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# The influence of snowball throwing learning method on students' self-efficacy

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**Abstract**
This study was motivated by the finding that students' self-efficacy at MTsS Hifzhil Qur'an was relatively low. Further investigation revealed that this issue was associated with the teaching methods employed by the teachers. Therefore, implementing innovative instructional strategies is necessary to enhance students' self-efficacy. Among various instructional approaches, the Snowball Throwing method is considered a promising strategy for addressing this issue. Accordingly, this study aimed to examine whether the Snowball Throwing method has a significant effect on students' self-efficacy. This study employed an experimental design involving 60 seventh-grade students, comprising one experimental class and one control class. The research instrument was a student self-efficacy questionnaire developed based on established self-efficacy indicators. The collected data were analyzed using an independent-samples t-test, which yielded a p-value of 0.005. Since this value was lower than the significance level of 0.05, the findings indicate that the Snowball Throwing method had a significant positive effect on students' self-efficacy. Therefore, this method may be considered an effective instructional approach for improving students' self-efficacy.

**Keywords:** Learning, Self-efficacy, Snowball throwing

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## Introduction

The learning process that takes place in schools is the spearhead of a series of educational activities. The quality of education is largely determined by the learning activities conducted by teachers in the classroom (Utami et al., 2019). The better the learning process, the better the outcomes it will yield for the educational system. The success of the learning process can be seen through the students' proficiency in both hard skills and soft skills after participating in the learning activities.

Yandi et al (2023) states that after participating in learning activities, changes will occur in the psychological domain of students. This psychological domain consists of three main aspects: cognitive, affective, and psychomotor. Therefore, after learning, students are expected to possess strong cognitive abilities, positive affective traits, and competent psychomotor skills. It is thus hoped that following the learning process, students will not only understand the

subject matter well but also develop good attitudes such as confidence, independence, and motivation.

The same applies to mathematics learning. A learning activity is considered successful when students' mathematical abilities improve, which can be demonstrated through their mathematics test scores. In addition, students' enthusiasm, motivation, and attitudes during the learning process also serve as important indicators of the success of mathematics learning (Riyandiarto, 2017).

One of the affective aspects that plays an important role in learning mathematics is students' self-efficacy. Bandura (1998), a renowned psychologist, states that self-efficacy refers to a person's confidence in their own ability to perform a specific task. If someone strongly believes in their ability to solve a particular problem or achieve a desired goal, they are said to have high self-efficacy. Conversely, if a person feels unsure of their capabilities or tends to avoid challenges, this indicates low self-efficacy (Raihani et al., 2023).

In mathematics learning, self-efficacy also plays a crucial role. Self-efficacy in the context of mathematics refers to a student's confidence in their ability to solve various mathematical problems (Narpila, 2020). In practice, Ferdyansyah (2020) categorizes self-efficacy into two types, namely high and low. Students with high self-efficacy typically have strong motivation and perseverance in solving mathematical problems. On the other hand, students with low self-efficacy tend to avoid working on math problems, especially those they perceive as difficult.

The affective aspect of self-efficacy in learning mathematics is an important factor. When students have high self-efficacy, they tend to be more enthusiastic in solving math problems and more motivated to learn mathematics (Zakariya et al., 2022). This often leads to an improvement in their academic performance. However, if students lack enthusiasm in learning math and frequently feel incapable, they are likely to become reluctant to study. As a result, their mathematics achievement may fall short of expectations.

The importance of self-efficacy has also been highlighted by Brown et al. (2005) who stated that individuals with high self-efficacy tend to work harder when performing a task. Moreover, they build a positive motivation between themselves and the task at hand. When this is applied to mathematics learning, it can be said that high self-efficacy in students will encourage them to be more enthusiastic in learning mathematical concepts, completing math assignments, and overcoming challenges encountered while working on those tasks.

Given the crucial role of self-efficacy in mathematics learning, it is expected that students will develop high self-efficacy after the learning process. However, in reality, there are still students who exhibit low levels of self-efficacy. One such case was found at MTsS Hifdzil Quran. Out of 30 students who completed a self-efficacy questionnaire, the data showed that only 40% could be categorized as having high self-efficacy. This indirectly indicates that only 40% of the students were truly motivated and confident during mathematics learning sessions.

Interviews conducted with students at MTsS Hifdzil Quran revealed similar findings. Most students admitted that they lacked confidence when the teacher presented math problems. They felt unintelligent in mathematics, were too embarrassed to ask questions, afraid of being mocked by peers, and even refused to answer questions—even when they actually knew the

correct answers. These interview results clearly indicate that the level of self-efficacy among students at MTsS Hifdzil Quran is indeed low.

This low self-efficacy undoubtedly affects the students' academic performance. Therefore, it is important to investigate further the factors contributing to the low self-efficacy among students at MTsS Hifdzil Quran. One major factor that strongly influences students' self-efficacy is the learning activities conducted by the teacher (Amelia et al., 2022). When a teacher is able to deliver engaging and stimulating lessons, students' self-efficacy tends to increase—and the opposite is also true.

Theoretically, an ideal learning process is one that effectively achieves the intended learning objectives (Sanjani, 2021). In other words, teachers are expected to design and deliver high-quality instruction with appropriate learning levels and well-planned activities aimed at meeting those objectives. Through engaging and well-structured learning experiences, students are more likely to participate actively and feel more motivated. As a result, this will naturally lead to an improvement in their academic performance.

The expectations for the learning process are outlined in the Process Standards of Permendiknas (Kemendikbud, 2016), which states that teachers should conduct learning activities that actively involve students, foster motivation, and engage them in developing their interests and talents. Through a structured and student-centered learning process like this, it is expected that the intended learning objectives can be achieved optimally.

Unfortunately, the expectations for this learning activity have not been realized as intended. There are still several schools that have not implemented the expected learning process, such as MTsS Hifdzil Quran. Based on observations of the teaching process at MTsS Hifdzil Quran, it was found that teachers still use traditional teaching methods. The teachers deliver lectures, rely heavily on textbooks, and then assign several tasks to the students.

The learning process is one-way, meaning that teacher communication dominates. As a result, the learning activities are neither interactive nor engaging and tend to be boring for the students. Some students even appear indifferent during mathematics lessons, especially when the teacher assigns math tasks. They show little enthusiasm in completing the work and often prefer to copy their classmates' answers. This, in turn, contributes to the low self-efficacy among students.

Therefore, it is necessary to implement some changes or innovations in mathematics learning activities, such as applying learning models or methods that can make mathematics lessons more enjoyable for students and encourage their active participation throughout the learning process. Learning activities in small groups can also serve as an alternative to encourage students to engage in discussions, allowing for two-way communication. According to Kurniawan et al. (2022) these small groups can help ensure equal distribution of information among students, where higher-achieving students can assist those who are struggling. Additionally, incorporating games into the learning process can make the activities more enjoyable, so that students remain active and enthusiastic in participating in mathematics lessons.

Snowball throwing learning is one of the learning strategies that can be used as an innovation in mathematics instruction. According to Sudana (2019), snowball throwing is a learning method in which students work in small groups and study a specific topic. Each group then writes questions on sheets of paper, which are crumpled into balls and thrown to other

groups. Each group that receives a paper must solve the questions written on it correctly. The group that answers the questions the fastest and most accurately is considered the winner of the game.

The use of small groups in the snowball throwing method allows students to engage in discussions with their group members, creating communication that is no longer one-way. Teachers can facilitate effective communication between students and teachers, as well as among the students themselves. Through these discussions, more capable students can help those who are struggling, leading to a more equal distribution of mathematical skills among all students (Smit et al., 2023). This improved mathematical ability will boost students' confidence when completing math assignments. In other words, the snowball throwing learning method has the potential to enhance students' self-efficacy.

Likewise, the inclusion of game-based activities such as throwing paper creates a more active and enthusiastic classroom atmosphere. Students become more motivated to learn in order to solve the questions written on the paper. This playful activity also helps prevent students from feeling sleepy or bored during math lessons (Jumari, 2024). Furthermore, it can boost students' confidence when learning mathematics or completing math assignments. This means that the snowball throwing learning method is effective in enhancing students' self-efficacy.

Several previous studies have also shown results related to the relationship between snowball throwing learning and students' self-efficacy. For example, research conducted by Novianti. The results of Novianti's study (Ernawati et al., n.d.) showed that snowball throwing learning can develop students' self-efficacy. The implementation of this model positively contributed to the development of students' self-efficacy, particularly because the collaborative learning structure encourages students to express their ideas more confidently. Novianti also recommended that school principals, teachers, or prospective teachers use the snowball throwing method to help increase students' confidence. Similarly, a study by Setiadi (Setiadi, 2023) found that students with high self-efficacy are more suited to being taught using the snowball throwing learning method. However, Setiadi's study did not clearly address how the model supports students with lower levels of self-efficacy, indicating that the effectiveness of the model may not be evenly distributed across different student profiles.

Further evidence is provided by Rahayu and Pratama (Restu et al., 2022), who demonstrated that the snowball throwing technique contributes to improved confidence and social interaction among students. Nevertheless, their study was limited to the subject of Indonesian language learning, which raises questions about the generalizability of the findings across different subject areas. Another related study by Firmansyah (2015) showed that snowball throwing can increase learning motivation and academic outcomes; however, the study did not explicitly measure the impact of the model on self-efficacy, making the relationship between the variables less conclusive.

Collectively, these findings suggest that while the snowball throwing learning model has shown promising potential in improving learning-related psychological and behavioral outcomes, research focusing specifically on its direct influence on students' self-efficacy remains limited. The existing studies vary in scope, context, and measurement indicators,

leaving a gap in understanding how and to what extent the model fosters self-efficacy across different learning environments, subjects, and student characteristics.

Unlike previous studies that primarily examined the snowball throwing learning model in terms of students' motivation, learning outcomes, classroom participation, or general psychological responses, the present study specifically focuses on its direct influence on students' self-efficacy. While earlier research varied widely in context, subject matter, and measurement indicators, none have systematically investigated how this model fosters self-efficacy within snowball throwing learning method at the middle school level. Therefore, this study fills an important gap by providing empirical evidence on the extent to which snowball throwing contributes to the development of self-efficacy in a more clearly defined learning environment.

Recent studies on innovative cooperative learning models have increasingly highlighted the importance of student-centered activities that promote active participation, engagement, and peer interaction. Among these models, the snowball throwing strategy has gained attention for its potential to improve classroom dynamics, motivation, and learning outcomes. Empirical evidence from various subjects has shown that the model effectively enhances students' involvement, strengthens their conceptual understanding, and fosters collaborative problem-solving skills.

However, despite the growing number of studies examining its pedagogical benefits, research focusing specifically on the psychological constructs underlying learning—particularly self-efficacy—remains limited. Previous studies have generally measured external outcomes such as achievement, participation, or general motivation, without exploring the internal belief systems that determine students' confidence in mastering academic tasks. Furthermore, existing investigations vary widely in research design, learning context, and measurement indicators, resulting in fragmented insights regarding how the snowball throwing model influences students' self-efficacy.

Within this landscape, the present study advances the current state of knowledge by positioning self-efficacy as the primary outcome variable and by employing a more clearly defined and context-specific measurement framework. By examining the model's implementation in mathematic lesson at middle school level, this research addresses the unresolved question of whether and how snowball throwing contributes to the strengthening of students' academic self-beliefs. Thus, this study not only fills an important gap in the literature but also provides a more robust theoretical and empirical foundation for understanding the psychological impact of the snowball throwing model in contemporary instructional settings.

## Methods

This type of research is quantitative with an experimental research design. By definition, experimental research is a type of study in which the researcher manipulates conditions by providing a treatment and then observes the effect of that treatment (Akbar et al., 2023). In this study, the experimental design used is the posttest-only control group design. This design begins by dividing the sample into two groups, a control group and an experimental group, then administering the treatment, and finally measuring the results through a posttest. The

treatment given is the snowball throwing learning method, which is referred to as the independent variable. Meanwhile, students' self-efficacy is the dependent variable.

This study involved 126 seventh-grade students of MTsS Hifdzil Qur'an as the population. From this population, a cluster random sample of 60 students was selected and divided into two groups: 30 students in the experimental class and 30 students in the control class. The experimental class was taught using the snowball throwing learning method, while the control class continued with conventional instructional practices without any additional intervention. The implementation of the snowball throwing method in the experimental class consisted of 4 meetings, each lasting 90 minutes, conducted over 2 weeks. The instructional materials focused on set concepts, and each learning session was conducted through four main stages. The lesson began with an introduction in which the teacher explained the topic and learning objectives. This was followed by the implementation of the Snowball Throwing strategy, where students wrote answers or ideas on paper, formed paper balls, and exchanged them with classmates for discussion and evaluation. Subsequently, the teacher facilitated a discussion of the exchanged responses, addressed misconceptions, and provided feedback. The session concluded with a summary of the key points and a reflection on the learning process.

The control class was taught by the same teacher, using the same instructional materials, and for an equivalent duration, but following the conventional teaching method typically applied in the classroom. To control for external variables, both classes were conducted under similar environmental conditions, and no additional interventions were introduced outside the planned instruction. Following the instructional period, a posttest was conducted to evaluate changes in students' knowledge and self-efficacy levels.

To collect the required data, a self-efficacy questionnaire was used. This questionnaire consists of 16 statements to be answered by students after receiving the snowball throwing learning treatment. The self-efficacy questionnaire was developed based on Bandura's theory (Efendi, 2013), which states that there are three dimensions of self-efficacy: task difficulty level (magnitude), strength, and the breadth of domain and behavior (generality). The questionnaire was developed using a Likert scale consisting of four response options: strongly agree, agree, disagree, and strongly disagree.

The questionnaire's validity was assessed through an expert review process involving three reviewers, confirming that all items adequately represent the construct of self-efficacy. Furthermore, the reliability of the questionnaire was evaluated using Cronbach's alpha, which yielded a coefficient of $\alpha \geq 0.08$ indicating acceptable internal consistency.

After all data calculations are completed, the hypothesis in this study will be tested using the independent sample t-test. According to Jaya (2019) before performing the t-test, prerequisite tests must be conducted, namely the normality test and the homogeneity test. In this study, all data analysis procedures were carried out with the help of the SPSS 22 software.

## Results

The first step taken by the researcher after developing a valid and reliable questionnaire was to conduct a trial of the self-efficacy questionnaire. This trial was carried out to determine the validity and reliability of the questionnaire. Only after meeting these two criteria would the

self-efficacy questionnaire be deemed appropriate for use in the study. The trial results showed that out of the 16 statements included in the questionnaire, 7 were categorized as having moderate validity, while 9 were categorized as having high validity. Meanwhile, the reliability test results showed a reliability coefficient of 0.873, indicating that the questionnaire has a high level of reliability. Based on the results of this trial, the self-efficacy questionnaire is deemed suitable for use in the sample classes.

Next, the researcher carried out an intervention in the experimental class using the snowball throwing learning method over the course of two meetings, focusing on the topics of quadrilaterals and triangles. After the treatment was administered, the self-efficacy questionnaire was distributed to both sample classes. The responses were then analyzed quantitatively. The descriptive results of the questionnaire data can be presented in Table 1.

**Table 1**. Descriptive Result of the Questionnaire

| Group | Number of Students | Range | Minimum Score | Maximum Score | Average | Standard Deviation | Variance |
|---|---|---|---|---|---|---|---|
| Snowball Throwing Learning | 30 | 18 | 44 | 65 | 57,90 | 5,228 | 27,334 |
| Conventional Learning | 30 | 21 | 45 | 63 | 53,73 | 5,860 | 34,340 |

Based on Table 1, it can be seen that the average self-efficacy questionnaire score for students in the experimental class is 57.90, while the average score for students in the control class is 53.73. This indicates that students in the class using the snowball throwing method have higher self-efficacy than those in the class that did not receive any treatment. These findings suggest that the use of the snowball throwing learning method contributes to higher student self-efficacy compared to conventional teaching. In other words, there is a significant effect of the snowball throwing learning method on students' self-efficacy.

A similar result was also found in the analysis of the self-efficacy questionnaire when grouped according to the questionnaire's assessment criteria. The results are presented as Table 2.

**Table 2**. Analysis Of The Self-Efficacy Questionnaire

| Interval | Snowball Throwing Learning | | Conventional Learning | | Criteria |
|---|---|---|---|---|---|
| | Number | Percentage | Number | Percentage | |
| 91 – 100 | 0 | 0% | 0 | 0% | Very High |
| 78 – 90 | 0 | 0% | 0 | 0% | High |
| 65 – 77 | 5 | 17% | 0 | 0% | Fairly High |
| 52 – 64 | 22 | 73% | 20 | 67% | Moderate |
| 39 – 51 | 3 | 10% | 10 | 33% | Fairly Low |
| 26 – 38 | 0 | 0% | 0 | 0% | Low |
| 14 – 25 | 0 | 0% | 0 | 0% | Very Low |

Based on the Table 2, in the class that received the snowball throwing learning method, 17% of students had moderately high self-efficacy, while in the conventional learning class, no students fell into this category. The same pattern appears in the moderate self-efficacy category, where 73% of students in the snowball throwing class fell into this range, compared to only 67% in the conventional class. The difference becomes even more noticeable in the moderately

low self-efficacy category: the snowball throwing class recorded only 10%, whereas the conventional class reached 33%.

This data indicates that the level of students' self-efficacy in the snowball throwing learning method is higher than that of students in conventional learning. Therefore, it can be concluded that the snowball throwing learning method has an influence on students' self-efficacy.

To strengthen the statement that the snowball throwing learning method has a significant effect on students' self-efficacy, it is necessary to verify it through inferential statistics. First, a hypothesis is formulated to be tested, followed by classical assumption tests as prerequisites for conducting the t-test. There are two prerequisite tests that must be fulfilled: the normality test and the homogeneity test. Once the data meet both of these assumptions, the t-test can be conducted to determine the validity of the formulated hypothesis.

The normality test is a prerequisite test aimed at determining whether the data collected comes from a population with a normal distribution or not. Ideally, the data should come from a normally distributed population in order for the t-test to be appropriate. The normality test in this study was conducted using the Kolmogorov-Smirnov test with the help of SPSS software. The result present in Table 3.

**Table 3**. The Result of Normality Test

| Group | Kolmogorov Smirnov | | |
|---|---|---|---|
| | Statistic | Df | Sig |
| Conventional Learning | 0,107 | 30 | 0,200 |
| Snowball Throwing Learning | 0,125 | 30 | 0,200 |

By observing the significance value (sig) for conventional learning, which is 0.107, and the significance value for snowball throwing learning, which is 0.125, and comparing both to the significance level of 0.05, it is found that both sig values are greater than 0.05. Therefore, it can be concluded that both data sets are normally distributed. This means that the self-efficacy data of students who received conventional learning and those who received snowball throwing learning come from populations that meet the assumption of normal distribution.

The next prerequisite test is the homogeneity test. This test is necessary to determine whether the data collected in this study have homogeneous variance. If the data do not have homogeneous variance, the t-test cannot be performed. To verify homogeneity, the Levene's test was conducted using SPSS 22. The results of the test are present in Table 4.

**Table 4**. The Result of Homogenity Test

| Levene Statistic | df1 | df2 | Sig |
|---|---|---|---|
| 0,605 | 1 | 58 | 0,440 |

By observing the Sig value in the table above, which is 0.440, it can be seen that this value is greater than the significance level of 0.05. This indicates that the self-efficacy data of students who received snowball throwing learning and those who received conventional learning have homogeneous variances.

Based on the prerequisite tests conducted earlier, the self-efficacy data meet the requirements for both normality and homogeneity. Therefore, the data can be analyzed using

an independent sample t-test to verify the research hypothesis. The results of the t-test, conducted using SPSS 22, are as follows in Figure 1.

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | T | Df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Homogenitas *Self Efficacy* | Equal variances assumed | .605 | .440 | -2.906 | 58 | .005 | -4.167 | 1.434 | -7.037 | -1.297 |
| | Equal variances not assumed | | | -2.906 | 57.261 | .005 | -4.167 | 1.434 | -7.038 | -1.296 |

**Figure 1**. The Results of the T-Test

Based on Figure 1, the Sig (2-tailed) value is 0.005. This value is then compared with the significance level of 0.05, indicating that Sig (2-tailed) < 0.05. According to the decision-making criteria, this result leads to the acceptance of the alternative hypothesis (Ha) as the valid conclusion of this study. Therefore, it can be concluded that there is a significant effect of the snowball throwing learning method on students' self-efficacy in mathematics learning.

## Discussion

Both descriptive and inferential analyses clearly show that the snowball throwing learning method has a significant effect on students' self-efficacy. This effect is evident from the data, which indicate that students in the snowball throwing class have higher self-efficacy, whereas students in the conventional learning class demonstrate lower levels of self-efficacy.

The positive influence of the snowball throwing learning method on students' self-efficacy can be explained by its learning syntax, which actively engages students throughout the learning process. In snowball throwing learning, students are required to formulate questions, exchange them with peers, and respond to questions during group discussions. These activities provide students with mastery experiences, as they are directly involved in understanding and explaining mathematical concepts. Successfully completing these tasks strengthens students' beliefs in their own abilities to learn mathematics.

In addition, during the discussion stage, students observe how their peers solve problems and express mathematical ideas. This process provides vicarious experiences**,** particularly for students who initially have low confidence, as they learn from classmates with similar ability levels. Furthermore, the interactive nature of group discussions encourages verbal persuasion**,** as students receive feedback, encouragement, and reinforcement from both peers and teachers.

These forms of social support play an important role in strengthening students' confidence in their mathematical abilities.

The snowball throwing learning syntax also incorporates a game-based element through the activity of throwing and answering questions. This dynamic and enjoyable atmosphere reduces learning anxiety and creates positive emotional conditions, which contribute to students' physiological and affective states. According to Nursafitri et al (Nursafitri & Sarifah, 2023), play-based learning activities can increase students' interest and enthusiasm in learning mathematics. When students feel relaxed and motivated, they are more willing to participate actively in the learning process.

Moreover, the competitive design of the snowball throwing activity encourages students to focus more deeply on understanding the mathematical concepts being studied. Games structured as competitions motivate students to put forth their best effort in order to succeed (Makarim & Fathurrohman, 2023). As students become more focused and engaged, their conceptual understanding improves. A strong understanding of the material subsequently enhances students' confidence, which is closely related to self-efficacy (Santosa, 2018).

Therefore, it can be concluded that the significant effect of the snowball throwing learning method on students' self-efficacy is not merely due to increased student activity, but is closely related to the alignment between its learning syntax and the core sources of self-efficacy, namely mastery experiences, vicarious experiences, verbal persuasion, and positive affective states.

Several previous studies have also revealed similar findings. For example, the study conducted by Novianti et al. (2018), which examined the snowball throwing model as the independent variable and problem-solving skills viewed from students' self-efficacy as the dependent variable. Novianti found that the snowball throwing model had a significant influence, showing that students with high levels of self-efficacy demonstrated better problem-solving abilities compared to those with lower self-efficacy.

Similarly, a study conducted by Lilik Fadilatin Azizah also supports this finding. Azizah (2018) found that the snowball throwing learning method effectively improved students' academic achievement, along with high levels of self-efficacy. She further recommended the use of snowball throwing as a strategy to address issues faced by students with low self-efficacy.

## Conclusion

Based on the data analysis, it can be concluded that the snowball throwing learning method has a significant effect on improving students' self-efficacy. This impact is attributed to the unique characteristics of the snowball throwing method, which creates an effective learning environment where students are more active, enthusiastic, and better able to understand mathematical concepts—ultimately leading to improved academic performance.

These findings suggest that mathematics teachers may consider integrating the *snowball throwing* method into classroom instruction, particularly when addressing issues related to low student self-efficacy. Moreover, the method has the potential to be applied as an intervention for other challenges related to students' mathematical skills.

For future research, it is recommended to investigate the long-term effects of the *snowball throwing* method on self-efficacy and academic achievement across different grade levels and subject areas. Additionally, further studies could explore how the method interacts with other pedagogical strategies or student characteristics, such as motivation, learning style, or prior knowledge, to better understand its broader applicability and effectiveness.

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## Declarations

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