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Research Article

Perceived teacher support on student engagement through self-efficacy as a mediator in elementary school students' mathematics lesson

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Abstract

This study aims to determine the effect of Teacher Support on student engagement through self-efficacy as a mediator in the mathematics learning process of elementary school students in Surabaya, Indonesia. The sample used 181 students in grades four to five who took mathematics classes at Elementary School. The data collection used included scales of Teacher Support, self-efficacy, and student engagement using a Likert Scale. The Student Engagement Scale consists of 16 valid items with a reliability coefficient of .856. The Teacher Support Scale consists of 10 valid items with a reliability coefficient of .743. The Self-efficacy Scale consists of 17 valid items with a reliability coefficient of .885. The data analysis technique used path analysis. and Sobel test. The results of the Sobel analysis show a t-count value of 3.192 > 1.97, which explains that t-count is greater than t-table. This shows that self-efficacy plays a significant role as a mediator in the influence of teacher support on student engagement in mathematics learning.

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Introduction

According to the Organization for Economic Cooperation and Development's (OECD) Program for International Student Assessment (PISA) study of 15-year-old students in 2015, Indonesian students ranked 63rd out of 72 nations in terms of their proficiency in mathematics (Giwati, 2018). The TIMSS results in 2015 received the latest results, namely that Indonesia was ranked 44th out of 49 countries (Nizam, 2016). The results of observations in various elementary schools in grades IV and V in several cities on Java found that there are still many students who do not pay attention to the teacher when the learning process is taking place. Students quickly feel bored when studying mathematics, and they are not interested in learning mathematics because they view mathematics as an abstract field of study. There are students who don't seem interested in learning and prefer telling stories and playing with friends; there are students who don't pay attention, chat with friends, go in and out of class, don't do assignments, etc. From the results of the analysis of daily test scores, it shows an average score of 56.66 and classical completeness of 44.44%. These learning outcomes are low and unsatisfactory.

In facing everyday life, all children will face various things that require organizing and using information in a competitive, uncertain and constantly changing environment, therefore children must be able to think rationally, analytically, methodically, critically, creatively and cooperatively. Therefore, Nahdi (2017) believes that mathematics

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teaching should start in elementary school. This is because mathematics teaches logical, analytical and systematic thinking skills

Mathematics achievement is influenced by the extent to which students are engaged during the lesson. According to Bergdahl et al. (2020), Martin and Bolliger (2018) the strong involvement of students in learning activities both within and outside the classroom eventually has an impact on learning outcomes. This idea goes beyond just explaining students' interests or willingness to learn, explaining how they engage psychologically in order to understand numerous concepts in education in an efficient and useful manner (Poondej & Lerdpornkulrat, 2016; Zambak & Magiera, 2018). According to D'Mello and colleagues (2017), student engagement actively helps learning activities. According to Fredricks (2015), students who are increasingly focused on learning or engaged in learning can overcome the problems of low learning achievement, high levels of student boredom, and alienation and even reduce the high dropout rate.

Student Engagement

According to earlier studies Fredricks (2011), Afzal and Crawford (2022), student engagement has three dimensions: behavioral engagement, emotional engagement, and cognitive engagement. According to Reeve and Tseng (2011), behavioral engagement states that student involvement in learning activities is effort, persistence and attention in the learning process. Emotional engagement, which can be seen by the enthusiasm and interest of students, the absence of anger, boredom and anxiety. Cognitive engagement describes cognitive engagement as the use of self-regulation and advanced and in-depth learning techniques in the process of learning activities carried out by students.

According to the research findings, the interaction of specific student needs and contex is a key element in fostering student engagement (Reyes, et al., 2012; Taylor & Parsons, 2011). The environment and contex in which learning takes place affect student's engagement in the teaching process. The surroundings "cannot be separated from the student's engagement," according to Fredricks and McColskey (2012). McMahon and Zyngier (2009) treat student engagement in their study as a significant social signal that motivates teachers to encourage students in return. To sway pupils' behavior, the teacher uses a variety of social messages related to his or her teaching approach. These messages are conveyed by the teacher using a range of verbal and nonverbal cues. Depending on the situation, this may entail encouraging the students to continue working on a particular activity in the same manner they did at first, or it may entail responding to inquiries or general student behavior.

The self-system model of motivational growth is mentioned in the many viewpoints presented above (Connell & Wellborn, 1991; Skinner et al., 2008). The self-determination theory was the foundation for this approach (Ryan & Deci, 2000). This theoretical framework helps us understand how social context influences students' self-system processes, which in turn affects their engagement and achievement. According to the idea, competence, autonomy, and relatedness—three fundamental human needs—form the context for the development of self-system processes (Connell & Wellborn, 1991).

Teacher Support

The social context factor in the classroom is the relationship between teacher and student, student and student. Teachers' social support is a form of fulfilling students' needs for relatedness, but it also has an impact on other aspects. Connell and Wellborn (1991) said that self-system processes including competence, autonomy, and relatedness lead to engagement or disaffection. In specifically, the paradigm holds that engagement takes place when psychological needs are addressed and is reflected in cognition, mood, and behavior. According to studies, pupils who have kind and encouraging connections with their classmates report having more positive academic attitudes and values as well as higher levels of school satisfaction. These students are also more academically engaged (Marks, 2000). The research results of Xu, et.al. (2023) shows that there is a relationship between perceived teacher support and student engagement (r_{xy} = .249, p<.05). Chong, et al. (2018) said that teacher support is a form of support that influences students so they can be actively involved in class. Brewster & Bowen (2004) say that the teacher's attitudes and behavior shown to students will influence how happy or bored students are with school. The relationship between teachers and students can develop academic values, maintain student involvement in the long term, and shape students' self-identity as learners (McHugh et al., 2013).

Other self-system activities, such self-efficacy, which denotes confidence in one's capacity to bring about a desired result (Bandura, 1997). According to Bandura, self-efficacy is an individual's belief in their ability to do something and produce things that are in accordance with their initial goals. Bandura (1997) and Schunk (1991) explained that self-efficacy has been linked to the amount of effort and willingness to stick with projects. When they possess the necessary skills, those with strong efficacy beliefs are more likely to put out effort in the face of hardship and stick with a task. As a result, students who had higher self-efficacy views were considerably more likely to be cognitively engaged than students who had lower self-efficacy beliefs. Furthermore, high self-efficacy beliefs were linked to a gradual rise in the use of meta-cognitive techniques over time, as well as elaboration and organizational strategies for deeper processing (Linnenbrink & Pintrich, 2003). This is supported by the results of Qudsyi's research (2020) it shows that self-efficacy is the strongest variable in predicting student engagement.

Self-efficacy

In explaining self-efficacy, Bandura (1997) suggests that one source of effectiveness is verbal persuasion from other people. Teacher support is included in the source of self-efficacy, namely verbal persuasion that comes from the social environment. According to Liu et al. (2001), perceived teacher support is the idea that students have that their teachers care about them and will help them if they need it by providing them with academic, emotional, and competence support. The research results show children who experience more teacher support in math classes have more positive attitudes and have higher levels of self-efficacy when it comes to mastering math (Rice et al., 2013). However, students are less likely to convert their academic interests into goals and activities when the learning environment is undersupport, which lowers their academic self-efficacy (Olani et al., 2010). Numerous research have demonstrated that academic self-efficacy can be favorably predicted by perceived teacher support (Liu et al., 2021). This is supported by the research results of Ren, at al. (2022) showed that teacher support positively predicted self-efficacy ($\beta = 0.52$, $p < 0.001$).

Problem of Study and Hypothesis

Based on these perspectives, the authors deal with engagement. Teacher support will have a greater impact on student engagement only if self-efficacy is a mediator. The theoretical model of student engagement in this research is listed below. Therefore, the research hypothesis is:

- there is a simultaneous direct effect of teacher support and self-efficacy on student engagement
- there is a direct effect of teacher support on self-efficacy
- there is an influence of teacher support on student engagement through self-efficacy as a mediator.

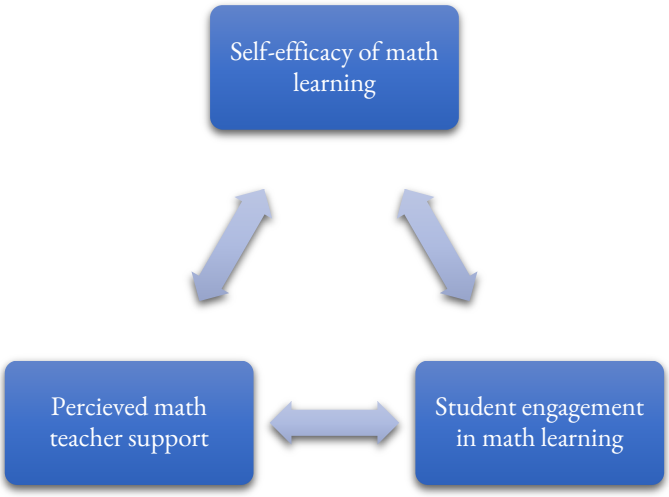

Figure 1. Theoretical model for student engagement in math learning

Method

Research Model

The research was designed with quantitative. According to Creswell (2003), quantitative research uses experimental and survey research methods and collects data using predetermined instruments to provide statistical data. Quantitative research can produce results that are prescriptive, explicative, and confirmatory. In this research, a quantitative method was used to confirm the role model of self-efficacy as a mediator on the influence of perceived teacher support on student engagement.

Participants

This researcher involved a total sample of 181 students in four elementary schools with the characteristics of fourth to fifth grade students who attended math classes. Purposive sampling method was used to determine the participants of the study. The four elementary schools involved in this research are private elementary school of Pancasila 45, private elementary school of Muhammadiyah 12, state elementary school of Tembok Dukuh 1, and state elementary school of Bubutan VIII at Surabaya. Number of respondents by school and class can see on table 1.

Table 1. Participants structures

School	Class	N	%
Private Elementary School of Pancasila 45, Surabaya	4th grade	18	10,5%
	5th grade	19	10,4%
Private Elementary School of Muhammadiyah 12, Surabaya	4th grade	27	14,9%
	5th grade	29	16%
State Elementary School of Tembok Dukuh 1, Surabaya	4th grade	27	14,9%
	5th grade	30	16,5%
State Elementary Shool of Bubutan VIII, Surabaya	4th grade	16	8,8%
	5th grade	15	8%
Total		181	100%

The measuring instruments for this research use the Student Engagement Scale based on aspects compiled by Fredricks (2011), the Self-Efficacy Scale based on aspects compiled by Bandura (1997), and the Teacher Support Scale compiled based on aspects of Chen (2005). The three scales are in Likert form with four answer choices: Student Involvement Scale (21 items, $\alpha = 0.856$), Self-Efficacy Scale (17 items, $\alpha = 0.885$), Teacher Support Scale (10 items, $\alpha = 0.743$). Data analysis to prove the hypothesis using regression analysis.

Data Collection and Procedure

Validity analysis uses a classic approach by correlating the total item score with the total score of the measuring instrument. Reliability analysis uses Cronbach's alpha formula with a coefficient limit of > 0.6 which is declared reliable. The instrument for measuring student engagement variables was prepared by researchers based on Fredricks' (2011) theory that there are three dimensions, namely behavioral engagement, emotional engagement, and cognitive engagement, and arranged based on a Likert scale of 21 items. The validity test result was obtained for 16 valid items. The reliability test obtained an alpha coefficient of .856.

The teacher support variable measuring tool was prepared by researchers based on the opinion of Chen (2005) that there are three dimensions, namely cognitive support, emotional support, and instrumental support, and is arranged based on a Likert scale of 22 items. The validity test result was obtained from 10 valid items. The reliability test obtained an alpha coefficient of .740.

The self-efficacy variable measuring instrument was prepared by researchers based on the opinion of Bandura (2001) that there are three dimensions, namely level, strength, and general, and is prepared based on a Likert scale of 19 items. The validity test results obtained 17 valid items. The reliability test obtained an alpha coefficient of .885.

Results

Hypothesis testing in the research was carried out by path analysis and then using mediation analysis using the sobel test. The Sobel test is used with the aim of finding out the value of the mediator. The results in this study are presented below.

Direct Effect Teacher Support on Self-Efficacy

The first, we analyzed direct effect of teacher support on self-efficacy. Direct effect of teacher support on self-efficacy can see on table 2.

Table 2. Direct effect teacher support to self-efficacy

Coefficients[a]						
Between Variables	**Model**	**B**	**Std. Error**	**Beta**	**t**	**Sig.**
Teacher Support ⟶ Self-Efficacy	(Constant)	17.909	4.247		4.217	.000
	Teacher Support	1.002	.133	.491	7.536	.000

Based on table 2, it can be concluded that t = 7.536 and p < 0.05, that there is a significant influence of teacher support on self. efficacy and magnitude of influence .491

Direct Effect Teacher Support and Self Efficacy on Student Engagement

The second, we analyzed direct effect of teacher support and self-efficacy on student engagement. Direct effect of teacher support and self-efficacy on student engagement can see on table 3.

Table 3. Multiple regression analysis test results

Coefficients[a]						
Between Variables	**Model**	**B**	**Std. Error**	**Beta**	**t**	**Sig.**
Teacher Support ⟶ Student Engagement Self-efficacy ⟶ Student Engagement	(Constant)	26.010	3.679		7.071	.000
	Teacher Support	.057	.126	.033	.455	.650
	Self-efficacy	.441	.062	.519	7.144	.000

Based on table 3, the results of the multiple regression analysis are the effect of teacher support on student engagement was obtained with a value of t=.455 and p > .05, so it can be concluded that there is no direct effect of teacher support on student engagement, with an effect size of .033. The effect of self-efficacy on student engagement obtained t = 7.144 and p < 0.05. It can be concluded that there is a significant influence of self-efficacy on student engagement, and the magnitude of the influence on student engagement = .519

Indirect Effect Teacher Support on Student Engagement and Self Efficacy as Mediator

The third, testing the indirect effect of teacher support on student engagement through the mediator self-efficacy obtained the following results:

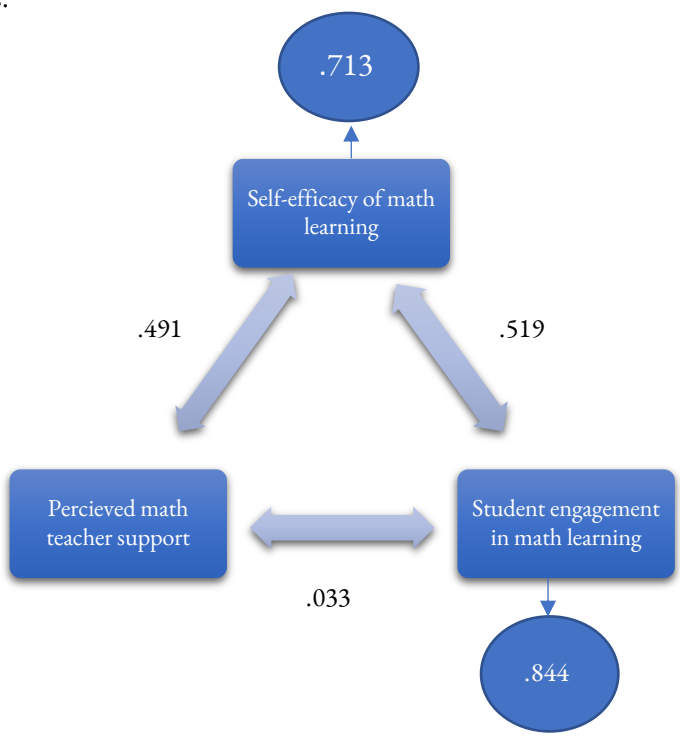

Figure 3. Student engagement model in math learning

The magnitude of the mediator's influence can be calculated by calculating the coefficient of the direct influence of teacher support multiplied by the coefficient of the direct influence of self-efficacy on student engagement, which is obtained as .491 x .519 = .2548. The magnitude of the influence of teacher support on student engagement after entering the mediator variable is .2548, which means it is greater than the direct influence of teacher support on student engagement (.2548 >.033). The Sobel test was used to determine the role of the mediator, namely, whether self-efficacy acts as a mediator. The t-count result is 3.1925, while the t-table is =1.97. Thus, it can be concluded that t-count > t-table, which means that self-efficacy significantly plays a full mediating role in the influence of teacher support on student engagement.

Discussion and Conclusion

This research examines the influence of teacher support on student engagement through self-efficacy as a mediator among elementary school students in grades 4-5. The results of the analysis show that there is no significant influence of teacher support on student engagement. Aljareh and Shindel (2020) report that proper student-teacher interactions stimulate learners to participate in class activities as they foster an emotionally favorable and supportive classroom environment. Meanwhile, student engagement concerns not only emotional aspects but also behavioral and cognitive aspects (Fredericks, 2011). Teachers' influence is framed within a theoretical framework of self-determination as a contextual factor; the external environment can heighten intrinsic motivation, promote the internalization of extrinsic motivation, and sustain engagement by meeting three fundamental psychological needs: autonomy, competence, and belonging (Deci & Ryan, 1985). According to the notion of self-determination, teacher assistance only affects relatedness requirements and possibly behavioral engagement while having no impact on the cognitive component of involvement. This explains why students' perceptions of teacher support do not enough affect their involvement.

However, the analysis's findings indicate that teacher support has a direct impact on students' engagement when self-efficacy is taken into account as a mediator. Self-efficacy, according to Bandura, is the conviction that one can accomplish goals and produce results that are consistent with those aims. Bandura (1997) and Schunk (1991) explained that self-efficacy has been linked to the amount of effort and willingness to stick with projects. Self-efficacy is considered to be a type of motivating belief that will affect all facets of student engagement. Students' behavioral engagement is favorably correlated with their self-efficacy views. Students who believe they can complete the assignment successfully are far more likely to work hard, persevere, and seek assistance in a flexible way (behavior engagement). Students who lack self-assurance are far less likely to put in a strong effort, are more likely to give up easily at the first sign of difficulties, or will attempt to complete the task without learning or mastering it with the assistance of others. Similarly, Linnenbrink and Pintrich (2003) claimed that when students feel confident in their ability to complete mathematical tasks, it will motivate them to be cognitively engaged, specifically through the use of deeper processing strategies like elaboration and organization strategies as well as meta-cognitive strategies. Wright and Mischel (1992) find that emotions can affect self-efficacy. According to Harter (1992), students who have high levels of self-efficacy are more likely to feel proud or happy when they succeed in their academic endeavors. In contrast, people who have low levels of self-efficacy frequently feel anxious or depressed (Pintrich, Roeser, & De Groot, 1994). These encouraging feelings will encourage students to participate in their studies.

Student engagement during learning is an important factor because it will determine the success of students in mastering subject matter (Ashwin,& McVitty, 2015), especially mathematics. To be able to engage in mathematics lessons is not only an emotional factor, but students' cognitive factors are also very determining. This result is shown in the model in this research: that the self-efficacy factor has a very significant influence on student engagement and plays a full role as a mediator of the influence of teacher support on student engagement. This is supported by the results of research by Parameswara et al. (2022) showing that cognitive reconstruction, namely changing thoughts that say "I can't" to "I can", can reduce students' anxiety. When students no longer experience anxiety, they will engage in the lesson material. Such cognitive reconstruction can also change negative self-efficacy into more positive self-efficacy.

Recommendations

The results of this research indicate that there is an influence of teacher support on student engagement in elementary school students' mathematics lessons through self-efficacy as a mediator. Based on the results of this research, it is recommended that teachers be able to strengthen students' self-efficacy abilities related to mathematics lessons and continue to provide cognitive, emotional, and instrumental support. School principals to provide training to teachers on learning models that not only transmit mathematical knowledge but can also increase students' self-efficacy. This is important because self-efficacy abilities will contribute to increasing student engagement in mathematics instruction. If the student's engagement in mathematics learning is high, it will have an impact on high mathematics achievement as well.

Limitations of Study

The limitation of this research is that the research subjects were students in grades four to five, although the measuring instruments for this research have been prepared according to theoretical aspects and in language that can be understood by elementary school-age children in grades four to six, so it is recommended for future researchers to take samples from the same class. In addition, research was conducted that described the influence of each teacher's support on student engagement.

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