# Analysis of Differences in Mathematical Understanding of Class IV Students at UNISMUH Makassar Labschool Based on Learning Style

**Sabrina[1], Ririn Widiyasari[2], and Nursalim[3]**
[1,2,3] *Universitas Muhammadiyah Jakarta*
fadlansabrina99@gmail.com[1], ririn.widiyasari@umj.ac.id[2], adennursalim@gmail.com[3]

**Abstract**
*This research aims to analyze differences in mathematical understanding of fourth grade students at UNISMUH Makassar Labschool based on their learning styles. The background to this research stems from various problems found in the field, such as students' low mathematical understanding, teachers' lack of understanding of learning styles, and the lack of research related to learning styles at the elementary school level. This research uses a descriptive qualitative approach with phenomenological methods to explore students' subjective experiences in understanding integer material based on visual, auditory and kinesthetic learning styles. The research results show that students with an auditory learning style tend to excel in solving problems verbally and narratively, while visual students are better at understanding basic concepts through pictorial representations, but have difficulty in advanced applications. Kinesthetic students show moderate comprehension, depending on the physical activity and props used. Although differences were found in the level of mathematical understanding between learning styles, these differences were not statistically significant. Thus, learning style is not the only determining factor in students' mathematical understanding, but it still needs to be considered in planning more adaptive learning.*
***Keywords:*** *Elementary School, Learning Styles, Mathematical Understanding*

## Introduction

Education is an object in improving the quality of human resources that are progressive, superior and trustworthy. One thing that must continue to be developed is character improvement. Therefore, it is necessary to make changes to the curriculum in Indonesia so that there is equal distribution of knowledge and technological developments throughout society. Thus, through the education process, Indonesian people will become prosperous in their lives.

Mathematics is one of the most important subjects in basic education. At the Elementary School (SD) level, good mathematical understanding becomes the foundation for students to learn more complex concepts at the next level. However, students' mathematical understanding often varies, influenced by various factors, including each student's learning style. Learning style refers to the way an individual absorbs, processes, and remembers information. Therefore, analyzing differences in mathematical understanding in terms of the learning styles of fourth grade students at Unismuh Makassar Lab School is very relevant to carry out.

Mathematical understanding not only affects students' academic abilities, but also critical thinking and problem solving skills. According to research conducted by (Suwarma et al., 2024), students' mathematical understanding can be improved through the use of learning methods that suit their learning style. This shows that the right approach to teaching can help students overcome the difficulties they face in understanding mathematical concepts. In the Al-Quran surah Al-Baqarah verse 269 has been explained.

Student learning styles can be divided into several categories, including auditory, visual and kinesthetic. Students with a visual learning style tend to understand information better through pictures, graphs or diagrams. Meanwhile, students with an auditory learning style find it easier to understand material through hearing, such as discussions or lectures. On the other hand, students with a kinesthetic learning style prefer to learn through direct practice and experience. Research shows that recognizing and adapting teaching methods to students' learning styles can improve their understanding of subject matter.

Law No. 20 of 2003, education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble morals, and the skills needed by themselves, society, nation and state (Pristiwanti et al., 2022).

The Muhammadiyah movement cannot be separated from its contribution in the field of education. Muhammadiyah education has its own characteristics compared to education in general (Arroisi, 2020). These characteristics are based on the Al-Qur'an and Sunnah, the Islamic preaching movement and Tajdid. It is in the field of education that according to (Hasnahwati et al., 2022) Muhammadiyah has a major role in unifying and mobilizing Muslim forces as the main shield in the Unitary State of the Republic of Indonesia.

Based on observations I made on Monday, 11 November 2023 at the Unismuh Elementary School Lab School in Makassar through interviews with class teachers at the school, it was found that students still lacked understanding of mathematical material. Apart from that, students' comprehension skills in learning lessons vary so that some students are still confused in solving problems specifically related to mathematical problems, but there are also some students who have mastered mathematical material. Therefore, it is very unfortunate if some students still lack understanding of the concepts in solving mathematical problems.

Mathematical understanding differs from one student to another. Differences in students' mathematical understanding can be seen in how students have levels of competence or ability, how to approach learning conditions, how students receive lessons, organize, connect between experiences that students have, and respond to the learning methods used by teachers in the teaching and learning process that students experience. From this, some students are fast, some are slow in understanding the concepts given.

Learning style is one of the important things to know how students understand lessons at school, especially mathematics lessons. Because students' learning styles are different, it is important for teachers to analyze students' learning styles in order to obtain information that can help teachers to be more thorough in understanding differences in the classroom and be able to carry out meaningful learning (Setiana & Purwoko, 2020). Learning styles consist of three learning styles, namely auditory, visual and kinesthetic. The auditory learning style is more about using hearing, the visual learning style is a learning style that is more about using sight, and the kinesthetic learning style is more about using movement and touch.

Identification of problems that the author found at Unismuh Makassar Lab School include, lack of understanding of students' mathematics, lack of understanding of students' learning styles, lack of research on learning styles in elementary schools, inflexible learning

methods, gaps between theory and practice in managing learning styles, learning evaluations that are not based on learning styles, students' difficulties in adapting to mathematical learning approaches, and lack of collaboration between teachers and parents in identifying learning styles.

Based on observations and searches carried out by the author so far, there has been no research that specifically discusses "Analysis of Differences in Mathematical Understanding of Class IV Students at Unismuh Makassar Lab School in View of Learning Style"

However, finding thesis/journal titles that have almost the same studies but different studies, such as:

Research entitled Description of the Ability to Understand Mathematical Concepts in View of Student Learning Styles (Usman et al., 2022). Based on research conducted on three class VII students at MTS Guppi Rannaloe with different learning styles, it can be concluded that there are differences in the ability to understand mathematical concepts for each student. Students with visual and kinesthetic learning styles show better abilities in providing examples and non-examples and expressing concepts in various forms of representation. Meanwhile, students with an auditory learning style have not demonstrated adequate abilities in all indicators of understanding the concepts studied. These results indicate that learning style has an influence on students' ability to understand mathematical concepts.

Research entitled Teacher Creativity in Utilizing IT-Based Media in View of Student Learning Styles by (Dewantara et al., 2021), this research concludes that teachers have a dominant role in selecting and utilizing IT-based learning media, but creativity in providing teaching media that is varied and appropriate to students' learning styles is still not optimal. Even though teachers have been able to utilize technology-based media in a simple way, this approach has not fully paid attention to the differentiation of students' learning styles. This is caused by teachers' limited pedagogical understanding regarding the relationship between the choice of learning media and the needs of students' learning styles. These findings indicate the need to develop teacher competency, especially in combining creativity in the use of learning media with learning principles that are centered on students' learning needs and preferences.

There has been no in-depth analysis of other factors that influence students' mathematical understanding in another previous researches. Therefore, this research will more specifically discuss the influence of learning styles on mathematical understanding at Unismuh Makassar Lab School.

## Research Methods

This research is qualitative research with a descriptive approach. Qualitative research was used to describe and analyze the phenomenon of differences in mathematical understanding based on the learning styles of fourth grade students at Unismuh Makassar Lab School. This type of research aims to gain an in-depth understanding of the relationship between students' learning styles and their level of mathematical understanding through analysis of non-numerical data.

The approach used in this research is a phenomenological approach, which aims to understand students' experiences in learning mathematics based on their learning style. This approach allows researchers to explore how each learning style (visual, auditory, kinesthetic, or combination) influences students' subjective mathematical understanding.

1. Primary Data:

   Data obtained directly from students through interviews, observations and learning style questionnaires.

2. Secondary Data

   Supporting data obtained from school documents such as mathematical grades, learning results reports, and records of teaching and learning activities

The data collection techniques used in this research are as follows:

1. Questionnaire

   A questionnaire is a data collection technique by giving it directly to research subjects. The questionnaire aims to determine subjects that suit learning styles including visual learning style, auditory learning style and kinesthetic learning style.

2. Test

   A written test was carried out to obtain data on students' ability to understand mathematical concepts. The data collected is in the form of answer sheets resulting from student work containing answers and accompanied by work steps.

3. Interview

   Interviews are a data collection technique that is carried out by holding questions and answers directly with the research subject. The type of interview conducted in this research was an unstructured interview. In this interview, the researcher did not use an interview guide that was structured in a systematic and complete manner, but used a very general interview guide that included important things and questions that would be developed and adjusted by themselves when they were in the field. This interview aims to find out information and explore data that is not revealed from the results of written test answers so that the data collected from the test is more accurate.

The data analysis technique in this research uses time triangulation, namely synchronizing the results of working on test questions with interviews which can at any time retrieve information on the subject. The techniques used to process research data are: There are 3 stages of data analysis, namely:

1. Data Condensation

Data condensation is the process of selecting, simplifying, classifying, selecting the main things or focusing on the important things. In this way, the condensed data provides a clearer picture and makes it easier for researchers to analyze further data.

2. Data Presentation

Data presentation is an activity carried out to organize data systematically so that it is easy to understand. Presentation of data in qualitative research, data is usually presented in the form of short narratives, tables or in other forms. However, what is often used in presenting data is in the form of narrative text to present the results of interviews with research subjects and tables to make it easier for readers to understand the research data.

3. Data Verification

Data verification is the process of drawing conclusions to find meaning by looking for relationships, similarities or differences to draw conclusions as answers to existing problems.

## Results and Discussion

Based on the results of the interview, it was concluded that students who have an auditory learning style prefer it if the teacher is willing to read the questions given to them. The reason is because this can make it easier for them to understand the questions. This is in line with the results of observations which show that students ask the teacher to read the questions, apart from that students collect data by asking friends directly. Based on the interview answers, it can also be concluded that of the three students who have an auditory learning style, two of them are able to convey information directly. This is reinforced by the results of observations that the students answered questions directly. It can also be concluded that students who have an auditory learning style can convey verbally the steps they take in solving problems. Based on interview answers, it was found that students with an auditory learning style cannot concentrate if the class is noisy, this can make them feel disturbed in solving questions. They need quiet and calm conditions to be able to work on questions. Students with an auditory learning style tend to understand mathematics material through two main cognitive components, namely narrative and routine. Narrative means students explain mathematical facts verbally, such as definitions, formulas and theorems, while routines are the steps or procedures followed in solving mathematical problems.

Students with an auditory learning style will more easily understand concepts through verbal explanations and verbal repetition of steps. However, they may have difficulty connecting concepts visually or using complex symbols without clear narrative support. Students with a visual learning style are able to understand questions by reading them themselves. This was also found in the results of observations which showed that students read the questions and worked on them independently. Students with a visual learning style

are students who like to be neat, students who have a visual learning style are unable to concentrate if the class is chaotic and there is a lot of movement.

Students with a visual learning style are able to restate the concept of integers well, for example explaining that integers consist of negative numbers, zero and positive numbers, and are able to draw a number line as a visual representation of this concept. They are also able to provide examples and non-examples of whole numbers correctly, such as mentioning negative numbers (-1, -2, etc.), zero (0), and positive numbers (1, 2, etc.). However, on more complex indicators, such as presenting concepts in various forms of mathematical representation, students with a visual learning style tend to experience difficulties. For example, they directly perform the addition operation without changing the form of the number according to the rules of integers (for example, not changing 7 + (-2) to the correct form).

In-depth interviews revealed that students with a visual learning style did not fully understand the meaning of questions that asked for concept representation in other forms, so they tended to use familiar methods without further exploration. Overall, students with a visual learning style show good mathematical understanding abilities at a basic level (restatement and giving examples), but still need to strengthen their mathematical representation abilities and application of integer operation procedures. Students who have a kinesthetic learning style in working on questions would prefer it if they were allowed to ask their friends directly while approaching them on the grounds that it would make it clearer for them to obtain the data. Observation results show that students approach friends to collect data. Students move around the classroom while working on the question material. Apart from that, the results of the research also show that students who have a kinesthetic learning style prefer to work on questions in groups because they think it will be more exciting to solve the questions.

Based on the results of research conducted through observation, interviews and documentation on fourth grade students at SD Lab School Unismuh Makassar who have an auditory learning style, it was found that the students' level of mathematical understanding in integer material was quite good, but it really depended on the delivery method that suited their learning style. Students with an auditory learning style show a positive response to the teacher's verbal explanation, especially when the material is presented through contextual stories or detailed verbal explanations. Furthermore, in learning activities, students tend to be more active and responsive when taking part in group discussions or when given the opportunity to explain the material orally. They also show good understanding in solving word problems, because they can visualize the problem verbally in their minds. However, there are challenges when students are faced with symbolic or numerical questions without verbal context.

The learning strategies applied by students also support auditory characteristics, where they prefer to repeat material by reading aloud, listening to the teacher's explanation, or discussing with friends. This strengthens the finding that a learning style that is appropriate to the learning method greatly influences students' level of understanding in mathematics material, especially integers. Overall, it can be concluded that fourth grade students with an auditory learning style have a good level of mathematical understanding in conceptual and contextual aspects, but need improvement in procedural and operational understanding of integers. Therefore, teachers are advised to use more verbal approaches, stories, discussions

and sound analogies in delivering mathematics material to students with an auditory learning style.

Students with a visual learning style have good abilities in understanding basic concepts of integers, including the ability to translate questions (translation), interpret questions (interpretation), and predict questions (extrapolation). Of the 10 students with a visual learning style, 7 students were able to master these three indicators well. However, students with a visual learning style tend to have difficulty with questions that require them to relate whole number operations to occupational concepts or applied mathematics. They are less able to carry out complex mathematical manipulations and double-check calculation results carefully. It is easier for them to understand the material if learning uses methods that utilize the sense of sight.

Based on the results of the kinesthetic learning interview, they answered in unison that they preferred working on integer questions in groups on the grounds that it would be more exciting and they could work together. This is in accordance with the results of observations made by students with a kinesthetic learning style who are seen as unable to sit calmly and often sit facing backwards to invite discussions with other friends. Students with a kinesthetic learning style are generally less able to meet indicators of understanding mathematical concepts as a whole. They were only able to fulfill around two of several indicators of understanding the concept of integers, such as restating the concept and solving limited integer operation problems. Students with a kinesthetic learning style are only able to fulfill one indicator of mathematical critical thinking ability, namely determining strategies and tactics in solving problems, but are lacking in providing simple explanations, further explanations, and making conclusions.

Based on the results of research through tests and interviews regarding the mathematical understanding of fourth grade students at Unismuh Makassar Lab School with auditory, visual and kinesthetic learning styles on integer material, it can be concluded that students with an auditory learning style have good mathematical understanding abilities, are able to fulfil almost all indicators of conceptual understanding, including restating concepts, classifying objects, applying concepts algorithmically, providing examples and non-examples, and presenting concepts in various representations. Their concept understanding scores tend to be high, some even reach the very high category (around 92%). Students with a visual learning style also show quite good mathematical understanding abilities, especially in restating concepts, classifying objects, and presenting concepts visually. However, they tend to be less than optimal in implementing more complex operating procedures and advanced mathematical representations.

Statistically, this research shows that there is no significant difference in students' mathematical understanding based on auditory, visual and kinesthetic learning styles. Even though there are variations in scores and abilities between groups, overall the average student mathematical understanding is in the high category, and learning style does not have a significant effect on students' mathematical understanding results.

**Conclusion**

Based on the results of research conducted on fourth grade students at Unismuh Makassar Lab School with learning styles, it can be concluded that students with an auditory learning style in integer material show a level of mathematical understanding that is closely related to their ability to use narratives and follow verbal problem solving routines. Students with a visual learning style in integer material are classified as good in the aspects of basic concepts and examples, but are still lacking in the aspects of advanced mathematical representation and application of integer operation procedures. Students with a kinesthetic learning style in whole number material are classified as moderate and are strongly influenced by the learning method used. It is easier for them to understand the material if learning involves physical activity and concrete props. However, they need additional guidance in developing creativity and the ability to solve mathematical problems abstractly. There are differences in the level of mathematical understanding ability between students with auditory, visual and kinesthetic learning styles, where auditory and visual students tend to be superior to kinesthetic. However, this difference was not statistically significant in this study. Therefore, learning style is not the main factor that determines the mathematical understanding of fourth grade students at Unismuh Makassar Lab School regarding integer material.

**Acknowledgement**

-

**References**

Ahmad, N. Q., Rahayu, W., & Rahmawati, Y. (2024). Dimensi pada Instrumen Lingkungan Pembelajaran Literatur Budaya Gayo: Systematic Literature Riview (SLR). Sulawesi Tenggara Educational Journal, 4(3), 129–144.

Ardiawan, Y., & Darma, Y. (2023). Analisis Kemampuan Pemecahan Masalah Ditinjau Dari Gaya Belajar. J-PiMat: Jurnal Pendidikan Matematika, 5(2), 925–936.

Arroisi, J. (2020). Pembaharuan Pemikiran Islam Model Muhammadiyah Dan Nahdlatul Ulama. Islam Nusantara, 4(2), 172–188.

Dewantara, A. H., Amir, B., & Harnida, H. (2021). Kreativitas guru dalam memanfaatkan media berbasis IT ditinjau dari gaya belajar siswa. AL-GURFAH: Journal of Primary Education, 1(1), 15–28.

Hasnahwati, H., Romelah, R., & Hakim, M. N. (2022). Konsep Keagamaan Muhammadiyah Dalam Islam Berkemajuan: Tinjauan Manhaj Tajdid, Tarjih Dan Pendidikan Muhammadiyah. Jurnal Panrita, 3(1), 40–49.

Hermawan, V., Anggiana, A. D., & Septianti, S. (2021). Analisis Kemampuan Pemahaman Matematis Melalui Model Pembelajaran Student Achievemen Divisons (STAD). Symmetry: Pasundan Journal of Research in Mathematics Learning and Education, 6(1), 71–81.

Pristiwanti, D., Badariah, B., Hidayat, S., & Dewi, R. S. (2022). Pengertian pendidikan. Jurnal Pendidikan Dan Konseling (JPDK), 4(6), 7911–7915.

Setiana, D. S., & Purwoko, R. Y. (2020). Analisis kemampuan berpikir kritis ditinjau dari gaya belajar matematika siswa. Jurnal Riset Pendidikan Matematika, 7(2), 163–177.

Suwarma, D. M., Palayukan, H., & Rahmayani, S. (2024). Analisis Perkembangan Berpikir Kritis Siswa dalam Pembelajaran Matematika Perspektif Studi Longitudinal. Indo-MathEdu Intellectuals Journal, 5(3), 3585–3597.

Usman, M. R., Baharullah, & Kristiawati. (2022). Deskripsi Kemampuan Pemahaman Konsep Matematis Ditinjau Dari Gaya Belajar Siswa. JURNAL MathEdu, 5(1), 62. http://journal.ipts.ac.id/index.php/MathEdu/article/view/3525%0Ahttps://journal.ipts.ac.id/index.php/MathEdu/article/download/3525/2336