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To cite this article: Hanifah *et al* 2020 *J. Phys.: Conf. Ser.* **1613** 012062

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Mathematical Representation Ability and Self -Efficacy

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Abstract. In mathematics, there are several abilities should be belong to students. One of the abilities should be belong to students is the ability of the mathematical representation. Mathematical representation ability makes it easy for students to solve mathematical problems, because students are required to make their mathematical models, by making mathematical models students will be easier to solve mathematical problems. This basic mathematical ability can be mastered well by students if students have affective abilities, one of them is self-efficacy. In this study, qualitative research methods are used. Descriptive research is chosen the type of literature study. Data collection method with literature study. This article examines the ability of the representation and self-efficacy in mathematics learning, which includes indicators of what needs to be developed in the ability of the mathematical representation, and indicators contained self-efficacy in mathematics learning. The brief description is based on an analysis of the representation abilities and self-efficacy in mathematics learning.

Keywords: mathematic, representation ability, self-efficacy

1. Introduction

Mathematics learning has a goal about abilities that should be have students. This ability is better known as mathematical ability. What is ability of mathematical? This question has been answered which suggested about ability of mathematical is the ability to deal with problems, both in mathematics and in real life [1].

The general objective in learning mathematics is problem solving, while the ability to solve problem is a basic ability in mathematics learning [2]. The key success of solving problems depend on the ability to represent problems, including creating and using mathematical representations in the form of words, graphs, tables, and equations, solutions, and symbol manipulation.

Improve the ability to make mathematical models, solve problems and interpret solutions [3]. This basic ability of mathematical can be mastered students well if they have affective abilities, one of them is self-efficacy. Students who have good self efficacy are expected to be able to make representations of mathematical problems, so students will more easily solve mathematical problems.

Therefore, this literature study will discuss about the ability of representation and self-efficacy in learning mathematics, which includes indicators of what needs to be developed in the ability of the mathematical representation, and indicators contained self-efficacy in mathematics learning. As an important ability that is also owned by students in mathematics learning. The discussion in this article uses a theoretical study of relevant library material.



2. Method

In this study, qualitative research methods are used, which aim to get answers that related to opinions, responses, perceptions or description of words. Descriptive research is chosen the type of literature study which is a review of the literature. Data collection method with literature study. The data collection techniques in library study refer to the technique by conducting a study of literature books, notes, and reports that are related to the problem being solved related to informal evidence in mathematics learning [4]. The research in this article aims to discuss the ability of the representation and self-efficacy in mathematics learning, which includes indicators of what needs to be developed in the ability of the mathematical representation, and indicators contained self-efficacy in mathematics learning. The brief description is based on an analysis of the representation abilities and self-efficacy in mathematics learning.

3. Result and Discussion

In this section, we will discuss how the ability of representation and self-efficacy is carried out in mathematics learning

3.1 Ability to Representation in Mathematics Learning

The standard mathematics learning process, namely: first, mathematical problem solving; second, mathematical reasoning and proof; third, mathematical communication; fourth, mathematical connections; and fifth, mathematics representation [1]. The five standard processes can not be separated from mathematics learning, because all the five is interrelated with one another in process of learning and teaching mathematics. Standard representations emphasize the use of symbols, charts, graphs and tables in connecting and expressing mathematical ideas. This shows that representation is one of the standard abilities that must exist in mathematics learning.

Representation is something that cannot be separated in mathematics learning [2]. Although it is not explicitly stated in the purpose of learning mathematics in Indonesia, implicitly the importance of representation appears in the goals of mathematical problem solving and communication, because to solve mathematical problems, the ability to make mathematical models and interpret solutions is an indicator of representation is needed.

Representation is a form of interpretation of students' thinking of a problem, which is used as a tool to find solutions to those problems [5]. In addition, students also easily get problem solving strategies. Revealed that "representation can support learning when instruction supports understanding understanding before using it to explain mathematical concepts [6]. Based on this opinion it can be said that the need to give an image to students about mathematical representation before starting to invite students to apply mathematical representation in solving everyday problems. Therefore that teachers should provide encouragement to students to develop their mathematical representation abilities during class learning [7].

The first standard of representational ability is to create and to use representation to organize, to record, and communicate mathematical ideas [1]. The second standard is choosing, using and translating between representations to solve problems, and the third standard is using representations to create models and interpret mathematical, physical, and social phenomena.

Representation is a configuration that can represent something else in several ways [8]. For example, a word can represent a real-life object, a number can represent a person's weight size, or the same number can represent a position on a number line. Forms of student interpretation can be in the form of words or verbal, written, drawing, tables, graphs, concrete objects, mathematical symbols and others [7].

Mathematical representations can be represented in visual and non-visual representations [9]. Visual representations include graphs, tables, sketches / drawings, and diagrams; Non-visual representations include numerical representations, and mathematical equations or mathematical models. Mathematical representation is divided into several types, as follows: (1) Representation of language (spoken language); translating observed traits and relationship in mathematical problems into written word. (2) Static Picture Representation; namely translating mathematical problems into representations of

images, tables, diagrams or graphs. (3) Representation of the symbol (Written symbol); translating mathematical problems into formulas, equations or mathematical expressions [10].

The ability of mathematical representation is measured by the achievement of the indicators. The indicators uses aspect of the ability of mathematical representation, namely the representation of language (words or written text), image representation and symbol representation [10].

Based on some of the opinions above, the mathematical representation indicators are: representation in the form of images include: creating geometrical shapes to clarify the problem and facilitate its resolution; representations in the form of mathematical expressions include: making mathematical models from a given problem; solve problems by involving mathematical expressions. representation in the form of written text includes: answering questions using written text.

3.2 *Self-efficacy in Mathematics Learning*

The learning process at school will succeed if it is supported by psychological aspects related to students' attitudes in learning [11]. Self-efficacy is a psychological aspect that produces a significant effect [12]. Self-efficacy is a person's judgment about his ability to carry out certain behaviors or achieve certain goals. Self-efficacy is an individual's beliefs about his ability to organize and complete a task that is needed to achieve certain results [13]. Self-efficacy is important for everyone to deal with a problem at hand [14]. Self-efficacy also greatly affects self-confidence, whereas self-confidence is one of the important aspects of personality in human life, which is formed through the process of learning in its interaction with the environment. Self-confidence is an aspect of human personality that has an important function to actualize human potential.

Self-efficacy is a belief / confidence that must be possessed by students in order to succeed in the learning process [15]. Based on this, the relationship with the ability of mathematical representation is self-efficacy has a function to assess the success of students in solving problems of mathematical representation ability, because with cell efficacy students are trained to be sure of their abilities, dare to face challenges, not easily to give up in solving problems, can knowing the weaknesses himself, then the treatment can indirectly change the habits of students so they are not ashamed to ask question, dare to express opinions, can work together with others, dare if asked by the teacher to come forward, with these things can indirectly hone students' mathematical representation abilities.

Self-efficacy plays an important role because its existence will motivate someone to have more regularity and self-assessment as a form of preparation in facing challenges in order to achieve the planned objectives. Self-efficacy prioritizes mastery in cognitive aspects so as to produce good performance [16], so that it can achieve its goals well as desired. Self-efficacy has a significant relationship or can make a major contribution to the achievement of students' mathematical abilities [17].

The effect of mathematical self-efficacy affects students' mathematical achievement. High self-efficacy creates calm in front of the task and confidence in facing difficult activities [18]. Conversely, someone who doubts his ability, think of things in a way that is more difficult than the real truth. Trusting one's academic abilities is an important component of school success. When someone is routine with the demands of a task or activity, they tend to bring up the self-efficacy that has been developed as a result of previous experience with similar assignments. There is a relationship between self-efficacy and academic achievement, namely the higher the self-efficacy, the higher the academic ability. Self-efficacy is also a determinant that influences a person's choice in perseverance in facing difficulties and the mindset and emotional reactions they experience.

There are four main sources that influence self-efficacy [13], that is:

1. Experience has success, for example in mastering a task or in controlling an environment, the ability of self-efficacy in that field will be awakened. A person can have strong self-efficacy that requires experience in overcoming obstacles through effort and perseverance.
2. The experience of observing others around, by seeing others succeed with ongoing efforts, it can increase self-efficacy to master an activity to succeed in that field.
3. People who have high intellectual when living can strengthen self-efficacy. So it can be assured that its ability can be used to get success.

4. Emotional & physiological conditions will affect to self-efficacy. Emotional conditions such as mood and stress, as well as physiological conditions such as pain and fatigue, can reduce the ability of self-efficacy. These conditions are interpreted as signs of vulnerability to ~~poor~~—reduce performance while positive conditions can increase self-efficacy.

From 4 main sources above, the experience of having success is the biggest source of self-efficacy because it is based on personal experience that every person has experienced [19]. In addition to these four sources, the level of self-efficacy of a person is caused by the presence of several factors that influence the perception of an individual's self abilities, among others [13], as follows.

1. Gender

Parents often have different views on the abilities of men and women. When men try to be very proud of themselves, women often underestimate their abilities. This comes from the parents' view of their children. Parents consider that women are more difficult to follow the lessons than men, even though their academic achievement is not too different. Parental involvement is indirectly related to students' mathematical achievement through the intermediary effect of mathematical self-efficacy, either partially or completely. In certain occupations, men have higher self-efficacy compared to women, and vice versa, women excel in some jobs compared to men.

2. Age

Self-efficacy is formed through a social learning process, it can be until our lifetime. Older needs more time span and experience in dealing it when compared to younger individuals, even younger may still have less experience life. Someone who is older will better able to overcome obstacles in his life compared to younger individuals, this is also related to the experience that individuals have throughout their life span.

3. Education level

Self-efficacy is formed through a learning process that can be accepted by someone at the formal education level. Someone who has a higher level usually has higher self-efficacy because basically they receive more formal education, besides someone who has a higher education level will get more opportunities to learn in overcoming problems in his life.

4. Experience

Self-efficacy is formed through the learning process that can occur in an organization or company where someone works. Self-efficacy is formed as a process of adaptation and learning that exists in the work situation. The longer a person works, the higher the self-efficacy that the individual has in a particular job, but does not rule out the possibility that the self-efficacy owned by the individual tends to decrease or remain constant. It also really depends on how individuals deal with the successes and failures they experience while doing work.

There are three dimensions used as a basis for measuring self-efficacy abilities [13], that is:

1. Magnitude

This dimension is related to the level of difficulty of a task that is believed by someone to be completed. If the individual is faced with problems or tasks arranged according to a certain level of difficulty, the Self-Efficacy will fall on tasks that are easy, moderate, and difficult in accordance with the limits of perceived ability to meet the behavioral demands needed for each level the. The dimension of difficulty has implications for the choice of behavior that is tried or which will be avoided. Individuals will try behaviors that they feel are capable of doing and will avoid behaviors that are felt to be outside their limits.

2. Strength

This dimension relates to the level of strength or weakness of an individual's beliefs about his abilities. Individuals with strong Self-Efficacy regarding their abilities tend to never give up and be resilient in increasing their business despite facing obstacles. Conversely individuals with weak Self-Efficacy tend to be easily shaken by small obstacles in completing their assignments.

3. Generality

This dimension is a dimension related to the breadth of the field of work performed. In overcoming or solving problems / tasks, some individuals have limited beliefs in certain activities and situations and some spread on a variety of activities and situations.

Other factors that influence self-efficacy include perception of ability, social comparison, attribution, available time, and perceived interests [20]. People may believe that students can control the use of their learning strategies, efforts, and perseverance, but if they still have low self-efficacy for learning then they feel learning is not important and does not want to invest time in it. Students usually stick to activities not because of high self-efficacy but rather because teachers keep them on task. There is a positive correlation in the early stages of learning when greater perseverance leads to better performance. As skills develop students must require less time to complete assignments, which means that self-efficacy will negatively correlate to perseverance. Thus, self-efficacy can predict perseverance better in higher-level classrooms, so this problem needs to be explored during academic learning.

Therefore, it can be said that this ability is only a strong predictor of problem solving and perseverance. Self-efficacy is an independent and significant predictor. So the teacher needs to know and direct that students have self-efficacy so that students are able to solve mathematical problems [21]. In addition, self-efficacy also has a strong direct effect on student performance [22]. To develop students' self-efficacy in solving mathematical problems, among others, respect the opinions of others if there are questions or suggestions submitted by students from other groups. This is one of the characteristics of students who have confidence, work hard, dare to appear in describing their ideas, are creative and critical in solving various mathematical problems he faces, and are not easily give up.

4. Conclusion

From the discussion that has been explained above, the writer concludes that the ability of mathematical representation is one of the abilities that is very important for students and is one of the goals to be achieved in learning mathematics. Representation is very useful in helping students solve a problem more easily. Representation is also useful as a means of communicating students' mathematical ideas or ideas to other students and to the teacher. Learning mathematics in class should provide sufficient opportunities for students to practice and develop mathematical representation abilities. Self-efficacy plays an important role in everything, especially for students who are solving math problems. With the high ability of self-efficacy in students is expected to succeed in solving mathematical problems. Thus, to instill high student self-efficacy, the teacher needs to create a learning atmosphere that is fun, active, and develops students' self-confidence and always gives good motivation. developing students' self-efficacy in solving mathematical problems including respecting the opinions of others when there are questions or suggestions submitted by students from other groups. This is one of the characteristics of students who have confidence, work hard, dare to appear in describing their ideas, are creative and critical in solving mathematical problems they face, and are not easily give up. Based on the description it can be said that the expression of students' ideas requires effective communication skills, hard work, and high confidence so that good ideas can be realized in the form of questions and suggestions.

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