URBAN STUDENTS SELF-EFFICACY PROFIL ON MATHEMATICS LEARNING: INSTRUMENT VALIDATION AND EVALUATION

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Abstract. This study aims to determine the effect of students' self-efficacy on mathematics learning outcomes. The type of research used in this research is descriptive research. The population in this study were junior high school students in Pekanbaru City, with a sample consisting of 49 students at SMP Negeri 25 Pekanbaru and SMP Negeri 34 Pekanbaru consisting of 53 students. The sampling technique in this study was simple random sampling. Data collection techniques in this study were carried out by surveys using questionnaires and interviews. Data analysis in this study used descriptive statistics. The results obtained from the influence of students' self-efficacy on mathematics learning outcomes are in the not good category with a percentage of 55% and 45% in the good category. The evaluation results show that the effect of self-efficacy (self-efficacy) of students at SMP Negeri 25 Pekanbaru and SMP Negeri 34 Pekanbaru on mathematics learning outcomes is in the not-good category. Teachers should play a more active role as companions, mentors, directors, and motivators in learning mathematics. With this, students will feel confident in their ability to solve mathematical problems in learning materials that are considered difficult, which will further increase students' self-efficacy towards learning outcomes in mathematics.
Keywords: *Self-efficacy, Student, Mathematics Learning Outcomes*

1. INTRODUCTION

Self-efficacy, or self-belief, is one of the psychological factors that play an essential role in students' learning processes, including in mathematics. The concept of self-efficacy was first introduced by Albert Bandura, who defined it as an individual's belief in their ability to achieve specific goals or complete particular tasks [1]. In an educational context, self-efficacy greatly influences students' motivation, persistence, and academic success [2]. Students with high self-efficacy tend to have greater motivation to learn, are less likely to give up, and are more confident in overcoming challenges they encounter. This makes self-efficacy a crucial aspect of learning mathematics, especially considering many students often view mathematics as difficult and intimidating.

Mathematics is often regarded as one of the most challenging subjects, leading many students to develop feelings of fear or lack of confidence in tackling it [3]. According to research, low self-confidence in mathematics often impacts students' performance, as they are more likely to avoid the subject, reduce their efforts, or even experience mathematics anxiety, hindering their learning ability [4]. This is where self-efficacy becomes very important. High self-efficacy in mathematics enables students to feel more confident in their ability to solve math problems, approach difficulties more positively, and even enjoy the process of learning mathematics.

The importance of self-efficacy in mathematics learning is not only related to students' cognitive aspects but also to affective aspects such as motivation and emotions [5], [6]. High self-efficacy enables students to view failure as part of the learning process rather than a sign of inability. Students with high self-efficacy are more motivated to try various approaches to solve problems, even if they initially encounter failure [7]. They tend to see challenges as opportunities for growth and skill improvement, rather than obstacles. Thus, self-efficacy can foster a positive mindset that supports the overall learning process.

Moreover, self-efficacy also plays a role in shaping students' learning strategies. Students with high self-efficacy are more likely to use effective learning strategies, such as critical thinking, planning, and reassessing their learning outcomes [8], [9]. In contrast, students with low self-efficacy tend to hesitate to take the initiative to try different learning strategies or to evaluate their mistakes. As a result, they are more likely to avoid challenges and remain passive in the learning process . In mathematics learning, where problem-solving skills are essential, low self-efficacy can be a significant barrier to students' academic progress.

With increased awareness of the importance of self-efficacy in mathematics learning, educators and researchers are increasingly emphasizing the need for strategies and approaches to enhance students' self-efficacy in this subject [10], [11]. This can be done by providing students with opportunities to experience success through structured tasks, offering positive feedback, and creating a supportive learning environment[12], [13], [14]. In this way, students can develop higher self-efficacy in mathematics, which in turn will improve their motivation and academic performance.

Overall, self-efficacy is a critical component in mathematics learning. Students' ability to feel confident in completing math tasks directly impacts their engagement, motivation, and academic results. By understanding and strengthening students' self-efficacy, educators can create a more positive and productive learning experience and help students view mathematics as a subject that can be mastered and understood rather than as a challenging obstacle. Based on the explanation above, we, as researchers, aim to explore and understand the extent of the influence of students' self-efficacy on mathematics learning in line with the indicators of magnitude, strength, and generality of the self-efficacy variable. This variable is measured using a questionnaire distributed to students

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for completion, along with direct interviews with mathematics teachers to gain insights related to the student's self-efficacy.

2. RESEARCH METHOD

This study utilizes a descriptive research design. Descriptive research is conducted by portraying the characteristics of the population or the observed reality. The population in this study consists of junior high school students in Pekanbaru, with a sample comprising 49 students from SMP Negeri, 25 Pekanbaru, and 53 students from SMP Negeri, 34 Pekanbaru. The sampling technique used in this study is simple random sampling, where each member of the population has an equal chance of being selected randomly, regardless of the existing population classes, to serve as the sample. Data collection was conducted through a survey, where the sample was chosen to be smaller than the larger population size. Questionnaires and interviews were used as instruments in this study. The questionnaire consists of 35 statements, each with a four-point scale that students must complete to assess the influence of self-efficacy on them. Meanwhile, three questions were designed for direct interviews with mathematics teachers at these schools, with attention given to each indicator of self-efficacy. Descriptive statistics were used for data analysis in this study, presenting the collected data in a more refined and useful form for analysis. The self-efficacy variable consists of three indicators: magnitude, strength, and generality. First, the magnitude indicator reflects a student's ability to avoid difficult tasks and focus on easy tasks. Second, the strength indicator reflects a student's ability to persevere or give up when facing challenges. Third, the generality indicator reflects students' ability to handle tasks based on their skills or limitations.

3. RESULTS AND DISCUSSION

3.1 Results

A validity test was conducted before starting the research. The questionnaire consists of 35 statement items created following the indicators of students' self-efficacy. A statement item is considered valid if the V-value is greater than 0.4; if V is less than 0.4, it is considered invalid. The results of the validity test can be seen in the following table.

Table 1. Aiken's Validity Results of Variable *Self Efficacy*

No Item	∑ S	V	Conclusion	No Item	∑ S	V	Conclusion
1	7	0,78	Middle/Valid	19	7	0,78	Middle/Valid
2	8	0,89	High/Valid	20	8	0,89	High/Valid
3	7	0,78	Middle/Valid	21	7	0,78	Middle/Valid
4	8	0,89	High/Valid	22	9	1	High/Valid
5	8	0,89	High/Valid	23	8	0,89	High/Valid
6	6	0,67	Middle/Valid	24	6	0,67	Middle/Valid
7	8	0,89	High/Valid	25	6	0,67	Middle/Valid

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No Item	∑ S	V	Conclusion	No Item	∑ S	V	Conclusion
8	9	1	High/Valid	26	7	0,78	Middle/Valid
9	7	0,78	Middle/Valid	27	7	0,78	Middle/Valid
10	6	0,67	Middle/Valid	28	8	0,89	High/Valid
11	6	0,67	Middle/Valid	29	8	0,89	High/Valid
12	9	1	High/Valid	30	7	0,78	High/Valid
13	7	0,78	Middle/Valid	31	8	0,89	High/Valid
14	8	0,89	High/Valid	32	7	0,78	Middle/Valid
15	9	1	High/Valid	33	9	1	High/Valid
16	9	1	High/Valid	34	9	1	High/Valid
17	8	0,89	High/Valid	35	8	0,89	High/Valid
18	7	0,78	Middle/Valid				

Based on Table 1 above, the validity test conducted meets the specified requirements. The validity test results show that items with V>0.4V > 0.4V>0.4 are considered valid, with 16 items categorized as medium/valid and 19 items as high/valid. Meanwhile, no items were considered invalid, as there were 0 items with V<0.4V < 0.4V<0.4 categorized as low/invalid. The empirical test using first-order CFA can be seen as follows:

Table 2. CFA First-Order of Variabel *Self Efficacy* Overall

No Items	Loading > 0,3	Criteria	No Items	Loading > 0,3	Criteria
Item 1	0,11	invalid	Item 19	0,4	Valid
Item 2	0,24	Valid	Item 20	0,46	Valid
Item 3	0,3	Valid	Item 21	0,36	Valid
Item 4	0,44	Valid	Item 22	0,59	Valid
Item 5	0,42	Valid	Item 23	0,28	Valid
Item 6	0,27	Valid	Item 24	0,45	Valid
Item 7	0,39	Valid	Item 25	0,43	Valid
Item 8	0,62	Valid	Item 26	0,62	Valid
Item 9	0,29	Valid	Item 27	0,4	Valid
Item 10	0,18	invalid	Item 28	0,42	Valid
Item 11	0,22	Valid	Item 29	0,4	Valid
Item 12	0,57	Valid	Item 30	0,29	Valid
Item 13	0,5	Valid	Item 31	0,63	Valid
Item 14	0,66	Valid	Item 32	0,57	Valid
Item 15	0,34	Valid	Item 33	0,61	Valid
Item 16	0,63	Valid	Item 34	0,43	Valid

Item 17	0,52	Valid	Item 35	0,61	Valid
Item 18	0,53	Valid			

Based on Table 2 above, the results show that RMSEA = 0.09 > 0.08, P-value = 0.00 < 0.05, and df = 998 > 989.15. Therefore, the validity test conducted on the self-efficacy variable instrument is overall good according to field data. From the obtained data, the highest value is found in item 14 with a score of 0.66, while the lowest value is found in item 1 with a score of 0.11. The results indicate that the influence of students' self-efficacy on mathematics learning has a reliability result that is not valid. Among the indicators that form the self-efficacy variable, 2 items are invalid, while the remaining 33 items out of 35 are valid, as their loadings are above 0.3 (estimate).

Validity CFA Second Order

Second-order CFA validity is used to ensure that the indicators are valid and reliable. Similar to the previous overall reliability test of the self-efficacy variable instrument, the reliability test of the self-efficacy variable instrument based on indicators can be measured using Second-Order CFA, with the criteria RMSEA < 0.08, P-value > 0.05, and df × 2 > Chi-Square considered valid. The results of the validity test can be seen in the following table.

Table 3. CFA second-order of *Self Efficacy* Variable

Indicators	Loading > 0,3 (Standardize)	Loading > 1,96 T-Value	Kriteria
Magnitude	0,60	2,08	Valid
Strength	0,92	6,86	Valid
Generality	0,91	4,34	Valid

Based on Table 3 above, the results show that RMSEA = 0.088 > 0.08, P-value = 0.00 < 0.05, and df = 1056 > 943.67. Therefore, the validity test conducted on the self-efficacy variable instrument as a whole is considered valid, as one of the criteria has been met. This aligns with the model found in the field, indicating that the data fit well. From the obtained data, the highest value is found in the strength indicator with a score of 0.92, while the lowest value is in the magnitude indicator with a score of 0.60. The study results show that the influence of students' self-efficacy on mathematics learning is valid and reliable, as the loadings are above 0.3 (estimate).

Evaluation Results by Indicators

In this study, students were asked to complete a questionnaire consisting of 35 statement items. Each indicator comprises 13 items for the magnitude indicator, 11 for the strength indicator, and 11 for the generality indicator. The statements are based on a four-point scale with the options of SS (Strongly Agree), S (Agree), TS (Disagree), and STS (Strongly Disagree). From the data obtained, the influence of students' self-efficacy on mathematics learning, as viewed from the three self-efficacy indicators, is as follows.

Magnitude Indicator

The results of the analysis of the magnitude indicator can be seen in Table 4, according to the percentage of responses for each option provided in the instrument.

Table 4. Evaluation result of Magnitude Indicator

Scale	Frequency	Percentage
Very Agree	2	1,96
Agree	48	47,06
Disagree	48	47,06
Very Disagree	4	3,92

Based on Table 4 above, the results indicate that the influence of students' self-efficacy on mathematics learning outcomes for the magnitude indicator falls into the poor category, with 51% in this category, and 49% in the good category. These results show that students' self-efficacy is not yet in the good category.

Strength Indicator

The analysis results of the strength indicator analysis can be seen in Table 5, according to the percentage of responses for each option provided in the instrument.

Table 5. Evaluation Result of Strength Indicator

Scale	Frequency	Percentage
Very Agree	1	0,98
Agree	33	32,35
Disagree	57	55,88
Very Disagree	11	10,78

Based on Table 5 above, the results indicate that the influence of students' self-efficacy on mathematics learning outcomes for the strength indicator falls into the poor category, with 67% in this category, and 33% in the good category. These results show that students' self-efficacy for the strength indicator is poor.

***Generality* indicator**

The results of the analysis of the generality indicator can be seen in Table 6, according to the percentage of responses for each option provided in the instrument.

Table 6. Evaluation Result of Generality Indicator

Scale	Frequency	Percentage
Very Agree	3	2,94
Agree	41	40,20
Disagree	43	42,16
Very Disagree	15	14,71

Based on Table 6 above, the results indicate that the influence of students' self-efficacy on mathematics learning outcomes for the generality indicator falls into the poor category, with 57% in this category and 43% in the good category.

Evaluation Result of Self-Efficacy

The overall evaluation results represent the accumulated evaluation from the three indicators obtained from data exploration. The analysis results can be seen in Table 7.

Table 7. Evaluation Result of Students' Self-Efficacy

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Scale	Frequency	Percentage
Very Agree	1	0,98
Agree	45	44,12
Disagree	48	47,06
Very Disagree	8	7,84

Based on Table 7 above, the overall results show that 55% fall into the poor category, and 45% fall into the good category. Therefore, it can be concluded that the influence of students' self-efficacy on mathematics learning outcomes in junior high schools in Pekanbaru City is in the poor category. Based on interviews conducted with mathematics teachers at SMP Negeri 25 Pekanbaru and SMP Negeri 34 Pekanbaru, it was found that the influence of students' self-efficacy on mathematics learning outcomes is less favorable. Teachers noted that most students lack confidence in their own ability to solve mathematical problems. Therefore, teachers must encourage their students to solve mathematics-related problems confidently. If students can solve mathematical problems well, their self-confidence is likely to be high.

3.2. Discussion

The analysis results indicate that, in terms of content and construct, the self-efficacy instrument is in a good category and can be used for data collection. Content and construct validity are essential in developing a student self-efficacy instrument to ensure that the instrument accurately measures the intended self-efficacy concept. Self-efficacy, defined by Albert Bandura as an individual's belief in their capability to achieve specific goals, is vital in motivating students in learning [15]. Instruments designed to measure self-efficacy should capture the main dimensions of self-efficacy within the educational context, such as students' confidence in completing tasks, overcoming challenges, and addressing obstacles in the learning process [16]. Content validity refers to the extent to which the items in an instrument cover the entire concept that is intended to be measured, ensuring that the items represent the relevant aspects of self-efficacy [17], [18]. In the context of student self-efficacy instruments, content validity is achieved when all items in the instrument accurately reflect the key components of self-efficacy, such as confidence, persistence, and readiness to complete tasks. Developing content validity typically involves experts in education or psychology to ensure that the constructed items are relevant to the concept of student self-efficacy.

Construct validity is the extent to which an instrument accurately measures the theoretical construct it is intended to measure, in this case, student self-efficacy [19], [20]. Construct validity ensures that the instrument not only comprehensively measures self-efficacy components but also aligns with the underlying theory [21], [22]. In this case, Bandura's self-efficacy theory identifies four main sources of self-efficacy: mastery experiences, vicarious experiences, social persuasion, and physiological states . A construct-valid self-efficacy instrument should include items relevant to these four sources.In the process of developing construct validity, exploratory factor analysis (EFA)

and confirmatory factor analysis (CFA) are often used [23]. EFA is used in the initial stage to identify the factor structure underlying the items in the instrument. For example, in a self-efficacy instrument, EFA can show whether items related to the ability to face challenging tasks and confidence in exams group under the same factor or different factors. CFA is then used to confirm the factor structure found through EFA, ensuring that the structure aligns with self-efficacy theory [18], [24]. If CFA shows that the theoretical model fits the empirical data, then the instrument's construct validity can be considered strong.

The importance of content and construct validity cannot be overlooked, as both ensure that the developed instrument can accurately measure student self-efficacy [25]. Without strong content validity, the items in the instrument may not represent the self-efficacy concept intended to be measured, leading to inaccurate results [26], [27], [28], [29]. Without adequate construct validity, the instrument may measure other constructs that are irrelevant or inconsistent with the self-efficacy theory. A valid instrument will also help researchers or educators gain a more accurate understanding of students' levels of self-efficacy[30], [31], [32]. This information can aid in designing appropriate interventions to improve students' self-efficacy, for example, by providing more mastery experiences or fostering a supportive environment to build students' confidence. In developing a student self-efficacy instrument, content and construct validity are crucial aspects that must be considered [33], [34]. This process involves selecting and writing representative items and empirically testing them through factor analysis to ensure the instrument aligns with self-efficacy theory [35]. Thus, a valid self-efficacy instrument becomes an effective tool in assessing and enhancing students' confidence in learning, which in turn can contribute to increasing their motivation and academic achievement.

The influence of students' self-efficacy on mathematics learning outcomes is in the poor category. Self-efficacy, a concept introduced by Albert Bandura, refers to an individual's belief in their ability to perform tasks and achieve goals [36]. In education, self-efficacy plays a critical role in shaping students' motivation, resilience, and academic success. However, in mathematics, many students experience low self-efficacy, meaning they doubt their capability to understand and succeed in mathematical tasks [37]. This low self-efficacy can significantly impact their learning outcomes, often resulting in avoidance, decreased effort, and poorer performance in mathematics [38]. Understanding why students' self-efficacy in mathematics is low is essential to developing strategies that enhance their confidence and performance in this fundamental subject.

One reason for low self-efficacy in mathematics is the negative perception of mathematics as a difficult or intimidating subject [39]. From a young age, students are often exposed to the notion that mathematics is challenging and that only certain people are naturally "good at math." This belief is reinforced by societal stereotypes that suggest math requires innate talent rather than effort and practice [40]. As a result, students may develop a fixed mindset, believing that they lack the "math ability," which undermines their self-efficacy [41], [42]. When students believe that their success in mathematics is

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beyond their control, they are less likely to put in the effort needed to succeed, perpetuating a cycle of low self-efficacy and poor performance.

Past experiences play a crucial role in shaping students' self-efficacy. For students who have struggled with mathematics in the past, each failed attempt can reinforce the belief that they are not "math people." Repeated experiences of failure or frustration in mathematics, such as poor test scores or difficulty grasping concepts, can contribute to low self-efficacy [43], [44]. When students repeatedly encounter challenges without the necessary support or intervention, they may begin to view themselves as incapable of succeeding in mathematics [45]. These experiences can have a long-lasting impact, as students carry their beliefs about their mathematical ability into future learning situations, affecting their motivation and willingness to engage with the subject.

The learning environment, including the teaching methods and classroom atmosphere, also plays a significant role in students' self-efficacy[46]. A rigid or overly competitive classroom setting can foster feelings of inadequacy among students, particularly those who struggle with the pace or difficulty of the material [47]. When teachers focus solely on correct answers rather than the learning process, students may feel discouraged by mistakes, viewing them as signs of failure rather than opportunities for growth. Additionally, if students do not receive individualized support or encouragement, they may feel isolated in their struggles, further diminishing their self-efficacy. A supportive learning environment, where teachers provide constructive feedback and encourage effort, is essential for building students' confidence in mathematics.

Peer influence and social comparison can also contribute to low self-efficacy in mathematics. In a classroom setting, students often compare themselves to their peers, which can lead to feelings of inferiority if they perceive others as more successful or quicker to understand mathematical concepts [48]. For instance, if a student consistently sees their peers excelling in mathematics while they struggle, they may begin to doubt their own abilities. This social comparison is especially pronounced in mathematics, where performance is often visible through test scores or participation in problem-solving activities [49]. The pressure to keep up with peers, combined with the fear of being perceived as "less capable," can contribute to lower self-efficacy in mathematics.

Mathematics anxiety is a common phenomenon that affects students' self-efficacy in the subject. This anxiety can stem from fear of failure, fear of judgment, or the pressure to perform well [50]. Students with high levels of math anxiety often experience physical symptoms, such as nervousness or stress, which can impair their ability to focus and perform well [51]. This fear of failure creates a mental block, preventing students from fully engaging with the material or giving their best effort [52]. The anxiety becomes a self-fulfilling prophecy, as students' fears lead to poorer performance, reinforcing their belief that they are not capable of succeeding in mathematics.

Many students struggle with mathematics because they lack effective learning strategies. Without proper guidance on how to approach mathematical problems, students

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may find the subject overwhelming and confusing [53]. When students do not understand how to break down complex problems or apply systematic problem-solving techniques, they may feel lost and incapable. This lack of strategy reinforces the notion that mathematics is inherently difficult and that they are ill-equipped to succeed [54]. Providing students with effective learning strategies, such as problem-solving frameworks or visualization techniques, can help them approach math with greater confidence and improve their self-efficacy over time. Mastery experiences—where students successfully complete tasks through their own effort—are one of the most powerful sources of self-efficacy [55]. However, many students do not have enough opportunities to experience success in mathematics. Traditional assessment methods often focus on testing students' ability to get the right answer rather than developing their understanding or problem-solving skills. Without incremental successes, students miss out on the positive reinforcement needed to build their self-efficacy [56]. By incorporating tasks that allow for gradual skill-building and providing regular feedback on progress, educators can help students experience success in mathematics, boosting their confidence and willingness to take on new challenges.

4. CONCLUSION

Based on research analyzing students' self-efficacy in mathematics learning outcomes, which consists of three indicators—magnitude, strength, and generality—the overall results show that 55% fall into the poor category, while 45% fall into the good category. Therefore, it can be concluded that the influence of students' self-efficacy on mathematics learning outcomes at the junior high school level is in the poor category. Consequently, it is hoped that teachers will play a more active role as mentors, guides, directors, and motivators in mathematics learning. By doing so, students will feel more confident in their abilities to solve mathematical problems in challenging topics, thereby enhancing their self-efficacy in mathematics learning outcomes.

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