

The Role of Educational Psychology in Mathematics Education and Learning in Schools

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Abstrak

Psikologi pendidikan merupakan salah satu cabang ilmu psikologi yang memiliki peran penting terhadap pendidikan. Sejarah menunjukkan bahwa psikologi pendidikan telah andil dalam pengembangan pendidikan dari waktu ke waktu, khususnya terhadap pendidikan matematika. Kesadaran tentang perbedaan individu dan perlunya intervensi psikologis pada siswa, semakin menguatkan peran psikologi pendidikan dalam pendidikan dan pembelajaran matematika. Penelitian ini bertujuan untuk mendeksripsikan peran psikologi pendidikan dalam terhadap pendidikan matematika. Menggunakan pendekatan kualitatif dengan desain literatur studi, penelitian ini mendiskusikan peran psikologi pendidikan pada proses pembelajaran matematika, asesmen pembelajaran matematika, dan penelitian pendidikan matematika.

Keyword: Psikologi Pendidikan, Pendidikan Matematika

Abstract

Educational psychology as a branch of psychology has an essential role in education. History shows that educational psychology calls for education to develop over time, especially in mathematics education. The awareness about individual differences and the fact that students need psychological intervention, the more convincing the role of psychology in education in mathematics learning. This study describes the role of psychology in mathematics education. Using a qualitative approach with a literature study design, this research discusses the role of educational psychology in the learning process of mathematics, mathematics assessment, and mathematics education research.

Keyword: Educational Psychology, Mathematics Education



PENDAHULUAN

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students can actively develop their potential (Rini, 2013). In this effort, there is an awareness that every human being has different potential. These differences in potential are in the areas of intelligence, interests, and privileges that each individual has (Salamah et al., 2023). For this reason, many institutions continue to strive to realize an ideal education system (Setiawan, 2016). Until now, schools are still the main educational institution for students to develop their unique potential (Audrey et al., 2023).

Education in schools is represented through learning in the classroom and outside the classroom. According to Pane and Dasopang (2017), learning is the process of interaction between students and educators, with lesson materials, delivery methods, learning strategies, and learning resources in a learning environment. Each element in learning is interrelated and has its own central function in each subject.

The subject of mathematics as one of the compulsory subjects from elementary school to high school has a special role. According to Handoko (2017), mathematics has an important role as the parent of science, a tool, a helper of mindsets, and an attitude builder (Siyoto & Sodik, 2015). Therefore, mathematics learning has its own uniqueness in its learning process which includes aspects of mathematical knowledge, mathematical applicability, and attitudes. On the other hand, mathematics is also not exempt from being considered a difficult subject and often makes you anxious (Amalia et al., 2022). This is why many studies take a psychological perspective in studying the learning process of mathematics, especially one of the branches of psychology, namely educational psychology.

According to Hidayat and Madya (1993) Educational Psychology is a systematic study of the processes and factors involved in individual learning or learning activities. Meanwhile, according to Tolland and Carrigan (2011), the study of educational psychology includes *assessment, intervention, consultation, and research*. Educational psychology is the main element that teachers need to master in improving the quality of mathematics learning (Gusteti & Neviyarni, 2022). Therefore, a mathematics teacher is not only required to master the math material, but also understand the psychological state of students during the learning process.

However, when students consider mathematics to be a difficult subject (Siregar, 2017). Various problems that arise in the mathematics learning process start from this perception. Sedyadi (2015) revealed that students often cheat in mathematics learning because of the assumption that mathematics is a difficult subject. Meanwhile, according to Ratnasari (2017), students' mathematics learning achievement is also low due to low interest in learning mathematics. Some cases show that the psychological aspect has a large role in the learning of mathematics itself.

This initiated the importance of the role of educational psychology in mathematics education. Therefore, this study aims to describe the role of educational psychology in the mathematics learning process, the role of educational psychology in mathematics lesson assessment, and the role of educational psychology in mathematics education research.

METHOD

This research uses a qualitative approach with a literature study design. Literature study design is a qualitative research design that uses the collection of library data, to be then read, recorded, and processed into a research study (Darmalaksana, 2020). In this study, the literature data used were articles related to psychological issues in mathematics education and educational psychology.

RESULTS AND DISCUSSION

A. The Role of Educational Psychology in the Mathematics Learning Process

Math learning is unique because it uses symbols and numbers. It is not uncommon for some students to need to think more, thus leaving the stigma that mathematics is a difficult subject

(Siregar, 2017). This causes low interest in learning, thus affecting students' mathematics scores (Sirait, 2016).

According to Umbara (2017) the role of educational psychology in mathematics learning is; Provide a conducive learning atmosphere, form a student center in the classroom, and focus on developing students' unique potential.

Educational psychology has a role to play in making mathematics learning fun and effective through intervention. Interventions carried out by educational psychology are aimed at influencing the process of brain development, cognition, behavior, and emotional regulation of students (Toland & Carrigan, 2011). We can see this in complexity in mathematics learning theory and mathematics learning approaches or models.

It begins with learning theories in mathematics learning such as mental discipline learning theory, behavioristic learning theory, cognitive learning theory, and humanistic learning theory (Lestari & Yudhanegara, 2017). These theories are part of educational psychology which is then applied in mathematics learning. The learning theory underlies the way of thinking and acting in mathematics learning. This shows how educational psychology plays a radical role in mathematics learning.

Then mathematics learning models that use student psychology as the basis for their development such as; SAVI (Somatic, Auditory, Visualization, Intectual) learning model, AIR (Auditory, Intellectually, Repetition) learning model, MID (Meaningful Instructional DesignIt) and so on.

According to Lestari and Yudhanegara (Lestari & Yudhanegara, 2017) The SAVI learning model is a learning model that involves movement through the body and senses and then uses the intellect to think. Similar to the VAK learning model and the AIR learning model which emphasizes that learning must utilize sensory tools. These models are based on the realization that humans can reach the peak of their abilities if they make significant use of the dominant senses (Elfiky, 2007). This shows the role of educational psychology in the formation of the idea of creating a learning model.

It is clear how educational psychology affects every element in the mathematics learning process. The role of educational psychology is not as an outsider, but as an initiator in the mathematics learning process. It is aimed at intervening in the development of students' brain, cognition, behavior, and emotional regulation in order to realize an essential education.

B. The Role of Educational Psychology in Mathematics Lesson Assessment

Behind the assumption that mathematics is a difficult subject that many students do not like, apparently not a few students actually like mathematics very much. Usually those who like math are students who don't really like long readings, or convoluted sentences.

Gardner (2011) states that humans have different dominant intelligences. This causes the level of interest and achievement of students to also vary. In line with Reavis (1999) who implies that everyone is a genius. But he judged a fish by his ability to climb a tree, he would believe all his life that he was a fool.

According to Gardner (2011), one type of intelligence in humans is logical – mathematic intelligent or logical – mathematical intelligence. Students with logical-mathematical intelligence tend to be smarter at operating numbers and symbols. Therefore, in theory, students with mathematical intelligence will be better at math lessons than other students.

However, mathematics is a subject that must be completed by students in Indonesia from elementary school to high school. In accordance with the applicable curriculum, every student is required to complete mathematics lessons well, regardless of the intelligence that students have.

Educational psychology plays a role in mathematics assessment with the aim of protecting and facilitating students' rights to continue to complete mathematics learning well. Assessment in mathematics learning is carried out with a question model according to the intelligence of each student. Some assessments in mathematics learning that have been developed according to the type of student intelligence include; math assessment for a group of students with musical intelligence (Benefit et al., 2019), a mathematical assessment for a group of students with kinesthetic intelligence (Benefit et al., 2019), and a mathematical assessment for a group of students with interpersonal intelligence (Benefit et al., 2019).

Benefit et al (2019) developed a mathematical assessment with musical intelligence. The development aims to ensure that the measurement of mathematics learning outcomes in students with musical intelligence can be effective through the construction of musical-based mathematics problems.

In line with this, Benefit et al., (2019) also developed a mathematical assessment with kinesthetic intelligence for students with kinesthetic intelligence. The objectives of the development are; Measurement of effective mathematics learning outcomes through the construction of kinesthetic-based mathematics problems.

Likewise, Benefit et al., (2019) who developed a mathematical assessment for students with interpersonal intelligence. The development is carried out so that the measurement of students' mathematics learning outcomes can be effective according to the intelligence of the students themselves, namely through the construction of interpersonal-based mathematics problems.

Development after development is carried out, showing the role of educational psychology in assessment in mathematics lessons. That the existence of educational psychology in the assessment of mathematics lessons aims to guarantee and facilitate the rights of students to be able to complete mathematics learning properly.

C. The Role of Educational Psychology in Mathematics Education Research

Mathematics is a unique subject because it uses a lot of symbols, abstractions, and generalizations (Amidi, 2017). This makes mathematics education have many interesting aspects to research.

In contrast to ordinary mathematics education research that discusses mathematics content, learning models, or the development of teaching materials. Through educational psychology, mathematics education research is seen from different perspectives. Special elements of psychology are studied in the mathematics learning process. The following are some of the research on educational psychology in mathematics learning:

a. Interest in Learning Mathematics

According to Sari & Esti (2015), students' interest in learning is the student's interest in learning. Meanwhile, Hidayat & Widjajanti (2018) stated that student learning interest can be defined as the student's state, so that it can cause a sense of liking that can generate enthusiasm in doing an activity that can be measured from liking, interest, and involvement in participating in the learning process. In mathematics learning, interest is indispensable and becomes a booster of student achievement itself.

b. Self Efficacy Mathematics

Self-confidence is a unique and important aspect of life. With the confidence they have, students can complete assignments or exams at school well. Students will believe in their abilities so that cheating behavior can be avoided. Students will be positive about their abilities and will not be easily influenced by others if they have high confidence. In mathematics lessons, the aspect of self-confidence or self-efficacy is the central part of its existence. Because many students have low math learning achievement due to lack of confidence.

c. Math Anxiety

Mathematical anxiety is a psychological disorder in the form of feelings of fear and anxiety in solving mathematical problems (Saputra, 2014). Meanwhile, according to Woodard (2004), some of the signs that a person experiences math anxiety are nervousness, lack of concentration, empty thoughts, and even feelings of nausea when facing math class.

The significant negative influence of math anxiety on students is shown by the following studies: Mathematical anxiety affects students' mathematical connection ability (Anita, 2014). Mathematics anxiety affects the mathematics learning outcomes of grade X students of SMA Negeri 11 Banda Aceh (Qausarina, 2016). Mathematical anxiety affects the understanding of mathematical concepts (Handayani, 2016).

d. Mathematical Disposition

Students' attitude toward mathematics is a mathematical disposition (Izzati, 2017). Mathematical disposition shows behavior that considers mathematics in his daily life. According to Lestari & Yudhanegara (2017) several aspects in mathematical disposition include; confidence, flexibility, interest, perseverance, self-reflection, and self-assessment of the application of mathematics in daily life.

Research on disposition has shown that mathematical disposition can be a predictor of students' success in learning mathematics. Sarifah et al., (2018) revealed that mathematical disposition affects students' mathematical solving skills. Meanwhile, Izzati (2017) revealed that mathematical disposition has an effect on the learning outcomes of flat-plane geometry students of IAIN Syekh Nurjati Cirebon.

e. Mathematical Resilience

Mathematical resilience is a person's ability to assess, overcome, and improve themselves or change themselves from adversity or adversity in learning mathematics (Zanthy, 2018). The concept of mathematical resilience has a central position in mathematics learning because many students experience difficulties in taking mathematics lessons (Johnson-Wilder & Lee, 2010).

These studies aim to describe and find solutions to problems in mathematics education. On the other hand, the realization that learning mathematics is not only about logic and arithmetic skills, but also the mental processes that underlie it. We can see that educational psychology plays an important role in this.

CONCLUSION

Mathematics is a unique subject because students become more active in using the skills of number processing, abstraction, and generalization. However, learning mathematics does not only involve the ability of logic and arithmetic. More than that, there are mental processes that underlie many factors of student success in mathematics education. All of that is inseparable from the role of educational psychology.

The role of educational psychology in mathematics education includes the process of learning, assessment, and research. The role of educational psychology in the learning process is shown by the theory and model of learning. Educational psychology also plays a role in the assessment of mathematics lessons, as shown by the development of many multiple-intelligent mathematics test constructions. In addition, educational psychology also plays a role in mathematics education research, as shown by the many studies of mathematics education psychology.

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