mathematics subject. In relation methodology, the study contributes, by adjusting previous research instruments to similar quality of performance of mathematics, the research describes the reliability and validity of the data.

7 Limitation and suggestions for future work

There are some limitations that lead to doing for future research. First, the sample size was small needs to increase in order to get more insights the main factors affecting student's performance towards mathematics subject. Second, the study considered the only mathematics subject and wishes to investigate other subjects such physics, chemistry, biology. Third, the study was limited to senior secondary students would broaden the number of students and include primary students.

8 Recommendation of the study

- The teacher should understand the student's problem while teaching
- The teacher should connect the knowledge in the classroom and outside of the classroom.
- There is a lack of consideration or focus while the student in the class, so the teacher should high aware.
- The majority of the students don't work out their home assignment, so the teachers should encourage the student to do their homework.
- Students have a bad perception of the mathematic so they have to believe that there is no hard subject but there is new material.

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