



QUALITY OF MATHEMATICS EDUCATION IN THE INDONESIAN INSTITUTES: A PLS-SEM APPROACH

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ABSTRACT

Purpose: Quality of education can be examined from different perspective and it should include different types of level of education. Hence, this study has focused on a specific field and it is mathematics and its quality and how different types of quality instruction can effect student achievement.

Design/Methodology: 308 responses were gathered from the 4th to 7th grade students of Indonesia particularly about their experience in mathematic courses using purposive sampling technique. PLS-SEM has been employed for data analysis using SmartPLS version 3.2.8.

Findings: The results have shown that quality of family cooperation, quality of instruction, quality of school environment and quality of school guidance have positively significant effect on students' achievement in mathematics courses. However, quality of teacher does not have any role in regards to students' achievement in mathematics courses.

Implications: Quality of family cooperation plays a great role because teachers are giving their full input after which it is family responsibility to boost up their child mind, educationists are recommended here to make a monthly teacher-parents meeting where each child be covered with their parents and teacher can tell them regarding the progress of his or her child. In addition to all platforms, the ground of quality of school guidance has a wise role in the platform of student achievement. Educationists are recommended here to make their guidance clear and must be in written rather than focusing on informing this will lead towards the achievements of their students and helps to grow the school image.

Keywords: Quality of Education, Indonesia, PLS-SEM, Mathematics, Student Achievement.

INTRODUCTION

Nowadays, education has been termed as key element in developing economic and social life globally and it helps in creating harmony, democracy and peace and also mitigates poverty (Klette, Blikstad-Balas, & Roe, 2017). All the countries around the world are striving to develop a competitive and knowledge-based environment for the overall education systems. Steps are being taken in education that are directed towards the concepts and ideas to enhance the quality of education, accountability, effectiveness and learning (Agasisti, Catalano, & Sibiano, 2013; Brian, 2007; Carnoy & Loeb, 2002; Chen, Liu, & Lin, 2014; Grygoryev & Karapetrovic, 2005; Karip, 2005; Okoro, 2011; Pashiardis, 2004). Linear to this argument, in enhancing their overall position around the world, Malaysia is striving to achieve general characteristics

for their education system and engaging in different reforms in the system (Atar & Atar, 2012; Çalışkan, Karabacak, & Meçik, 2013; Corlu, Capraro, & Capraro, 2014; Sengönül, 2013; TUTKUN & AKSOYALP, 2010). In spite of this, it can be said that Malaysia still needs to take more steps for the enhancement of their education quality to be ranked higher in the global educational quality indicators (Akyüz, 2014; Erberber, 2010; Mullis, Martin, Foy, & Arora, 2012; OECD, 2013; Sezer, Güner, & Ispir, 2012).

The quality of education can be defined in the similar way that the overall quality can be defined generally. Quality is the product of attributes impacting the products and services that rely on the level of satisfaction to achieve the associated requirements (Cheng & Cheung, 2004). Hence, the scholars of the earlier generations that introduced this concept defined this idea of quality as being greatness and distinction in education. The quality of education is the assessment associated with education and comprises of how organized the learning is, its management, the concepts that are taught, degree of learning and the overall results achieved by the education (Akyüz, 2014; Erberber, 2010; Mullis et al., 2012; OECD, 2013; Sezer et al., 2012). The idea of the education quality resulted in the arising of schools that are effective and also resulted in many more studies focusing on this topic. Lezotte (1991) suggested the school effectiveness as the area where there is clarity of missions mutual to every stakeholder involved with the schools as well as the overall dedication to the objectives of instructions, priorities, evaluation procedures and overall accountability. Fisher and Cresswell (1998); Townsend (1997) also suggested that the school effectiveness is developed with the help of effectiveness in leadership, human resources, overall support of the family and environment and the motivation of the students to learn. Gamage (2001) argued great expectations being present for schools that are effective that are visible, accessible and fairness stakeholders.

In addition, while studying from the various viewpoints, with the help of school movement efficiency, degree of achievements of foundations for various dimensions of education obtains the attention. The quality of education in terms of functions of production is the degree that is achieved to reach the desired objectives and jobs accordingly to the number of pupils that achieved their diplomas, or accordingly to the other type of education that was obtained (Ghani, 2013; Kenny et al., 2014; Levine & Lezotte, 1990; McLeskey, Waldron, & Redd, 2014).

Nowadays, the aspect of examining education quality in different researches has been based on the development of student in creative, cognitive and affective manner. Also, it includes the acquisition of student's values and their attitudes for developing their life (Ciftci & Karadag, 2016). In addition, in a practical way the aspect of high quality education can be defined as the high number of students that can describe their behavior in a systematic, skill and knowledgeable way; those systems that provides such features are supposed to be high quality (Okpala, Okpala, & Smith, 2001; Pea, 2020). In the concept of management science any person who has served in service sector is known as customer, however, a customer is totally different in an education system (Ciftci & Karadag, 2016; Tomlinson, 2017). In institutes of education everyone gets involved that are staff, students and parents and customers are divided into two parts named as internal and external. The parents, students and staff are known as internal and society is known as external (Marshall, 2018). Also, Kanji, Tambi, and Wallace (1999) have stated that internal group is of two types named as primary and secondary; primary group contains staff (teachers); students are secondary. Therefore, this study has aimed to examine the aspect of student.

In addition, different studies examined regarding quality of education and identified that almost all studied quality of higher education (Baporikar, 2016; Chonjo, 2018; Mukminin, Rohayati, Putra, Habibi, & Aina, 2017) and the quality of general education.

The results of mathematic researches in this aspect has provided mixed results and further research is necessary to properly understand the relationship of professional developments, instructional practice and outcomes related to student (Dominguez, Nicholls, & Storandt, 2006; Jacob, Hill, & Corey, 2017; Lewis, Friedkin, Baker, & Perry, 2011; Santagata, Kersting, Givvin, & Stigler, 2010).

However, this aspect should be examined from different perspective and it should include different types of level of education. Hence, this study has focused on a specific field and it is mathematics and its quality and how different types of quality instruction can effect student achievement.

The following paper has been conducted in four different chapters. The second chapter has included theoretical background. The third chapter has included research methodology of this study. The fourth chapter has included analysis or testing of hypothesis and discussions. The fifth and final chapter has included conclusion and managerial recommendations.

LITERATURE REVIEW

The indication has been given towards the education ground quality where the student attainment has been notified as important. In the country of Indonesia, the student's achievements are considered as the through the grounds of courses, mathematics developed one of the influenced areas stated by (Dabamona & Cater, 2019). The aspect of school environment is essential as it refers to having a calm and beneficial environment which gives the student a proper way to study and eventually increase their achievements (Cirocki & Farrell, 2019). According to the author named (Nur, Suherman, Subarjah, & Budiana, 2019) mathematic is the ground that has been introduced in elementary school and become a platform of a nightmare for all the students of each education level. In the ground of international educational assessments like TIMSS along with PISA, it has provided proves in this record. The importance has been seen in the ground of social and psychological emerging of the student to feel secure and happy in the respective educational sector that gives a positive impact towards the achievement and fulfilling of goals that might be increased further.

According to recent reviews it has been stated that instructional practices of teacher is helpful to develop student and their learning process and it has been given high importance than compared to classroom and teacher's training that eventually helps in enhancing student's achievement (Baumert et al., 2010; Klette et al., 2017; Konstantopoulos & Chung, 2011; Timperley & Alton-Lee, 2008). In addition, (Jacob et al., 2017; Nilsen, Scherer, & Blömeke, 2018) stated that in order to improve student's achievement in mathematics it is highly important to develop professional development and the instructions of a teacher and student's thinking and reasoning in mathematics as well. However, in the same ground of school along with all the primary institutions that are being responsible for the multi-purpose education are being closely related towards many ground of different variables to complete the responsibility stated by (Deane et al., 2019). Just like the all types that are being under the ground of student achievement, which have been studies between the studies grounds like PISA along with TIMSS. With the student perspective and their view it leads towards the anxiety from this course but they achieve the goals as well state by the researcher named (Zuilkowski, Samanhudi, & Indriana, 2019). The aspect of teacher has been termed as very necessary in the development of student (Howe, Hennessy, Mercer, Vrikki, & Wheatley, 2019). The quality of teacher should be high so that the teacher can easily understand student's perspective and help in any way possible for their higher achievements (Vermunt, Vrikki, van Halem, Warwick, & Mercer, 2019). Whereas, in the platform of central department of schools it has been seen the students have capable performance if we compare it to another students, it has been continuously monitoring area for students and teacher where they can evaluate each child in a easiest way as stated by (Stewart, Lambert, Ulmer, Witt, & Carraway, 2017). According to the author named Petrovska and Sivevska (2017); it has been not considered as when students have achieve something in class or school, that can be compared on an average level on the daily basis, however parents used to ask teachers about the progress of the children if they get fail or success, the reason being these two platforms. In addition to this, it has been cooperated by both parents and teachers for the improvement in the ground of studies where it can also help the student to achieve their goals and boost up their performance. Whereas school focus on teacher performance that how they are teaching children that eventually lead towards the ground of student achievement and the resources will be more developed by the school stated by the author (Deane et al., 2019; Stewart et al., 2017; Vermunt et al., 2019; Xiaoyang, Kaur Sidhu, & Veloo, 2018; Zuilkowski et al., 2019). The positive relationship has been found that has been created among the central department and the performance of the students in terms of evaluating the educational system stated by the author named (Brian, 2007; Wößmann, 2003). However, today student expects the platform of school to not only give achievements in the ground of academicism but also give the studies and achievements regarding other services like cultural services, sporting and technical studies where they can contribute towards the industry in future as it gives the positive attitude towards the ground of school in the students that can increase their achievements stated by (Xiaoyang et al., 2018).

H1: Quality of instruction has a significant effect on student achievement.

H2: Quality of school environment has a significant effect on student achievement.

H3: Quality of teacher has a significant effect on student achievement.

H4: Quality of family cooperation has a significant effect on student achievement.

H5: Quality of school guidance has a significant effect on student achievement.

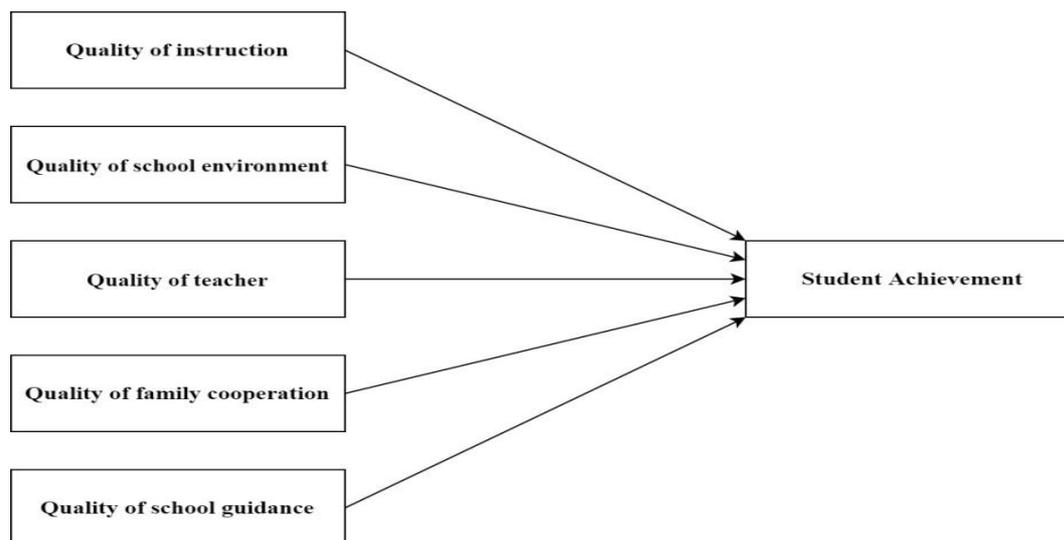


Figure 1: Research Model

RESEARCH METHODOLOGY

The quantitative approach is an essential approach because it has been termed as a quantifiable (numeric) based. This approach is necessary and highly useful in hypothesis development and it analyzes the data via using computational techniques (Creswell, 2002). Also, this approach is useful in providing in-depth information because it analyzes the attitude and feelings of a person. The results gathered from this approach can be useful for implementing on a larger population (Neuman, 2013). So, this study has decided to use quantitative approach and this decision was taken because of its ability to give more effective and general results.

In addition, explanatory purpose is a very useful purpose and especially in quantitative research because it has the ability to give a more stretched or detailed view towards particular things (Sekaran & Bougie, 2010). This purpose has a very major advantage that is, it can study the object in a specific depth so the researcher can have more advanced information to understand the research problem (Thornhill, Saunders, & Lewis, 2009). Hence, this study has used explanatory purpose because it has the ability to study those problems that were left behind and was not studied before.

Furthermore, the research design is another important aspect in methodology. The correlational design can be used to identify relationships between variable and it determines the correlations between the variables (Kothari, 2004). However, it cannot give conclusive reason behind a relation but it provides a proper correlation so that in future other studies can be able to narrow the findings to an in-depth understanding. Therefore, this study has used correlational design.

The convenience sampling is of great importance and especially in a quantitative research as this approach collects quantifiable data (Churchill & Iacobucci, 2010). The main aspect of this technique is that it provides a more relatively easy and time saving way for collecting data from conveniently available people (Creswell, 1994). Hence, this research has used convenience sampling because the researcher can collect large amount of data easily.

Table 1: Profile of the Respondents (n = 308)

	Frequency	Percent
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Gender	Male	273	88.6
	Female	35	11.4
Age Group	9 Years to 10 Years	46	14.9
	10 Years to 11 Years	69	22.4
	11 Years to 12 Years	193	62.7
Current Enrollment	4th Grade	95	30.8
	5th Grade	142	46.1
	6th Grade	71	23.1
Education of Mother	Undergraduate	102	33.1
	Graduate	153	49.7
	Post-Graduate	53	17.2
Education of Father	Undergraduate	14	4.5
	Graduate	168	54.5
	Post-Graduate	126	40.9

The PLS-SEM is more advanced technique and it is a second generation analysis technique. One of the main advantage of this technique is that it can give more high internal consistency (Ramli, Latan, & Nartea, 2018). This technique is very rigorous and easily implemented as compared to CB-SEM and gives more effective results in hypothesis testing as well (Hair, Hult, Ringle, & Sarstedt, 2016). Therefore, this study has used PLS-SEM using SmartPLS 3.2.8 and reason is that it also gives predictive relevance in the analysis as well.

DATA ANALYSIS

The below table 1 has showed results of measurement model.

Table 1: Measurement Model

	Loadings	Prob.	CR	AVE
QOE2 <- Quality of School Environment	0.729	0.000	0.824	0.703
QOE5 <- Quality of School Environment	0.935	0.000		
QOF2 <- Quality of Family Cooperation	0.955	0.000	0.862	0.760
QOF5 <- Quality of Family Cooperation	0.780	0.000		
QOG1 <- Quality of School Guidance	0.481	0.009		
QOG3 <- Quality of School Guidance	0.915	0.000	0.833	0.571
QOG4 <- Quality of School Guidance	0.625	0.000		
QOG5 <- Quality of School Guidance	0.907	0.000		

QOI2 <- Quality of Instruction	0.837	0.00 0		
QOI3 <- Quality of Instruction	0.893	0.00 0	0.88 8	0.72 5
QOI4 <- Quality of Instruction	0.823	0.00 0		
QOT3 <- Quality of Teacher	0.669	0.00 0	0.75 2	0.60 6
QOT4 <- Quality of Teacher	0.875	0.00 0		
SA1 <- Students' Academic Achievement	0.886	0.00 0		
SA2 <- Students' Academic Achievement	0.884	0.00 0		
SA3 <- Students' Academic Achievement	0.671	0.00 0	0.88 8	0.61 6
SA4 <- Students' Academic Achievement	0.688	0.00 0		
SA5 <- Students' Academic Achievement	0.769	0.00 0		

The threshold that has been recommended by Hair, Ringle, and Sarstedt (2011) is that values higher than 0.70 and in between 0.40 and 0.70 can be fully accepted and just accepted respectively. In addition, this table also have composite reliability and AVE and their recommended thresholds is, for CR 0.70 and for AVE it is 0.70 (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014). Hence, as the above table has value accordingly then the measurement model has been achieved.

The below table 2 has showed results of Fornell and Larcker (1981) criterion.

Table 2:Fornell-Larcker Criterion

	Q OF	Q OI	Q OE	Q O G	Q OT	SA
Quality of Family Cooperation	0.8 72					
Quality of Instruction	0.1 13	0.8 52				
Quality of School Environment	0.4 53	0.1 34	0.8 39			
Quality of School Guidance	0.1 30	- 0.3 97	0.1 22	0.7 55		
Quality of Teacher	0.0 34	0.6 29	0.2 74	- 0.3 08	0.7 79	
Students' Academic Achievement	0.3 67	0.2 43	0.4 10	0.1 84	0.2 20	0.7 85

The above table has a threshold which refers that in order to be accepted all values (bold and diagonal) should be higher than compared to other constructs (Fornell & Larcker, 1981). The above table has all values in relation to the recommendation and therefore discriminant validity has been achieved via Fornell and Larcker (1981) criterion.

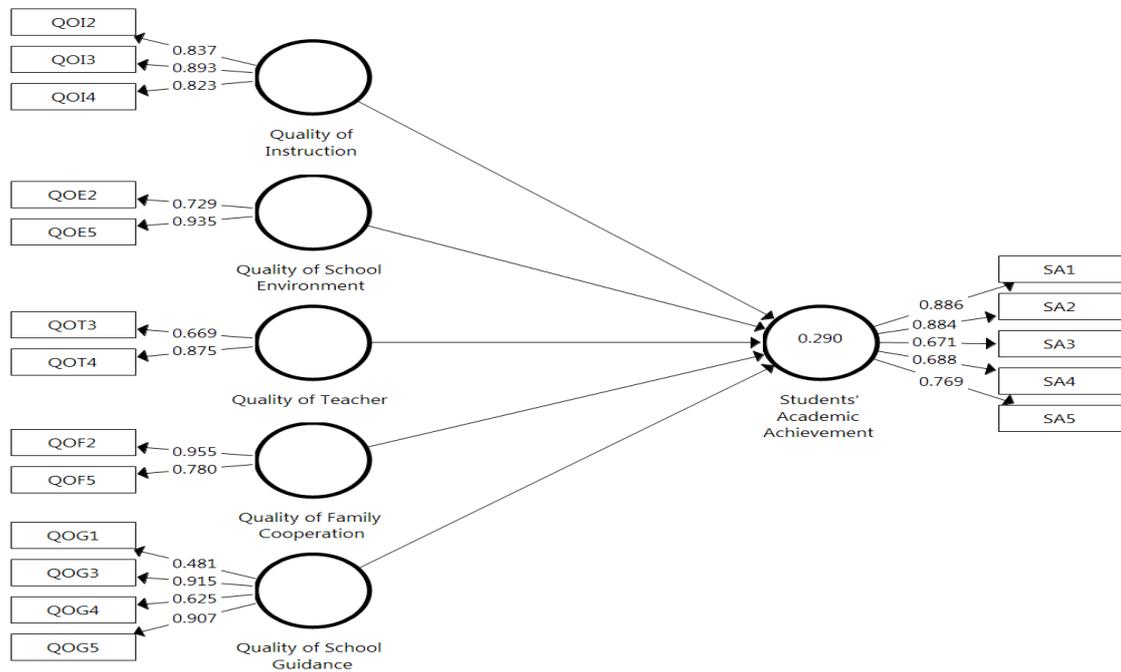


Figure 2: Illustration of PLS Algorithm

The following table 3 has results of cross loadings.

Table 3: Crossloadings

	QOF	QOI	QOE	QOG	QOT	SA
QOE2	0.440	0.163	0.729	0.090	0.270	0.219
QOE5	0.367	0.092	0.935	0.113	0.220	0.424
QOF2	0.955	0.122	0.407	0.129	0.050	0.397
QOF5	0.780	0.059	0.409	0.092	- 0.010	0.188
QOG1	0.085	- 0.338	0.066	0.481	- 0.441	- 0.025
QOG3	0.153	- 0.346	0.084	0.915	- 0.332	0.155
QOG4	0.011	- 0.489	- 0.068	0.625	- 0.422	0.035
QOG5	0.105	- 0.348	0.164	0.907	- 0.232	0.178
QOI2	0.002	0.837	- 0.001	- 0.232	0.378	0.181
QOI3	0.178	0.893	0.230	- 0.408	0.739	0.269
QOI4	0.053	0.823	0.017	- 0.367	0.304	0.097

QOT3	0.190	0.333	0.282	0.059	0.669	0.132
QOT4	- 0.079	0.608	0.175	- 0.442	0.875	0.203
SA1	0.457	0.110	0.365	0.219	0.063	0.886
SA2	0.200	0.293	0.331	0.180	0.282	0.884
SA3	0.212	0.266	0.285	0.175	0.280	0.671
SA4	0.242	0.047	0.275	0.125	0.055	0.688
SA5	0.317	0.199	0.345	- 0.015	0.152	0.769

In the above table it is recommended that bold values must be greater in their own respective constructs than values in other given constructs only in a horizontal view (Hair et al., 2011). So, according to the above table discriminant validity has been achieved using cross loadings.

Table 4: Hypothesis-Testing using Path Analysis

	Estimate	Prob.
Quality of Family Cooperation -> Academic Achievement	0.198	0.000
Quality of Instruction -> Academic Achievement	0.241	0.000
Quality of School Environment -> Academic Achievement	0.237	0.000
Quality of School Guidance -> Academic Achievement	0.247	0.000
Quality of Teacher -> Academic Achievement	0.073	0.114

R-Square = 0.290; Q-Square = 0.159

The results have shown that quality of family cooperation (0.198, $p < 0.01$), quality of instruction (0.241, $p < 0.01$), quality of school environment (0.237, $p < 0.01$) and quality of school guidance (0.247, $p < 0.01$) have positively significant effect on students' achievement in mathematics courses. However, quality of teacher (0.073, $p > 0.05$) does not have any role in regards to students' achievement in mathematics courses.

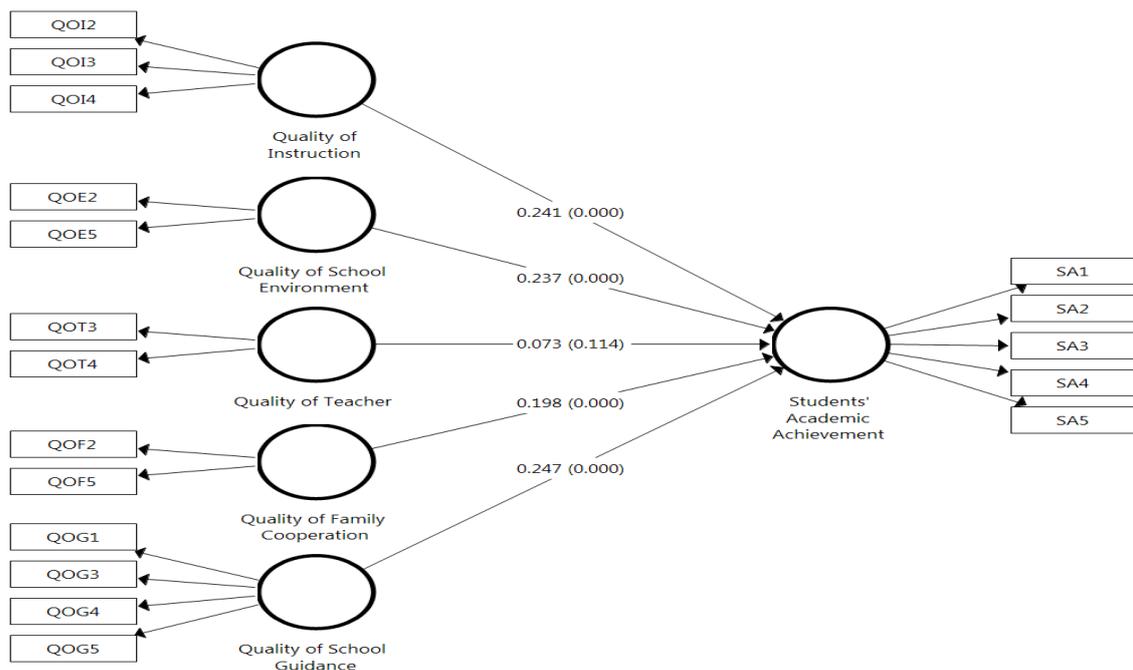


Figure 3: Illustration of PLS Bootstrapping

CONCLUSION AND IMPLICATIONS

The main objective of the following study is to observe the effect of mathematics education quality view on the ground of achievements in the school that has been based on the independent model of taking test. For the following ground, a theoretical model has been introduced where the structural equation modeling has been formed. In that model the mathematics education quality background zipped out the independent variable whereas the achievement of students has been included in the depended variable. This study has used quantitative approach for data collection and used convenience sampling. The data was analyzed using PLS-SEM via SmartPLS 3.2.8.

The findings of the following studies have been highlighted the relationship among the variable named quality perception stated by Dubayova et al. (2013); Rapaport, Clary, Fayyad, and Endicott (2005); Yen et al. (2011) and the variable named achievement Ahmad (2012); Ntoumanis and Biddle (1998); Zakaria, Zain, Ahmad, and Erlina (2012), that highlights the ground of education regarding mathematics perception in the significant factor of mathematics that creates anxiety along with achievements and support of the generation of mentioned model.

However, in the mathematics education quality it has been seen that in the following study there is external variable that has been formed by main five variables named as teaching process, environment of school, teacher, cooperation of family and counseling quality, in addition to this, the measurement model has been highlighted for the quality of mathematics education where the teacher of quality factors has been considered as the one of the significant and reliable variable in the factors of mathematics education quality. However the findings of the study highlights the past results that showed overlapping stated by the author named (Ahmad, 2012; Dubayova et al., 2013; Ntoumanis & Biddle, 1998; Rapaport et al., 2005; Yen et al., 2011; Zakaria et al., 2012).

In the following study the educationists are recommended to focus on the quality of school environment, as it will be more hygiene, clean or mannered oriented will the more student will boost up towards their achievement s environment plays a great role where the teacher student relationship must be strong. For this teacher will feel easy to get their feedback in a mannered way. However in the ground for quality of teacher, educationists are recommended here that to hire the highly qualified teachers rather than just give employment to the FSC students just to be promoted. Education for the teacher plays a great role where the student achievement can be seen easily. Whereas in the platform of quality of family cooperation plays a great role because teachers are giving their full input after which it is family responsibility to boost up their child mind, educationists are recommended here to make a monthly teacher-parents meeting where each child be covered with their parents and teacher can tell them regarding the progress of his or her child. In addition to all platforms, the ground of quality of school guidance has a wise role in the platform of student achievement. Educationists are recommended here to make their guidance clear and must be in written rather than focusing on informing this will lead towards the achievements of their students and helps to grow the school image.

In the following study the argument regarding the findings has been highlights regarding the tested model that shows that students perception of the ground mathematics education quality influence their mathematics achievement in their career, however, many initiative has been seen that increase the student's perception that must be considered in the priority. Whereas the data has been collected from the city that has been situated in the country named Indonesia, where the findings of considered as limited, however, the data has been collected through self-reporting that can cause the subjectivity and relationship among the variables that might get fails to get the platform of reality, the main point of the limitation in the following study has been seen in the methods that are being mentioned in the study. The main limitation has been seen here where the data has been collected from only the side of students.

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