The Effectiveness of Inquiry Learning Strategies in Mathematics Learning Outcomes

Nuke Lu'Lu Ul Chusna S[1,2], Zulfiati Syahrial[1], Nurdin Ibrahim[2]

[1]Education Technology, Universitas Negeri Jakarta, Indonesia
[2]Informatics Technology, Krisnadwipayana University, Indonesia
Email:NukeLuluUlChusnaS_7117167425@mhs.unj.ac.id, zulfiatisyahrial@gmail.com,
nurdin1349@gmail.com, nukelchusna@unkris.ac.id

Abstract

Student mathematics learning outcomes are still low, so educators must improve and develop learning by analysing learning strategies for student learning outcomes. Effective learning is not simple or certainly not sufficient anymore if only interpreted as a transfer of knowledge, it is important to be interpreted as constructivist learning that is more oriented towards students (student centuries). In a sense, students or learners become the centre of learning. While teaching-learning surrounds students. To realize effective learning is very dependent on how learners can develop learning strategies and can choose the right strategy in carrying out learning activities. Strategy is an attempt to obtain success and success in achieving learning objectives. From the existing problems, the researcher tries to apply a learning strategy that is considered effective to improve student mathematics learning outcomes, and what is appropriate is the inquiry learning strategy. Inquiry learning strategies provide broad opportunities for students to play an active role in the learning process.

Keywords: Effectiveness, Learning Strategies, Inquiry

Introduction

Education is one aspect of life that has a very important role in shaping the high quality and dedicated human resources (HR). In the National Education System Law number 20 of 2003 in Article 1 Paragraph 1 it is stated that Education is a conscious and planned effort to create an atmosphere of learning and learning process so that students actively develop their potential to have religious-spiritual strength, self-control, personality, intelligence, noble character and skills needed by himself, society, nation, and state. Education is one aspect of life that plays an important role in facing the challenges of the times and the development of science and technology. So education must be implemented as well as possible to obtain maximum results. Education cannot be carried out without learning, and vice versa learning will not be meaningful without the aim of education. Education is a business of personal development as a whole and more concerned with issues of image and values, while learning is an effort to develop intellectual capacity and various physical skills (Wala et al., 2017). Education is a plan to create a learning atmosphere and learning process so that students are active in developing their potential (Tyas&Naibaho, 2021).

Learning is more than a set of methods. Smart educators will approach learning material not as static knowledge or ideas, but as meaningful ways of thinking in a discipline that meansassigning a set of

concepts and a series of strategies to ask questions and create knowledge (Crawford et al., 2005).

A problem that exists when students are faced with problems given by the teacher, to solve the problems of various mathematical problems for students (Verschaffel et al., 2020), traditionally, because students do not understand in solving the problems given (Yerushalmy, 2006). In learning mathematics, students are prepared to face the process of problems in mathematics that must be carried out by students, namely problem solving, reasoning and verification, communication, connection, and representation where representation is one of the interpretations of students thoughts on problems in mathematics in the form of words, tables, graphs and or mathematical symbols as an instrument for solving problems (Fashihah&Qohar, 2020).

Mathematics is a deductive science, because the process of finding truth (generalization) in mathematics, is different from natural science and other sciences. The truth-seeking method used is the deductive method, where the generalization of the nature, theory, or proposition can be accepted after being proven deductively. Mathematics is an organized structured science because mathematics starts from elements that are not defined to the axioms or postulates and finally to the theorems. Mathematical concepts are arranged in a hierarchical, structured, logical, and systematic manner starting from the simplest concepts to the most complex concepts. Therefore, to study mathematics, the previous concepts that are prerequisites must be mastered to understand the next topic or concept (HastutiNoer, 2017).

Effective learning and learning skills for students are assumed by educators when they are adults and have a lot of experience with schools, but many students do not develop effective learning strategies. To acquire and integrate most cognitive processing skills, including learning strategies, problem-solving, decision making, and critical thinking students need practice and feedback that is guided by educators so that the role of educators can play a large role in helping students develop strategies to study and effective learning (Weinstein, 1989).

Good inquiry-based learning should not only develop in the understanding that scientific knowledge is subject to revision and knowledge based on empirical evidence whose meaning is influenced by the model or theory used. In addition, inquiry learning strategies can give students more freedom in formulating questions and choosing how to solve them, and providing opportunities for meaningful and positive interactions (Aditomo&Klieme, 2019). The inquiry learning strategy allows students to be actively involved in constructing concepts, but during the learning process, the tutors are still guided by the teacher. Success in increasing understanding of problems in solving mathematical problems, then learning focuses on finding concepts by students and is expected to be more meaningful for students themselves (Ananda &Prabawanto, 2020). The inquiry strategy is more emphasized on the process of students finding ways to solve problems from mathematical problems given by the teacher and remaining under the guidance and supervision of the teacher. The inquiry method, namely the finding method, is very effective in helping students understand concepts and improve skills in solving existing problems (Razali et al., 2020). The inquiry strategy is the interactive learning that can build the concept of understanding in solving mathematical problems and is expected to have an impact on students with better mathematics learning outcomes (Razali et al., 2020).

Methods
The method used in this article is the literature review method. The article aims to determine the effectiveness of inquiry learning strategies in improving mathematics learning outcomes.The data

in the article was obtained based on literature studies, including from previous studies, books, and articles.

Results

Educators are the basis for determining the quality of student success, both good and bad, therefore it is highly necessary for the quality of professional educators in the process of educational development. Educators are required not only to be smart in mastering subject matter but are also expected to be able to manage class well so that the learning process runs actively, innovatively, creatively, effectively, and pleasantly (Jauhar, 2011). Educators in the learning process should not only transfer knowledge but also be able to assist the process of understanding subject matter through the selection of learning models that are by current developments in science and technology.

Concepts in mathematics are not formed instantly and naturally but are formed through human experience empirically. The experience is then processed, processed, and analyzed based on the reasoning in human cognitive structures so that the concepts formed can be understood by others. Learning strategies have several implications as follows 1). The process of recognizing the basic characteristics of students that must be achieved through learning, 2). Choosing a learning approach system based on culture, aspirations, and philosophical views of the community, 3). Select and determine the procedures, methods, and techniques of the learning process, 4). Establish norms or criteria for learning success (Suparno& Wibowo, 2018).

Learning Inquiry emphasizes students to play an active role in learning. The guided inquiry learning model emphasizes the process of finding a concept so that a scientific attitude arises in students. The learning model examined in Models of Teaching, the inquiry learning model is one of the cognitive models that are superior for science learning in schools. Inquiry learning strategy is a learning strategy that has several advantages, including 1). Strategies that emphasize the development of cognitive, respective, and psychomotor aspects in a balanced manner so that learning is more meaningful, 2). Provide space for students to learn by students' learning styles, 3). By the development of modern learning psychology that considers learning as a change in behavior due to experience, 4). Can serve the needs of students who have abilities above average.

Inquiry learning strategy is a learning strategy that seeks to instill the basics of scientific thinking in students, so that in the learning process, students learn more independently, develop creativity in solving problems, plan experiments, conduct experiments, collect and analyze data, attract a conclusion. Inquiry learning strategies can be developed with an objective attitude, honesty, curiosity, openness and in the end can achieve results that are mutually agreed upon (Siagian&Nurfitriyanti, 2012). Effective learning is not simple or certainly not sufficient anymore if only interpreted as a transfer of knowledge, it is important to be interpreted as constructivist learning that is more oriented towards students (student centries). In a sense, students or learners become the center of learning. While teaching-learning surrounds students (Mulyono&Wekke, 2018). According to the National Education System Law no. 20 of 2003 article 1 paragraph 20 (Ministry of National Education, 2003: 2), learning is the process of interaction of students with educators and learning resources in a learning environment.

The effectiveness of learning is inseparable from quality activities in planning, implementing, and evaluating carried out by educators, therefore educators must pay attention toimportant elements of a learning design, namely 1). The objectives of learning are determined by educators and delivered to students, 2). Effective learning activities, 3). Provide guided training, 4). Check understanding and evaluation (Sani Abdullah, 2019). The learning process and learning outcomes will differ on many factors including the subject of study, learning time, and or the

influence of the surrounding environment. Learning outcomes will vary in various areas, including academic achievement, attitudes, motivation, and higher-order thinking skills (Wahono et al., 2020). To realize effective learning is very dependent on how educators can develop learning strategies and can choose the right strategy in implementing learning activities. Strategy is an attempt to obtain success and success in achieving goals. There are 3 (three) types of strategies related to learning that must be mastered by educators (Mulyono&Wekke, 2018) is as follows :

a) Learning Organizing Strategies, Reigeluth, Bunderson, and Meril (1977), stated the strategy of organizing lesson content is called structural strategy, which refers to the way to sequence and synthesize facts, concepts, procedures, and related principles.

b) Learning Submission Strategy, is a component of the method for carrying out the learning process, namely conveying learning content to students, and providing information or materials needed by students to display performance

c) Learning Management Strategy, is a variable component of the method that deals with how to organize interactions between students and other learning methods. This strategy is related to decision making about the organizing strategy and delivery strategy used during the learning process

Bloom said that the three main focuses that influence student learning outcomes, namely cognitive abilities, motivation, and quality of learning, where the learning outcomes of students, are ability and success of students after carrying out the learning process, which can be measured by tests and or directly observations (Erawati, 2020). The success of the learning process is active learning, which is when the teacher's learning process can create an atmosphere in such a way that students are active in asking questions, discussing in solving a mathematical problem. The learning process is an active process of the learner in building knowledge, not the students only receiving the material presented by the teacher (Husni, 2020).

Conclusion

Inquiry learning strategy is one of the effective learning strategies in improving mathematics learning outcomes, by providing opportunities for students to be more independent, creative in solving problems, planning and conducting experiments, and analyzing data to find results by the objectives of learning.

References

Aditomo, A., &Klieme, E. (2019). *Forms of inquiry-based science instruction and their relations with learning outcomes: Evidence from high and low-performing education systems*.

Ananda, T., &Prabawanto, S. (2020). Implementation Inquiry Model with Examples and Non Examples to Enhance The Mathematical Conceptual Understanding of Primary School Students. *Proceedings The 2nd International Conference on Elementary Education*, *2*(1), 879–888.

Crawford, A., Saul, E. W., Mathews, S., &Makinster, J. (2005). *Teaching And Learning Strategies For The Thinking Classroom*. The International Debate Education Association, New York, NY, 10019.

Erawati, N. K. (2020). *Mathematics Learning Outcomes Based on Gender in the Inquiry Learning Model*. *394*(Icirad 2019), 264–269. https://doi.org/10.2991/assehr.k.2001 15.043

Fashihah, &Qohar, A. (2020). Analysis of Mathematical Representation Process Standard in Learning Mathematics on Relation Concept. *Formatif: JurnalIlmiah Pendidikan MIPA*, *10*(148), 115–124.

HastutiNoer, S. (2017). *Strategi PembelajaranMatematika*(pertama). Matematika.

Husni. (2020). The Effect of Inquiry-based Learning on Religious Subjects Learning Activities: An Experimental Studi in High Schools. *JurnalPenelitian Pendidikan Islam*, *8*(1), 43–53. https://doi.org/https://doi.org/10.366 67/jppi.v8i1.434

Jauhar, M. (2011). *ImplementasiPaikemdariBehavioristi ksampaiKontruktivistik*. Prestasi Pustaka.

Mulyono, H., &Wekke, I. S. (2018). *Strategi Pembelajaran di Abad Digital* (Pertama). GaweBuku.

Razali, Halim, A., Haji, A. G., &Nurfadilla, E. (2020). Effect of inquiry learning methods on generic science skills based on creativity level. *Journal of Physics: Conference Series*, *1460*(1). https://doi.org/10.1088/1742-6596/1460/1/012118

Sani Abdullah, R. (2019). *StretegiBelajar dan Mengajar*(editi pert). PT. RajaGrafindoPersada.

Siagian, R. E. F., &Nurfitriyanti, M. (2012). MetodePembelajaran Inquiry Dan Pengaruhnya. *Formatif :JurnalIlmiah Pendidikan MIPA*, *2*(1), 35–44. https://doi.org/http://dx.doi.org/10.30 998/formatif.v2i1.85

Suparno, & Wibowo, A. (2018). *Strategi BelajarMengajarTeori dan Praktik*(1st editio). Penerbit Samudra Biru, Yogyakarta.

Tyas, E. H., &Naibaho, L. (2021). Hots Learning Model Improves the Quality of Education. *International Journal of Research - GRANTHAALAYAH*, *9*(1), 176–182. https://doi.org/10.29121/granthaalay ah.v9.i1.2021.3100

Verschaffel, L., Schukajlow, S., Star, J., & Van Dooren, W. (2020). Word problems in mathematics education: a survey. *ZDM - Mathematics Education*, *52*(1). https://doi.org/10.1007/s11858-020-01130-4

Wahono, B., Lin, P. L., & Chang, C. Y. (2020). Evidence of STEM enactment effectiveness in Asian student learning outcomes. *International Journal of STEM Education*, *7*(1), 1–18. https://doi.org/10.1186/s40594-020-00236-1

Wala, S. Y., Purnami, A. S., & Widodo, S. A. (2017). *Efektivitas Model PembelajaranKooperatif Number Head Together Terhadap Hasil BelajarMatematia*. *XVII*(2), 53–66.

Weinstein, C. (1989). Helping Students Develop Strategies for Effective Learning. *Educational Leadership*, *46*(4), 17–19.

Yerushalmy, M. (2006). Slower algebra students meet faster tools: Solving algebra word problems with graphing software. *Journal for Research in Mathematics Education*, *37*(5), 356–387.