THE EFFICACY OF MATHEMATICS AS A MODERATOR ON THE RELATIONSHIP BETWEEN TEACHER SUPPORT AND MIDDLE SCHOOL STUDENTS' ACADEMIC ENGAGEMENT

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Abstract

The role of teacher support can help increase academic involvement with self-efficacy in mathematics as a moderator variable. Teacher support is a form of perception from students whether in everyday learning, the teacher supports students to help them understand mathematics. Meanwhile, self-efficacy in mathematics is a perception from within students to feel able to follow every material and solve every math problem. Research conducted on 430 students showed that perceived teacher support has a significant role, and mathematics self-efficacy is a variable moderator (MRA test technique) in academic engagement. Based on the test results using the structural Equation Model (SEM) obtained results for the perception of teacher support has a value of $\beta = 0.18$, and the multiplication value between teacher support and mathematics, self-efficacy has a value of $\beta = 0.19$.

INTRODUCTION

Mathematics is a subject used to indicate educational success in a country (Siregar, 2016). In Indonesia, mathematics is a compulsory subject at every level of education. Math at School aims to equip students to think logically, analytically, systematically, critically, and creatively and can work together (OECD, 2019). Mathematics can create human resources who are aware of technology and are useful for meeting the practical needs of solving everyday problems (Akbar et al., 2018).

However, the achievement of students in mathematics in Indonesia still needs to improve. The worldwide survey downtrend in International Mathematics and Science Study (TIMSS) in grades 4 and 8. The survey results report that the math skills of Indonesian students are ranked 46 out of 51 countries (Permana, 2019). Another survey was conducted by the Organization for Economic Co-operation and Development (OECD) through the Program for International Student Assessment (PISA). The 2018 PISA survey results report math literacy value Indonesia is at the bottom of the list, ranked 73 out of 79 countries with a score of 379. The country's average math ability score AGE is 487 (AGE, 2019). Low academic scores result from low student involvement (Fredricks et al., 2004; Skinner et al., 1990).

Student engagement (student engagement) is a term used to identify students' active participation in activities in the school environment, including the learning process in class (Finn in Fredricks et al., 2004). Fredericks Et al. (2004) define student engagement as a multidimensional emotional, behavioral, and cognitive construct. Factors that influence student engagement, namely internal and external factors. Internal factors come from within the

student, such as student characteristics, self-confidence, emotional state, and internal motivation. External factors come from the environment that supports active learning, namely school rules, school climate, and interactions with family, friends, and teachers.

The academic engagement has attracted the attention of educational psychology researchers because it relates to aspects of student development regarding school integration and academic achievement (Chen, 2005; Korobova & Starobin, 2015; Ros et al., 2012; Serrano & Andreu, 2016; Wang & Fredricks, 2014). Involvement can also minimize negative psychosocial, risky behavior, dropping out of school, and low academic performance (Estell & Perdue, 2013; Fredricks et al., 2004; Li & Lerner, 2013; Quin et al., 2018). In Bronfenbrenner's ecological theory, a microsystem is where students spend most of their time with the closest people, such as family, peers, school, and neighbors (Santrock, 2004). Entering the junior high school level, more students are at school, so high interaction is with teachers and peers.

Several studies state that peers are an important context during adolescent development. However, peer support can have a positive or negative impact depending on the friends you have (Chen, 2005; Wang & Eccles, 2012). The positive impact of peers increases achievement and involvement in school (Estell & Perdue, 2013; Fredricks et al., 2004; Gunawan et al., 2017). Negative impacts lead to non-compliance and deviant behavior (Chen, 2005; Santrock, 2012; Wang & Eccles, 2012). In anticipating this, students need adult support that leads in a positive direction, namely support from the teacher.

The school's social climate is created by adults present in the school environment, one of which comes from teacher support (Woolley, in Zabala et al., 2016). Research by Fernandez-Zabala et al. (2016) found that the correlation index was significant between the variable contextual impacts on school involvement and is derived from teacher support. Teacher support is the student's perception of the teacher's concern and understanding of students at school (Klem & Connell, 2004). Teacher support is in the form of emotional, cognitive, and instrumental support (Chen, 2005). In this case, teacher-student relationships such as feelings of affection, concern, willingness to spend time, effort, and energy, and being able to be relied on by students play an effective role in student engagement (Randa et al., 2019; Thornberg et al., 2020).

Research by Ros et al. (2012) found that the teacher-student relationship is related to engagement in general, specifically cognitive engagement. Research by Thornberg et al. (2020) highlights that the quality of the teacher-student relationship is positively related to affective engagement and behavior. In line with previous research, the findings of Miranda-Zapata et al. (2018) state that teacher support has the greatest positive influence on emotional involvement, ultimately affecting school attendance. Other findings are that teacher support has the largest and most significant correlation to student engagement compared to parental and peer support (Chen, 2005; Fernandez-Zabala et al., 2016; Randa et al., 2019). Teacher support can also bridge the support of parents and peers (Woolley et al., in (Azila-Gbettor & Abiemo, 2020). More specifically, Chen's research (2005) found that perceived teacher support was more effective than support from parents with low educational backgrounds and socioeconomic status. Building good relationships between teachers and students is an effective solution to increase learning engagement (Bryson & Hand, 2007; Chen, 2005).

Students' perceptions of teacher concern positively relate to motivation (Wentzel in Chen, 2005). According to Bandura in Schunk and Zimmerman (2012), self-efficacy is one of the basics of motivation. In Bandura's social-cognitive theory, self-efficacy is an individual's belief in his abilities which forms the basis of behavior in influencing the level of learning involved in achieving goals (Schunk, 2012). Research by Suparman et al. (2012) found that self-efficacy has the biggest role in motivation to learn Mandarin in early adolescents compared to parental involvement and the teacher-student relationship. Academic self-efficacy predicts learning engagement (Azila-Gbettor & Abiemo, 2020).

Academic self-efficacy becomes an important resource in various aspects of student achievement that influences students in choosing activities and gives positive results (Santrock, 2004). Research by Martin & Rimm-Kaufman (2015) found that self-efficacy can increase emotional and cognitive involvement in learning mathematics. More specifically, Cheema's research (2018) found that math self-efficacy is related to mathematical literacy. Increasing math efficacy can improve students' math performance. A higher academic self-efficacy in completing mathematical tasks will further improve mathematics learning outcomes (Desai et al., 2017).

Different research results regarding teacher support with student involvement were found in several studies. The findings from Ansong et al. (2017) stated that teacher support is not a mediator or direct predictor of student engagement. There is no significant predictor of social support with learning engagement (Wang & Eccles, 2012; Quin et al., 2018). For example, in positive school behavior, students who are at risk are those who receive strong negative support from peers but obtain less support from parents and teachers. On the other hand, the support of teachers and parents can completely counteract the negative influence of peers. Social support becomes a domain to compensate for deficiencies in other domains (Wang & Eccles, 2012).

Some of the research results that have been described show inconsistent results. More research results should be conducted regarding perceptions of teacher support and academic self-efficacy on academic engagement. However, the results of existing comparative studies have not specifically tested self-efficacy in mathematics as a moderator. Thus, this study aims to examine the role of perceptions of teacher support on academic engagement in students of SMP X in Jakarta with self-efficacy in mathematics as a moderator variable.

METHODOLOGY

Research Participants

Participants in this study were 430 junior high school students in grades VII, VIII, and IX aged 12-16 years who were teaching mathematics. The choice of junior high school level was intended because junior high school students are in a transitional period from childhood to adulthood which demands a variety of new developmental tasks, causing emotional imbalance. The junior high school level is also one of the levels that become a benchmark for the success of learning mathematics in international assessments such as TIMSS and PISA.

Questionnaire Design and Data Collection

Measuring student involvement used in research is School Engagement Scale developed by Fredricks et al. in Gunawan, Dewi, and Tiatri (2017). This measuring instrument has 15 statement items with 5 scale responses Likert. The score starts from the numbers one to five. Score one Never Indicates (TP), score two rarely indicates (JR), Score three Sometimes indicates (KD), Score four Often indicates (SR), and score five indicates Very Often (SS). Measuring instrument teacher support in this study was measured by the perceived Teacher Academic Support Scale (PTASS) developed by Chen (2005) and adopted by Jani & Qudsyi (2017). This scale has 19 question items with a Cronbach Alpha reliability coefficient of 0.886. This scale has 5 responses, namely Very Appropriate (5), Appropriate (4), Sometimes Appropriate (3), Not Appropriate (2), and Very Unsuitable (1). Meanwhile, self-efficacy in mathematics in this study was measured by Academic Self-Efficacy Scale developed by Butler (2011) and adopted by Husnita & Qudsyi (2017). This measuring instrument will be adapted to mathematics lessons. The measuring instrument has 32 questions with a Cronbach Alpha reliability coefficient 0.920. This scale has 5 responses, namely always feeling sure (5), often feeling sure (4), sometimes feeling sure (3), rarely feeling sure (2), and never feeling sure (1).

RESULTS AND DISCUSSION

Participant Demographics

Description	Frequency	Percentage
Gender		
Male	190	44,2
Female	234	54,4
Living together		
Other	5	1,2
Parent	407	94,7
Alone	2	0,5
Guardian	2	2,3
Length of Study Hours		
12 hours	373	86,7
24 hours	46	10,6
More than 4 hours	5	1,2
Ever Won a Contest		
No	388	90,2
Yes	36	8,3

Hypothesis test

For hypothesis, analysis is done by testing the research hypothesis using the program LISREL version 8.8. Program LISREL used to perform this role test is Structural Equation Model (SEM). Based on the diagrams, standardized can be seen the role of each independent variable on the dependent variable with the role of a mediator variable. The results are in Figure 1.
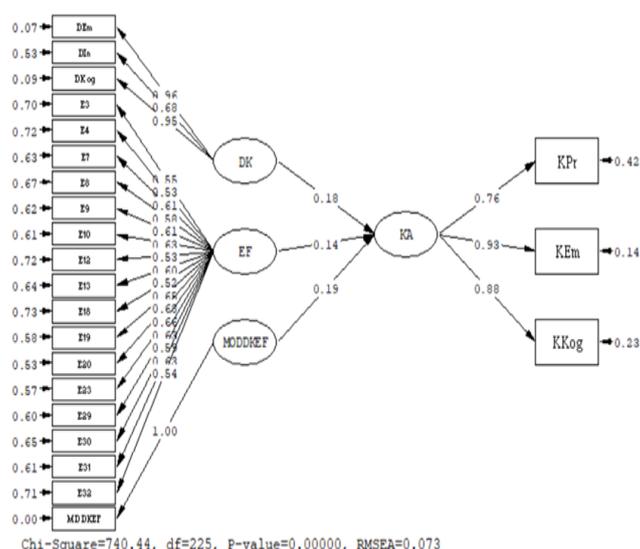
Figure 1: Research Structural Model Diagram

Based on the picture above, the model test from the research shows that the model fits fit (models have very good fit) because of value Chi-Square= 740.44, P-value = 0.000, and RMSEA = 0.073. Based on the results of the role test in the diagram-value, the obtained variable Perception of Teacher Support has a significant role on the variable. This can be seen from the value of $\beta = 0.18$, which means it has a positive and significant role. Furthermore, the large role of efficacy in academic engagement can be seen at $\beta = 0.14$, which means it has a positive and significant role. Furthermore, the multiplication value between support and efficacy has a value of $\beta = 0.19$. The R value2 = 0.13 (13%) indicates the overall role size. An image of the multiplication results to see the relationship between teacher support and self-efficacy can be seen in Figure 2.
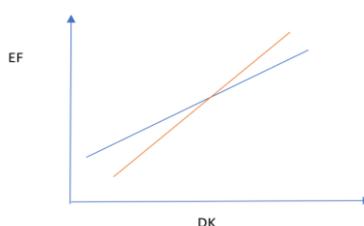

Figure 2: Multiplication Result Variable Efficacy with Teacher Support

Based on the results in Figure 2, increased teacher support will also lead to increased self-efficacy in lessons in mathematics, thereby supporting student academic engagement. Subsequent tests can be reviewed from the overall fit Goodness of Fit (GOF) model. Testing GOF was conducted to evaluate whether the resulting model is a model fit. Based on the results of this test, it is also known that various values are model indicators fit, or GOF has been fulfilled, so it can be concluded that the structural model in this study can be stated fit. In summary, the model indicators fit (compatibility) that has been fulfilled can be seen in Table 1.

Table 1: Goodness of Fit (GOF) Measure of Structural Model Research

Size GOF	Match Targets	Description
Normal Theory Weighted Least Squares Chi-Square = 740.44 (P = 0.000)	P Value > 0.05	No Fit
RMSEA = 0.073	< 0.05 or 0.05 ≤ RMSEA < 0.08	Good Fit
NFI = 0.92	≥ 0.90	Good Fit
NNFI = 0.93	≥ 0.90	Good Fit
CFI = 0.94	≥ 0.90	Good Fit
IFI = 0.94	≥ 0.90	Good Fit
RFI = 0.91	≥ 0.90	Good Fit
RMR = 0.056	≤ 0.10	Good Fit
Standardized RMR = 0.056	≤ 0.10	Good Fit
GFI = 0.91	≥ 0.90	Good Fit
AGFI = 0.91	≥ 0.90	Good Fit

Difference Test

Different Test of Self-Efficacy Variables Viewed From Gender

For additional data analysis, a different test of self-efficacy variables will be carried out regarding gender. Test the difference through the program SPSS. It uses a parametric test by method Independent Sample T-Test. Based on the results obtained, the value of t = -3.341 and p <0.05. This shows a significant difference in self-efficacy between male and female participants. This can be seen in Table 2.

Table 2: Efficacy Variable Difference Test Results Because of Gender

Self-Efficacy	Mean	t	p	Information
Man	2,98	-3,352	0.001	There is a significant difference
Woman	3,12			

Different Test of Self-Efficacy Variables Viewed from Length of Studying Mathematics

For additional data analysis, a different test of self-efficacy variables will be carried out for the additional study in mathematics. Test the difference through the program SPSS. It uses a parametric test by method One Way ANOVA. Based on the results obtained, the value of F = 6.371 and p < 0.05. This shows a significant difference in self-efficacy in students with an additional group of 1-2 hours of learning to more than 4 hours. After a significant difference was found, a follow-up test was carried out to determine significant between-group differences using Bonferroni. The results of further processing were obtained by groups that had differences in the group 1-2 hours with 2-4 hours with a mean difference of 0.297, p < 0.05. This can be seen in Table 3.

Table 3: Efficacy Variable Difference Test Results because of Length of Studying Mathematics

Self-Efficacy	Mean	F	p	Description
12 hours	3,06	6,371	0.002	There is a significant difference
24 hours	3,35			
More than 4 hours	2,61			

IMPLICATIONS FOR RESEARCH AND PRACTICE

This research can add to empirical studies for the development of psychology, especially educational psychology, related to the role of the Perception of Teacher Support on academic engagement with Mathematics Self-Efficacy as a moderator. The results of this study illustrate that Academic Engagement will be shaped by Perceived Teacher Support and supported by Higher Mathematical Self-Efficacy in students. Practical advice that can be given by researchers based on the results of this study is that mathematics teachers should be able to provide support both emotionally and instrumentally, such as encouragement and various supports for teaching mathematics, such as tables, illustrations, or examples that are closer to students' lives. Thus, learning mathematics will become more interesting, and students will volunteer to be involved in every mathematics lesson. The final suggestion for students who take mathematics lessons, the belief that they will be able to learn mathematics is very important. Therefore, students are advised to increase self-confidence by diligently practicing various problems and math problems. For example, regularly practice at least one hour every day. Intensive practice will make students accustomed to dealing with math problems. Thus the belief arises that the students will be able to work on each math problem to completion.

LIMITATIONS AND FUTURE RESEARCH

This study needs to consider several conceptual and methodological limitations for future research. First, this research is a case study in one school, so the research results cannot be generalized to a wider scope. Future research may increase the number of participants. In addition, researchers can use different research methods, for example, experimental, qualitative, or mixed methods. Second, there are limitations on non-specific targets, namely, there is more than one mathematics teacher whom students perceive. There is no control to know the characteristics of the teacher and the way the teacher teaches. Subsequent research can refer to one mathematics teacher with other additional information, such as social competence, pedagogics, and teacher personality.

CONCLUSION

Based on the data analysis that has been done on the participants, the results of this study indicate that there is a positive and significant role. The results state that Perceived Teacher Support has a significant positive role, and the math self-efficacy variable moderate's academic engagement. Based on the main data analysis to test the research hypothesis, it also uses a structural model with diagrams Confirmatory Factor Analysis (CFA) to describe the flow of research variables. The results of the fit test for the structural model of this study stated that size GOF had been fulfilled, so it can be concluded that the structural model in this study can be stated fit.

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