Literature Study of Discovery Learning-Based Worksheets for Students' Concept Understanding Skills on Numbers Material

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Abstract

In learning mathematics, concept understanding becomes the basis for solving the problems given. However, the lack of a concept investigation guide makes it difficult for students to understand it. So the innovation is needed to guide students in the form of worksheets to help concept understanding through the discovery of ideas. This method is better known as Discovery Learning. The purpose of this study is to analyze student worksheets based on Discovery Learning on the skills to understand on number material. The method used in this research is a literature study where data collection is done by collecting national and international journals related to the research objectives. Based on the results and discussions, it was found that discovery learning-based worksheets can be used as a learning innovation for the concept understanding skills on number material. Furthermore, it is necessary to do further research on the development of discovery learning-based worksheets for concept understanding skills.

1. Introduction

It is undeniable that in keeping up with the times with significant technological developments, students are required to develop their potential and knowledge through education. The education taken is expected to attract students in forming mindsets, discovering ideas, principles, and concepts that aim to hone students' skills in making decisions on a problem. One of the fields of education with a very large influence on the mindset and skills of students is mathematics. Its great influence is also proportional to the anxiety of students in facing this difficult lesson. Mathematics has important role in modern human life. Mathematics is a universal science that underlies the development of modern technology and has important abilities in various disciplines and advances the power of human thought (Ibrahim and Suparni, 2008). It is clear that mathematics has an important role in everyday life. Thus, students are required to have the ability to understand concepts because this is important for students to solve mathematical problems, problems in other disciplines, and problems in everyday life which are the vision of developing mathematics learning to meet today's needs (Sumarmo, 2003). NCTM (2000:35) also states that the ability to understand concepts is important in the principles of learning mathematics. This is in line with the first objective of learning mathematics, namely understanding mathematical concepts, explaining the interrelationships between concepts and applying concepts flexibly, accurately, efficiently, and precisely in problem solving (Depdiknas, 2006).

Several previous studies have shown that mathematics learning generally does not provide opportunities for students to understand the mathematics being studied (Ratna, 2014) and tends to focus on textbooks or student worksheets which after being studied do not meet the characteristics that have been applied and do not refer to scientific approach (Suriani, 2021). So the impact is that students do not understand the knowledge gained (Kusmanto, 2014). This is linear with the problems that are often faced by students, namely the lack of ability to understand mathematical concepts (Kusmawati, 2022).

In the material of numbers, students should be directed to find ideas (discovery) concepts to solve the problems given. So that if learning is only teacher-oriented and there is no guidance to investigate mathematical problems, students will have difficulty understanding the concepts in the number material. The solution that can be given in this condition is in the form of a learning device in which there are stages to investigate, determine, and reconstruct the completion steps, namely student worksheets. The linear learning model with this is the Discovery Learning learning model. Therefore, in this literature study, the author focuses on student worksheets based on discovery learning for the ability to understand students' concepts on number material.

Understanding is the ability to capture meanings such as being able to express a material presented in a form that can be understood, able to provide interpretation and be able to classify it (Ginanjar & Kusmawati, 2016:65). While the ability to understand mathematical concepts is defined as the ability to relate mathematical notations and symbols that are relevant to mathematical ideas and then combine them into a series of logical reasoning (Maharani, Hartono, and Hiltrimartin, 2013: 2). So it can be concluded that in the ability to understand concepts students must be able to re-explain and solve problems according to the concepts they have got.

According to the Ministry of National Education, indicators of concept understanding include the following, (a) restate a concept, (b) classify certain objects according to the concept, (c) give examples and non-examples, (d) presenting the concept in a representative form, (e) develop necessary or sufficient conditions of a concept, (f) use and utilize and choose certain procedures or operations, and (g) applying concepts or algorithms in problem solving.

So that the indicators of mathematical understanding ability chosen in this literature study include, (a) restating a concept; (b) classifying objects according to certain properties; (c) applying the concept or problem-solving algorithm (Suriani, 2021).

2. Discussion

Discovery learning is a place of learning where the teacher's role is more appropriate as a facilitator who helps students find information by deduction and construction (Suphi, 2016). Discovery learning is learning where ideas are conveyed through the discovery process (Suriani, 2021). So it can be concluded that discovery learning is a learning activity that focuses on the student discovery process based on the information found with the teacher acting as a facilitator. The steps - the learning steps (syntax) discovery learning are (a) giving stimulation (stimulation), (b) identify the problem, (c) data collection, (d) processing and interpreting data, (e) proof, and (f) drawing conclusions.

Student worksheets are defined as printed teaching materials in the form of sheets of paper containing material, summaries, and instructions for implementing learning tasks that must be done by students with reference to the basic competencies (KD) that must be achieved (Andi Prastowo, 2012: 204). This is in line with (Trianto, 2010) who said that the student worksheet is a guide sheet for students used to investigate problems. Thus, in the student worksheets, the tasks that are ordered and the basic competencies to be achieved must be clear, in order to make it easier for students to complete the tasks in the student worksheets.

Student worksheet is a teaching material print in the form of sheets of paper contains materials, summaries, and instructions implementation of learning tasks that must be done by students, both theoretical as well as practical which refers to basic competencies that must be achieved by participants taught, and its use depends on the other teaching materials (Mutmainah & Nurhadi, 2018).

Understanding is a translation of the term understanding which means as the absorption of the meaning of the material being studied. As stated Herbert and Carpenter (Hasanah, 2004) describe a number of benefits to knowledge gained in learning mathematics with understanding that is as follows (a) it is generative, meaning that knowledge is formed from learning outcomes with the understanding that at any time it can be resurfaced (stimulated), (b) meaningful, adjusting between subject matter and thinking skills students enable more meaningful learning activities, (c) strengthens memory and reduces the amount of information that must be memorized, (d) facilitate the transfer of learning, the occurrence of transfer in learning with understanding or understanding because of the similarities in context between the new knowledge to be learned and the old knowledge that can quickly reappear, and (e) affect trust,

students who learn with understanding always will give rise to knowledge that is interconnected systematic in cognitive structure.

The Discovery Learning Method is an active and hands-on learning style that developed by Jerome Bruner in the 1960s. Bruner emphasized that learning must be done while doing or learning by doing. With In this method, students actively participate, not just receive passive knowledge. Discovery Learning shows approach general instructional approach that represents the development of constructivist learning for a school-based learning environment. Bruner (1961) developed discovery learning from contemporary studies in cognitive psychology, and stimulate the development of more specific instructional methods. Although Bruner is often referred to as the developer of Discovery learning, learning in the 1960s, but ideas related to this learning method were obtained of several thoughts and theories that have been previously developed by several other experts such as John Dewey, Jean Piaget, and Seymour Papert. Bruner (1961) argue that, the practice of self-discovery teaches one to obtain information in a way that makes that information more ready for use in problem solving.

Based on the literature study conducted, it can be said that the Discovery Learning-based Student Worksheet can help students in understanding mathematical concepts, especially in number material for grade VII junior high school students. Basically, there are three main objectives of learning mathematics in junior high school, including forming the ability to understand mathematical concepts, the ability to explain the relationship between concepts, and the ability to apply concepts in various mathematical problem solving (Mawaddah & Maryanti, 2016). In the 2013 curriculum there are seven indicators of concept understanding, namely restating the concepts that have been studied, classifying objects based on whether or not the requirements that make up the concept are met, identifying the properties of operations or concepts, applying concepts logically, providing examples or counter examples (opposite). examples) of the concepts studied, presenting concepts in various forms of mathematical representation (tables, graphs, diagrams, sketches, mathematical models or other methods), linking various concepts in mathematics and outside mathematics, developing necessary and/or sufficient conditions for a draft. Without a good understanding of the concept, students will find it difficult to solve mathematical problems. Therefore, in this study the emphasis is on understanding mathematical concepts.

The results of Wahidah et al's research (2018) show that Student Worksheets with the Creative-Productive model are valid and practical in developing students' mathematical concept understanding abilities. This creative-productive model worksheet can continue to be developed for other materials as needed. The research results of Mawaddah et al. (2016) concluded that the discovery learning model is good for understanding mathematical concepts. This learning model needs to be developed again with appropriate learning approaches and strategies to attract students' interest in mathematics.

Research results Indriani et al (2021) conclude that the low concept understanding skills of students need to be improved so that research is carried out to analyze worksheets as student needs. The worksheets were developed with the help of an electronic live worksheet that contains covers, introductions, core competencies, basic competencies, indicators, and various forms of questions that are in accordance with the concept understanding indicators. This worksheet is declared validated and needs to be continued to the implementation and evaluation stages.

Based on the results of the research analysis of Sinambela et al (2018), it was found that there was a significant effect of the discovery learning model on the ability to understand mathematical concepts. The use of discovery learning learning models can be a solution for low concept understanding abilities. This is of course developed with strategies and media that are of interest to students.

Research results Pasaribu et al. (2020) the results of the effectiveness of the product developed are 3.45 from the highest scale of 4. while the increase in understanding of mathematical concepts is 0.63 which means that students' abilities increase after using the developed media. This is showed that the development of Discovery Learning-based Student Worksheets was effective for improving the concept understanding skills of class XI students at SMA Negeri 1 Rantau Selatan. Besides Student Worksheets, other media also need to be used to create interesting and fun learning.

The results of Kartika's research etc (2020) concluded that discovery learning-based student worksheets were stated to be validated, practical, and effective for improving learning outcomes and understanding of seventh grade junior high school students. Therefore, student worksheets with the discovery learning model can be a learning innovation that is also a solution to students' mathematical understanding problems.

Based on the research that has been done, it is known that the relationship between worksheets and discovery learning models can help students in understanding mathematical concepts. This is reinforced by Ermi's opinion (2017) that Student Worksheets have several benefits, including (a) helping teachers direct students to find mathematical concepts, (b) developing process skills, scientific attitudes, and student interests, (c) making it easier for teachers to manage the learning process, (d) make it easier for teachers to see the success of students in achieving learning objectives.This is in line with Suriani's opinion (2021) that discovery learning-based student worksheets are designed to emphasize finding previously unknown concepts, so that students feel interested and challenged to get results or findings through concepts understanding questions on student worksheets.

The results of the research above are relevant to the results of Suriani's research (2021), in the final test results of the ability to understand concepts which consist of 7 math questions on number material, it is found that the percentage of mastery learning of experimental class students using discovery learning-based worksheets is more significant than control class students who do not use student worksheets based on discovery learning, which reached 72% completeness with an average of 77.59%. Thus it can be proven that discovery learning-based student worksheets can improve students' understanding of mathematical concepts. This proves that discovery learning can improve the results of students' conceptual understanding abilities. This is due to the discovery learning worksheet that is designed to emphasize the discovery of previously unknown concepts or principles, problems that are faced with problems engineered by the teacher. So that students are interested in mobilizing all their minds and skills to get findings through questions of understanding the concepts that exist in discovery learning worksheets. This is in line with the results of research conducted by Asnita, (2014) showing that the learning model with discovery learning can improve student learning outcomes.

3. Conclusion

Based on the results and discussion of research, it can be concluded that mathematics student worksheets based on discovery learning models have an effect on improving students' mathematical concept understanding skills. So that discovery learning-based worksheets can be used as learning innovations for concept understanding skills in number material.

Suggestions that the author can convey based on this research are; (1) to mathematics teachers, for alternative learning, they should use discovery learning-based worksheets so that students' ability to understand mathematical concepts is better and is expected to re-evaluate how are student learning outcomes and characteristics of students, also it is recommended to add teaching materials others such as learning media that interesting to motivate students in study. (2) for further researchers, it is necessary to conduct further research on the development of discovery learning-based worksheets for concept understanding skills, and (3) students are advised to accept and study discovery learning-based worksheets, so that they can improve their ability to understand mathematical concepts.

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