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Application of Differentiated Learning to The Polyhedron Material in Visual Form to Understanding Ability Junior High School Students Concept

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ABSTRACT. The ability to understand mathematical concepts plays an important role in students' skills and success in learning mathematics. However, in reality, quite a few students have the stigma that mathematics is difficult and scary. This causes a low ability to understand mathematical concepts due to the application of learning strategies that are not appropriate to the abstract field of mathematics and the diverse characteristics of students. The application of content differentiation learning can be a solution to this problem. Mathematics learning aims to turn abstract reasoning into concrete. Visual media as a tool in the differentiated learning process can help students think concretely, explore various mathematical concepts, encourage students to participate actively, and provide meaningful experiences in the learning process to increase understanding of mathematical concepts. The aim of this research is to analyze the relationship between differentiated learning and students' ability to understand concepts in geometry material on the data side in visual form. This research refers to descriptive research with a qualitative approach with a literature review method through exploration of articles related to the research topic. Then carry out research sourced from trusted literature, namely articles, books and research results from experts to answer how the application of differentiation learning with visual media affects students' ability to understand concepts in Polyhedron Material.
Keywords: differentiated learning**,** concept understanding ability, visual, Junior High School

INTRODUCTION

Learning mathematics at the elementary and secondary levels is the key to student success in mathematical skills and understanding. One of the abilities that must be met in learning mathematics is the ability to understand mathematical concepts. This is a requirement for students to be able to master learning in order to develop their ability to solve mathematical problems. Agree with this statement Baiduri et al (2021) said that the ability to understand mathematical concepts is important in the skills and success of learning mathematics.

The ability to understand mathematical concepts is the ability that students have in understanding mathematical concepts which has an impact on students being able to restate concepts, group objects based on certain properties, provide examples and non-examples of a concept, present concepts in mathematical representation. , apply certain procedures, and apply concepts in solving mathematical problems (Badan Standar Nasional Pendidikan (BNSP), 2006). Another opinion states that understanding concepts in mathematics is a student's ability accompanied by action to understand principles and concepts related to procedures and create meaningful relationships between existing concepts and newly learned concepts (Atmaja, 2021).

According to the National Education Standards Agency to assess students' ability to understand mathematical concepts, there are seven indicators: (Badan Standar Nasional Pendidikan, 2006)

Table 1 Variable Indicator of the Ability to Understand Mathematical Concepts

Indicator of Ability to Understand Mathematical Concepts	1)	The ability to restate a concept
	2)	The ability to categorize objects based on certain properties based on concepts
	3)	Ability to provide examples or non-examples of the concepts of material being studied

Indicator of Ability to Understand Mathematical Concepts	4)	Ability to present concepts in various mathematical representations
	5)	Kemampuan untuk menyatakan kondisi perlu dan cukup untuk suatu konsep
	6)	Ability to determine appropriate procedures in solving problems
	7)	Ability to apply concepts and procedures in problem solving.

Students are said to have a good understanding of mathematical concepts, if they are able to connect new knowledge with previously acquired knowledge, it will be easier to solve the mathematical problems given. Vice versa, so that understanding mathematical concepts greatly influences the process of solving existing mathematical problems.

The facts from the description above show that there are still many students who still do not understand mathematical concepts. This can have an impact on subsequent, more complex mathematics learning material. So quite a few students say that learning mathematics is difficult, scary and unpleasant because of students low ability to understand mathematical concepts (Yulianah et al., 2020). Putri (2024) argue that the low ability of mathematical concepts faced by students can be driven by several factors. First, most students only copy the steps given by the teacher, so that when given a different form of question, students will have difficulty. Apart from that, mathematics learning activities are still focused on the teacher so that students do not get meaningful experiences. Another factor is learning methods that do not suit the various characteristics and learning styles of students so that they do not attract students interest in focusing on mathematics learning activities.

The diverse abilities and characteristics of students in accepting the mathematics learning process are the main factors for teachers to develop strategies and approaches which are an effort to

improve basic mathematical concepts. (Syarifuddin & Nurmi, 2022). Each individual has differences which are characteristics that only that individual has (Firmansyah, 2021). Likewise, students have different abilities in learning and understanding mathematics, so from these differences it can be seen the level of understanding that students have

One strategy that can be used as a solution to the situation of diverse student characteristics and needs is through the application of differentiated learning (Aryani, 2023). Differentiated learning is an effort in the learning process by looking at student needs in terms of learning readiness, interests and talents, as well as student learning profiles (Aprima & Sari, 2022). Differentiated learning is a learning process for students that is tailored to their competencies, needs and choices (Evendi et al., 2023). The teacher's role is to be a student facilitator according to student needs so that the treatment given to each student cannot be the same.

Learning with a differentiation approach is built on three aspects, namely content differentiation, product differentiation and process differentiation (Tomlinson, 2001). Through an independent curriculum with differentiated learning, it becomes a policy that can encourage students to express their abilities according to their learning potential and interests. 1) Content differentiation includes what students learn in relation to learning materials and curriculum. In this aspect, teachers can modify learning materials and curriculum to suit learning styles and conditions that students feel are lacking. 2) Product differentiation, namely students show what they have learned. Through this aspect, students produce learning products that teachers can use to assess the extent to which students have understood the material, then give students the next material. 3) Process differentiation refers to how students process ideas and information. The process of student interaction with the material, where

this interaction determines student learning choices.

A differentiated learning approach can provide stimulation for students to actively participate in learning. By providing services and facilities according to students' interests and learning needs, students can be active in learning (Afifah et al., 2024). With students' active involvement in creating meaningful experiences during the learning process, these meaningful experiences become aspects that can fulfill indicators of the ability to understand mathematical concepts. (Trisnani & Utami, 2020). This is in line with opinion Afifah, et al (2024) The application of adapted learning also has the potential to encourage the development of students' skills and abilities in understanding the mathematical concepts given.

The concept of geometry in mathematics is one of several materials provided in class VIII semester 2 (two), namely the concept of surface area and volume of flat shapes. Learning Outcomes (CP) and Learning Path and Objectives (ATP) based on Standards, Curriculum and Educational Assessment (BSKAP, 2022) on the concept of surface area and volume of a polyhedron:

Table 2 CP and ATP Polyhedron Material

Learning Outcomes (CP)	Learning Flow and Objectives (ATP)
Students solve problems by finding the surface area and volume of three-dimensional shapes using this formula Students can apply ratios to measurement in a variety of contexts	Test and explain the procedure for formulating the surface area of a polyhedron
	Apply the polyhedron surface area formula appropriate to the given contextual problem
	Test and explain the formula for the volume of a polyhedron
	Apply the polyhedron volume formula appropriate to the given

Learning Outcomes (CP)	Learning Flow and Objectives (ATP)
	contextual problem
	Apply the concept of ratios in determining surface area and volume when changing the size of a polyhedron.

Geometry is a field of mathematics that focuses on points, lines, angles, plane shapes, geometric figures and their components (Ufairah, 2022). In the polyhedron material, students are not only asked to determine a value, but are required to be able to visualize the object in their minds (Andriyani, 2023). In this way, students can understand the concepts in the learning material for building flat-sided spaces with the help of visual learning media.

The addition of learning media is a supporting aspect of meaningful and varied learning that can facilitate student diversity and increase understanding abilities by adapting to the needs of each student's learning style (Sukmawati et al., 2023). Learning media is adapted to students learning styles, namely visual, auditory and kinesthetic (Rahmawati & Gumiandari, 2021). The implementation of visual learning media as differentiated learning content allows students to gain experience that can encourage understanding of mathematical concepts.

Based on the previous explanation, differentiated learning with a content focus supports teachers to modify materials, curriculum and learning strategies according to student needs. The development of visual learning media is an alternative for content differentiated learning to improve students' ability to understand mathematical concepts. Technological advances have a positive impact on the world of education, the involvement of visual elements provides opportunities for educators and students to explore and understand mathematical concepts easily and interestingly (Sabrina et al., 2023). Visual media can help students gain concrete experiences with the help of concrete objects. One use of

visual media in the form of concrete objects can be implemented in flat-sided spatial construction materials in the form of spatial meshes and the use of LKPD designed in such a way.

This literature study explains that differentiation learning is implemented for differentiated learning on flat-sided geometric material into visual form on the ability to understand concepts of junior high school students. Scientific articles were the source for preparing this article. This paper aims to analyze the relationship between differentiated learning and students ability to understand concepts in flat-sided geometric material in visual form.

METODE PENELITIAN

This research refers to descriptive research with a qualitative approach by applying the literature review method. The literature review method is an activity that focuses attention on certain topics of interest for critical analysis of the contents of the manuscript being studied (Wahyuni, 2022). In this study, explore articles related to the topic of differentiated learning at the secondary school level, namely the junior high school level. Specific articles used as data are articles published in the last 5 years, namely 2020-2024. In the early stages of a literature search focused on the keyword "Differentiated learning" obtained as many as 1811 articles. Furthermore, the keyword "Ability to Understand Concepts" got search results for 465 articles. Keyword "Visual Media" got the results of searching 998 articles.

The total number of searches is 3274 articles accessed through google schoolar in the Publish or Perish (PoP) application. Next, the author conducted a screening (data selection) by reading the entire content of the article, and obtained 184 articles based on article quality selection criteria in Table 3. The last stage is the feasibility test so that 9 articles are obtained in accordance with the purpose of literature review which is used as the main literature article. For the author, the literature review step is an important step in determining the topics discussed in the research. Then, conduct research

sourced from trusted literacy, namely articles, books, and the results of expert research.

Table 3 Article Selection Criteria

Criteria	inclusion	Exlusi
Types of articles	SINTA indexed articles	Non SINTA indexed articles
Language	Indonesian and English	Non-Indonesia and Non-English
Publication year	2020-2024	> 2020
Topic	Differentiated Learning; Concept Understanding; Visual Media; Junior High School Mathematics; Curriculum Merdeka and Curriculum 2013	Independent curriculum and 2013 curriculum that are not related to mathematics
Subjects of study	Students at the junior high level; Phase D learners	In addition to junior high school or phase D learners

RESULT AND DISCUSSION

A. Research Results

Based on the results of studies and studies, as well as the selection of data (*screening)* selected as many as 9 articles related to the relationship between the application of differentiation learning with the ability to understand concepts with the help of visual media in mathematics

learning. The results of the study can be seen in Table 4 below.

Table 4 Results of Analysis of Selected Articles

Author &Years	Title	Research Methods	Results
Sarah Devi & Sulistyani, (2023)	The Effectiveness of The Quadrilateral Material Learning Module Judging From The Understanding of Concepts And Literacy Abilities Learners	Experiment	No effectiveness of using modules Learning quadrilateral material in terms of understanding concepts and literacy skills of students. Because factors in the learning environment of students who are less supportive in learning. Students are less than optimal in group work and Lack of attention during presentations
Salsabila et al., (2024)	Development of Android-Based Mathematics Learning Media in Differentiated Learning at SMPN 1 Mantup	Sistem One Group Pretest-Posttest Design	Learning media effectively differentiated mathematics for SPLDV materials
Haryanti, (2024)	Improved mathematical reasoning skills through Differentiated Learning at SMP Negeri 4 Waru	Classroom Action Research (PTK)	The application of differentiated learning can improve mathematical reasoning skills learners
Yulianti & Purwati, (2023)	Application of Liveworksheet-Assisted Differentiated Learning To improve mathe	Classroom action research (PTK)	Learning Liveworksheet-assisted differentiation can improve learning outcomes with achievement learning completeness

Author &Years	Title	Research Methods	Results
	matics learning outcomes of grade VIII students SMP N 6 Denpasar Academic Year 2022/2023		
Rompis, (2024)	Differentiated Learning Using Used Items on Circle Material for Improving Student Learning Outcomes	Classroom action research (PTK)	There is an increase in teacher activity in activities Learning; There is an increase in student activity in activities Learning; There was an improvement in student learning outcomes tests
Fauziyah et al., (2021)	The Effect of Quiz Giving on Learning By using audio	Experiment	Exist The effect of giving quizzes on learning using audio-visual media on learning

Author &Years	Title	Research Methods	Results
	-visual media against Mathematics Learning Achievement		achievement mathematics learners; Achievement of students taught by giving quizzes on learning by using audio-visual media can exceed the KKM value
Fitriana & Juwana, (2023)	Implementation of Assisted Differentiated Learning E-LKPD to Improve Student Mathematics Learning Outcomes	Classroom Action Research (PTK)	Application of differentiated learning E-LKPD can improve students' mathematics learning outcomes
Dwi & Budy Kusuma, (2023)	Contribution to the Application of Differ	Experiment	Problem-solving capabilities Mathematics of Learners Taught

Author &Years	Title	Research Methods	Results
	entiated Learning Models aided by Teaching Tools for Problem Solving Ability in Mathematics Learning		Use learning models tool-assisted differentiation snakes and ladders prop is better rather than taught learners Using the Learning Model Conventional
Kurniasih, (2022)	Efforts to Improve Character and Learning Outcomes Build a Flat Side Room By Using Model Student Facilitator And Explaining (SFAE)	Classroom action research (PTK)	There is an increase in polyhedron material skill test results in students, this can be shown by the results of the Build Flat Side Space material knowledge test in students

Author &Years	Title	Research Methods	Results
	Assisted by Disseminating Media for Class VIII. A Students of SMPN 10 Tegal		

B. Discussion

The results of the analysis of 8 articles related to differentiated learning at the junior high school level with the help of visual media to improve students' ability to understand mathematical concepts, can be seen various research methods and most of them use test instruments to measure student learning outcomes. By adjusting 21st century skills, understanding concepts, literacy abilities, learning outcomes, learning readiness, learning achievement, problem-solving abilities, and mathematical reasoning abilities of students is related to the level of students' concept understanding ability in mathematics learning.

In line with the results of the study Syarifuddin & Nurmi (2022) At the junior high school level, grouping students' abilities and needs in the implementation of differentiated learning can improve students' understanding of concepts in the learning process. So that with the increasing understanding of concepts in mathematics learning, it can eliminate the stigma of mathematics as difficult learning and can eliminate student anxiety in mathematics learning activities. This will have a good impact on students' mathematics learning outcomes (Laia, 2022).

Understanding mathematical concepts encourages students to be able to improve their reasoning skills. By turning abstract mathematical concepts into concrete. Students with visual learning styles are more dominant in mathematics learning, because by utilizing visual media students will get meaningful experiences and freely explore mathematical concepts (Sabrina et al., 2023).

The positive influence of implementing visual media in differentiated learning with content focus in teaching and learning activities in the ability to understand mathematical concepts. In addition to encouraging the understanding of mathematical concepts, visual media can also build a cool learning atmosphere so that students feel excited and not bored. Student participation in learning with visual media can make students think more creatively.

The consistent use of various types of models and visual media learning is proven to improve the ability to understand mathematical concepts of junior high school students. This can be described by several key elements. First, an important factor is the selection of the right media. Each type of media has its characteristics, so it needs to be matched with the context of the material to be taught. A careful planning process determines the successful use of visual media in learning. Careful and good planning is characterized by integrating the use of visual media in the curriculum, adjusting learning methods, and preparing relevant material.

Testing the validity of visual media is carried out by experts in the field. This is a process that can ensure that the visual media used meet quality standards and are in accordance with mathematics education at the junior high school level. The effectiveness of visual media is proven in improving the ability to understand mathematical concepts. Good visual support, animation, and interaction between teachers and students in learning activities can improve students' ability to understand mathematical concepts.

Thus, considering the selection of suitable media, good learning planning, validity testing, and effectiveness in improving the ability to understand concepts and student participation becomes a very important role in the use of visual media at the junior high school level in mathematics learning. Visual media in mathematics learning, such as concrete props, multimedia, and audiovisual are consistently proven to provide good results in understanding the concepts of junior high school students. The use of visual media not only increases student participation actively, but has a positive impact on student motivation, understanding of concepts, effectiveness, and learning outcomes. Validity tests and direct trials in the field prove that the success of visual media is measured by attractiveness, effectiveness, validity, and significantly improved learning outcomes.

CONCLUSION

Grouping students' abilities and needs in the implementation of differentiated learning can improve students' understanding of concepts in the learning process. So that with the increasing understanding of concepts in mathematics learning, it can eliminate the stigma of mathematics as difficult learning and can eliminate student anxiety in mathematics learning activities. This will have a good impact on students' mathematics learning outcomes,

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encouraging the understanding of mathematical concepts, visual media can also build a cool learning atmosphere so that students feel excited and not bored. Student participation in learning with visual media can make students think more creatively.

Thus, it can be concluded that the application of visual media is proven to improve the ability to understand mathematical concepts of junior high school students.

Based on the conclusions described above, several suggestions were formulated as follows:

1. Teachers should apply variations in teaching and learning activities, by practicing making learning media tailored to students. So as to create a meaningful and interesting learning experience
2. Teachers should attend training on learning media, to deal with various student learning styles with each characteristic and develop their potential.

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