Griya Journal of Mathematics Education and Application
Volume 5 Nomor 2, Juni 2025
e-ISSN 2776-124X| |p-ISSN 2776-1258
https://mathjournal.unram.ac.id/index.php/Griya/index

Analysis of Vark Learning Styles in Elementary School Students' Mathematical Concept Understanding

Vivi Rachmatul Hidayati, Baiq Yuni Wahyuningsih, Iva Nurmawanti, Hikmah Ramdhani Putri

Pendidikan Guru Sekolah Dasar, FKIP, Universitas Mataram, Mataram

vivirachma@unram.ac.id

Diterima: 30-04-2025; Direvisi: 16-05-2025; Dipublikasi: 27-05-2025

Abstract
This study aims to identify elementary school students' understanding of mathematical concepts based on Neil D. Fleming's learning style theory (VARK), which consists of four main categories: Visual, Auditory, Read/Write, and Kinesthetic. A descriptive qualitative approach was used in this research, with the subjects being sixth-grade students of SDN 14 Cakranegara. The research instruments included learning style questionnaires, mathematical concept comprehension tests, and interviews. Data analysis was conducted in three stages: data reduction, data presentation, and conclusion drawing. The results showed that the majority of students had a kinesthetic learning style, indicating a preference for learning through physical activities and hands-on practice. Students with a kinesthetic learning style demonstrated a better understanding of mathematical concepts when learning methods involved physical activities. Additionally, several students exhibited a combination of visual, auditory, and read/write learning styles, reflecting variations in how they understand and apply mathematical concepts. Based on these findings, the study recommends that teachers implement varied teaching methods tailored to students' learning styles to enhance their understanding of mathematical concepts.

Keywords: Mathematical Concept Understanding; Learning Styles; VARK, Mathematics Education; Elementary School

Abstrak
Penelitian ini bertujuan untuk mengidentifikasi pemahaman konsep matematis siswa Sekolah Dasar berdasarkan teori gaya belajar Neil D. Fleming (VARK), yang terdiri dari empat kategori utama: Visual, Auditory, Read/Write, dan Kinesthetic. Pendekatan kualitatif deskriptif digunakan dalam penelitian ini, dengan subjek penelitian adalah siswa kelas VI SDN 14 Cakranegara. Instrumen penelitian meliputi kuisioner gaya belajar, tes pemahaman konsep matematis, dan wawancara. Analisis data dilakukan melalui tiga tahap, yaitu reduksi data, penyajian data, dan penarikan kesimpulan.Hasil penelitian menunjukkan bahwa mayoritas siswa memiliki gaya belajar kinestetik, yang menunjukkan preferensi belajar melalui aktivitas fisik dan praktik langsung. Siswa dengan gaya belajar kinestetik menunjukkan kemampuan pemahaman konsep matematis yang lebih baik ketika metode pembelajaran melibatkan kegiatan fisik. Selain itu, terdapat beberapa siswa yang memiliki kombinasi gaya belajar visual, auditory, dan read/write, yang menunjukkan variasi dalam cara mereka memahami dan menerapkan konsep matematis. Berdasarkan temuan ini, penelitian merekomendasikan agar guru dapat mengimplementasikan metode pembelajaran yang variatif sesuai dengan gaya belajar siswa untuk meningkatkan pemahaman konsep matematis mereka.

Kata Kunci: Pemahaman Konsep Matematis; Gaya Belajar; VARK; Pendidikan Matematika; Sekolah Dasar

1. INTRODUCTION

The implementation of the curriculum in schools cannot be separated from the role of teachers in creating a supportive learning atmosphere so that the goals are achieved. The implementation of the Kurikulum Merdeka policy strengthens the various roles of teachers in the learning process (Daga, 2021). The implementation of the Kurikulum Merdeka provides an opportunity for students to create a concept of independence. Wassahua (2018) said that independent learning in general is a policy program that provides freedom for schools, teachers, and students to develop, innovate, and freely learn independently and creatively. The goal of education initiated by Ki Hadjar Dewantara, namely to liberate the lives and lives of children by providing guidance to achieve their safety and happiness (Marwah et al., 2018). Thus, based on this concept, education is directed at meeting the needs of students by providing various efforts so that they can develop their abilities to be able to provide benefits for themselves and their environment.

One of the learning that has an important role in the development of science is mathematics learning. Until now, it is undeniable that mathematics lessons are still considered a scary subject for students, both at elementary school and even at college level (Permatasari, 2021; Ratnasari, 2017; Rawa & Mastika Yasa, 2019). The abstract nature of mathematics is often the cause of students being less motivated to learn mathematics. In addition, there are internal and external factors from students that cause this to continue to happen. Internal factors are factors from within the students themselves, for example, learning styles, interests and motivations of students. Meanwhile, external factors are factors from outside the students, for example, schools, teachers and the learning process undergone by the students themselves.

Learning style is one aspect that every student has in absorbing, organizing and processing the information received. This learning style refers more to how students prefer to learn and usually each student has their own learning style. According to Bobbi De Porter and Mike Hernacki in their book entitled Quantum learning, getting used to comfortable and enjoyable learning, it is explained that learning style is the keyword for developing performance at work, at school, and in interpersonal situations. A good learning style will run perfectly, so that it can improve student learning outcomes in the learning process (Asriyanti & Janah., 2019). Jampel (2016) conducted a study to analyze the motivation and learning styles of elementary school students and the results showed that the dominant learning style used by elementary school students was the visual learning style. In addition, Latifah (2023) in her research showed that the learning style used by elementary school students was 52% visual, 29% auditory and 19% kinesthetic. Based on the research results above, it can be concluded that each student has a different learning style and will affect the abilities they have, be it the ability to understand concepts, mathematical communication skills and/or problem-solving skills.

The VARK model is a new alternative model that is modified by utilizing the modalities possessed by students (Mayarnimar & Taufina, 2017). Therefore, learning design must be designed by considering the learning style possessed by each student. Because each student has a different learning style. Fleming VARK Learning Style Theory consists of 4 main categories, namely:

1. Visual, namely learning that contains ideas or concepts and information that can be presented in the form of images or techniques. Students who have a visual learning style are able to receive information if it is presented in the form of images and are able to describe it in real terms. In the learning process, students with this learning style prefer to see images and diagrams such as shows, demonstrations, and videos.
2. Auditory, namely learning that uses hearing. Auditory learning is very dependent on hearing or speech that is heard by students during the learning process. Students with an auditory learning style need to listen to what is said in order to understand better, and conversely students will have difficulty understanding if they receive written instructions. In the learning process, students like to pay attention to tapes, conversations, discussions, and oral directions
3. Read/write, namely learning in which a person tends to read or write anything that is heard or obtained from the surrounding environment. Students with a read/write learning style usually have to read to find information and write the information to be read repeatedly as reinforcement.
4. Kinesthetic, which is learning where students do student activities to understand the material being taught. Students with a kinesthetic learning style usually learn through physical activity and by participating directly in activities. In learning, students prefer to move and touch something that provides certain information in order to remember it and place their hands as a tool for receiving information.

Based on initial observations conducted at SDN 14 Cakranegara, it was found that mathematics learning outcomes had not fully achieved the KKM value. This was influenced by many factors, one of which was the students' conceptual understanding ability. In addition, when participating in learning, there were still students who did not pay attention to the material presented in front of the class. This resulted in low student participation when asked to work on questions in front of the class, because students did not understand the concept of the material being taught, so students preferred to memorize the formulas given rather than understand the concept of the material. The results of the observations above were also reinforced by the results of interviews conducted with several students, they revealed that the teacher explained the material too briefly in learning, so they only knew the formulas given without understanding the concept of the material presented by the teacher. Students found it difficult to recognize the symbols given and were not even able to use, utilize and choose certain procedures or operations in solving practice questions in class.

Students with diverse characteristics certainly have diverse learning styles, this is a challenge for teachers to be able to facilitate and design learning according to the learning style of each student. Each student's learning style "demands" different learning activities and media from one another. Students with certain learning styles are happier, more enthusiastic, and more motivated when doing certain activities than other activities in learning (Widharyanto, 2017). With knowledge of students' learning styles, it will be a reference for teachers to provide services to students according to their learning styles, so that by implementing learning by taking into account the learning style or characteristics of students, it can improve students' ability to receive the material taught by the teacher.

2. METHODS

This study uses a qualitative approach with a descriptive type, where this study will describe a systematic and accurate illustration of a trait, action, behavior and or phenomenon to be observed (Wassahua, 2018). The qualitative descriptive analysis method is to analyze, describe, and summarize various conditions, situations from various data collected in the form of interview results or observations regarding the problems studied that occur in the field (Koh & Owen, 2000) . Several instruments used in this study, namely: Neil Fleming Learning Style Questionnaire (VARK), Tests, Interview Guidelines and researchers. Indicators of conceptual understanding questions can be stated as follows (Kilpatrick, 2002; Sumarmo, 2014).

a. Ability to State Concepts Accurately
b. Choosing the Right Strategy and Steps for Solving
c. Ability to Use Mathematical Notation and Symbols Correctly
d. Ability to Connect Concepts
e. Logical and Consistent Reasoning in Arranging Solution Steps
f. Ability to Interpret Final Results
g. Ability to Use Visual Representations
h. Accuracy in Calculations
i. Flexibility in Solving Problems
j. Ability to Identify and Correct Errors

The indicators in the questionnaire to determine the learning styles of Visualization, Auditory, Read/Write, and Kinesthetic are as follows (Moazeni & Pourmohammadi, 2013).

a. **Visual**: Learning by observing graphs, diagrams, pictures, or mind mapping; Likes to give colorful highlights to important notes; Illustrate notes full of writing into pictures, graphs, or mind mapping; Less able to take notes completely when the teacher is explaining; Easier to remember from what is seen; and Learn using interesting illustrations.
b. **Auditory**: Easily learns or receives information by listening to explanations given by others or teachers; Able to express his/her opinions well; Likes to be in discussions; Likes to debate with others; Usually will read aloud.

c. **Read/write**: Learns easily by reading notes or textbooks; Likes to rewrite what is in books; Takes notes neatly and in detail from the teacher; Usually reads quietly; Remembers information from writing rather than graphs.
d. **Kinesthetic**: Likes to do a lot of movement when studying, such as moving hands, shaking head, or playing something; Usually likes to walk back and forth when memorizing something; Prefers practice and real work; Difficulty in writing assignments, but good at telling stories; Likes activities that involve body movement, such as sports or dancing; Cannot sit still for too long without physical activity; Takes many breaks when studying; Often plays with objects around while listening or doing something.

The data obtained in this study include, among others, a description of the ability to understand concepts, identification of student learning styles and transcripts of interview results. In this study, the data was analyzed based on Miles and Huberman using 3 stages, namely data reduction, data presentation and drawing conclusions. At this stage, the researcher collected data, then the researcher analyzed the data that had been obtained, and drew conclusions by looking at the results of the reduction and analysis of the data that had been obtained.

3. RESULT AND DISCUSSION

The test was administered to all 26 students, while interviews were conducted with 5 selected students according to the five types of learning styles that emerged. Based on the distribution of the questionnaire that has been carried out, data on learning styles and student learning outcomes in completing the mathematics test were obtained. The learning style questionnaire consists of 16 question items related to visual, auditory, read/write and kinesthetic learning styles. The distribution of data from the distribution of the student learning style questionnaire is as follows:

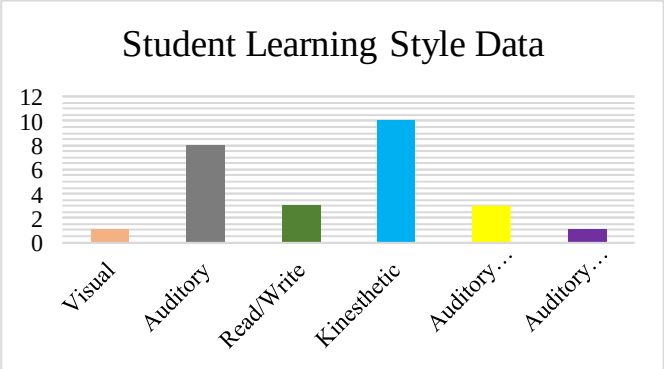


Figure 1. **Student Learning Style Data Results**

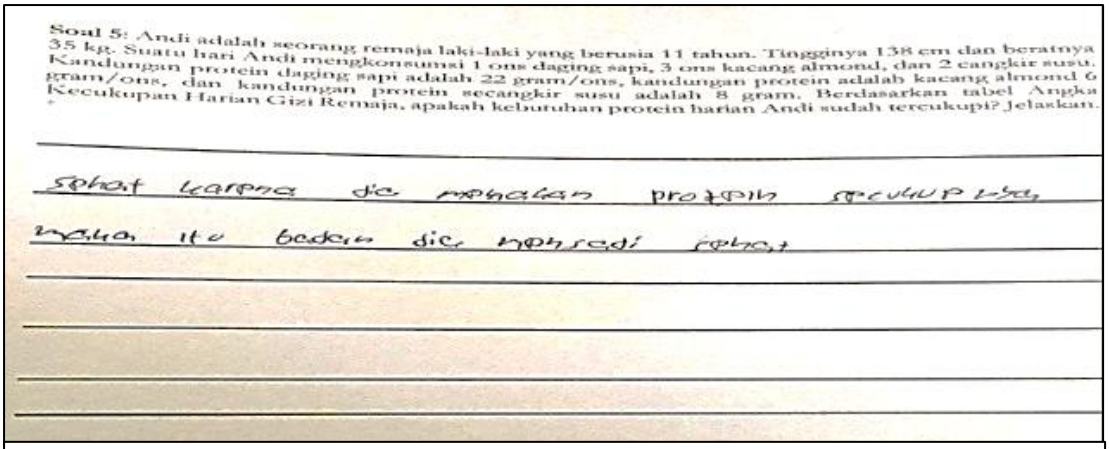
From the analysis results of the table above, the distribution of learning styles is as follows:

1. Visual Learning Style
   Only 1 student has a visual learning style. Students with a visual learning style tend to rely on sight to understand the material. They prefer to learn through pictures, diagrams, graphs, and other visual representations.
2. Auditory Learning Style
   As many as 8 students have an auditory learning style. Students with this style are more effective in understanding information through listening, such as through discussions, lectures, and verbal instructions. They are usually more comfortable learning with oral methods and listening to sounds.
3. Read/Write Learning Style
   As many as 3 students have a reading learning style. Students with a read/write learning style are more comfortable learning by reading and writing. They like to take notes and reread notes or texts to understand the material. Students tend to learn better through texts, books, and other reading materials.
4. Kinesthetic Learning Style
   Kinesthetic learning style was found to be the most dominant learning style with 10 students. Students with this style learn better through physical activity, hands-on practice, and hands-on experiences. In other words, they learn better by moving, interacting, and experiencing the material being studied.
5. Combination Learning Style
   There are also students who have a combination of learning styles. Students with this combination can learn in two different ways, such as auditory and read/write (A&R) and auditory and kinesthetic (A&K). They have the flexibility to learn using more than one method.
   a) Auditory and Read/Write Learning Styles: As many as 3 students have a learning style that combines auditory and reading. These students learn effectively through a combination of listening and reading learning materials.
   b) Auditory and Kinesthetic Learning Styles: There is 1 student who combines auditory and kinesthetic learning styles. This student learns through a combination of listening and physical activity, such as discussions followed by practical activities.

Kinesthetic learning style is the most dominant among students. This shows that the majority of students are more interested in learning through physical activities and direct practice. This indicates that more interactive and experiential learning may be more effective for the majority of students. Furthermore, auditory learning style is also quite high, both as a single learning style and a combination. Therefore, delivering information orally such as through lectures, discussions, or verbal instructions can be an effective method in learning. Meanwhile, the combination of visual and reading learning styles is found less, indicating that text-based and visual learning approaches may need to be combined with other methods to achieve greater effectiveness.

In an effort to understand the level of students' understanding of mathematical concepts, giving tests is an important step that not only functions as an evaluation tool, but also as a means to identify strengths and weaknesses in learning. This test is designed to explore the extent to which students can master basic mathematical concepts to more complex applications. Through the analysis of test results, it is hoped that a clear picture can be obtained regarding the individual abilities of students related to their understanding of mathematical concepts.

1. **Visual Learning Style**



Question 5: Andi is a teenage boy who is 11 years old. He is 138 cm tall and weighs 35 kg. One day Andi consumes 1 ounce of beef, 3 ounces of almonds, and 2 cups of milk. The protein content of beef is 22 grams/ounce, the protein content of almonds is 6 grams/ounce, and the protein content of a cup of milk is 8 grams. Based on the table of Daily Adequate Nutrition for Adolescents, has Andi's daily protein requirement been met? Explain

Student's answer:
Healthy, because he eats enough protein. So his body is healthy

Figure 2. Student 1's Problem Solving Results

a) Ambiguity in the Presentation of Mathematical Details.

The student's answer does not include mathematical calculations or details about the amount of protein consumed by Andi. There is no attempt to calculate the total protein obtained from various sources such as beef, almonds, or milk, so there is little understanding of the use of arithmetic operations (addition and multiplication). Here is the the following is an excerpt from an interview with S1 (Student 1) and Q (Researcher).

Q : Hi S1, you have done the problem about Andi's protein consumption. Can you tell me how you did this problem?

S1 : Yes, I saw the problem and immediately imagined that Andi ate beef, almonds, and drank milk. I thought, from the pictures of the food, Andi must have eaten enough protein.

P : Good, you imagined the food that Andi ate. Now, can you tell me how you calculated whether Andi had gotten enough protein?

S1 : I didn't count. I looked more at the types of food. If he had eaten meat, nuts, and milk, he must have had enough protein.

Students often have difficulty writing units of measurement. This is because students often ignore it and focus more on calculations. (Nuraini & Afifurrahman, 2023).

b) Conceptual Understanding of Protein Adequacy.

The student concludes that Andi is "healthy because he eats enough protein," which shows that the student understands that the amount of protein can affect health. However, this conclusion is not supported by data or calculations from the information given in the problem. The following is an excerpt from a conversation between Q and S1.

Q : How do you conclude an answer like that?

S1 : According to what I wrote. Because he has eaten enough protein, Andi is healthy.

Q : Are there any other reasons?

*S1 : *keeps quiet**

Students do not explore further regarding the statements they make. This could be because students are in a hurry to complete the questions. (Usqo et al., 2022).

c) Lack of Use of Table Information and Data in Questions.

Students did not appear to refer to the specific numbers provided in the problem, such as the protein content of beef (22 grams/ounce), almonds (6 grams/ounce), and milk (8 grams/cup). This suggests that students may have difficulty connecting information from the problem to relevant mathematical concepts. The following is a conversation between S1 and Q

Q : In the question, there are numbers that show the protein content of beef, almonds, and milk. Do you pay attention to the numbers to calculate the total protein that Andi consumes?

S1 : I see the numbers, but I don't count them. I focus more on the food that is described in the question. I think that if Andi has eaten beef, almonds, and milk, he must be healthy.

Q : So you focus more on the picture of the food than calculating the total protein consumed?

S1 : Yes, I prefer to see the picture of the food in my head. I think that if Andi has eaten everything, it must be enough.

Q : Do you find it difficult to use the numbers in the question to calculate the protein consumed?

S1 : It's a bit difficult to calculate it. I prefer if there is a picture or diagram that can help me compare the amount of protein from the foods. So I can see which one has more protein.

Q : Then, do you think that by using a picture or diagram, it will be easier for you to calculate it?

S1 : Yes, if there are pictures, I can understand it more clearly. Like a graph or chart that shows how much protein is in each food.

Q : So you feel more comfortable with visuals than numbers?

S1 : Yes, I understand it more easily if there are pictures. If it's just numbers, I often

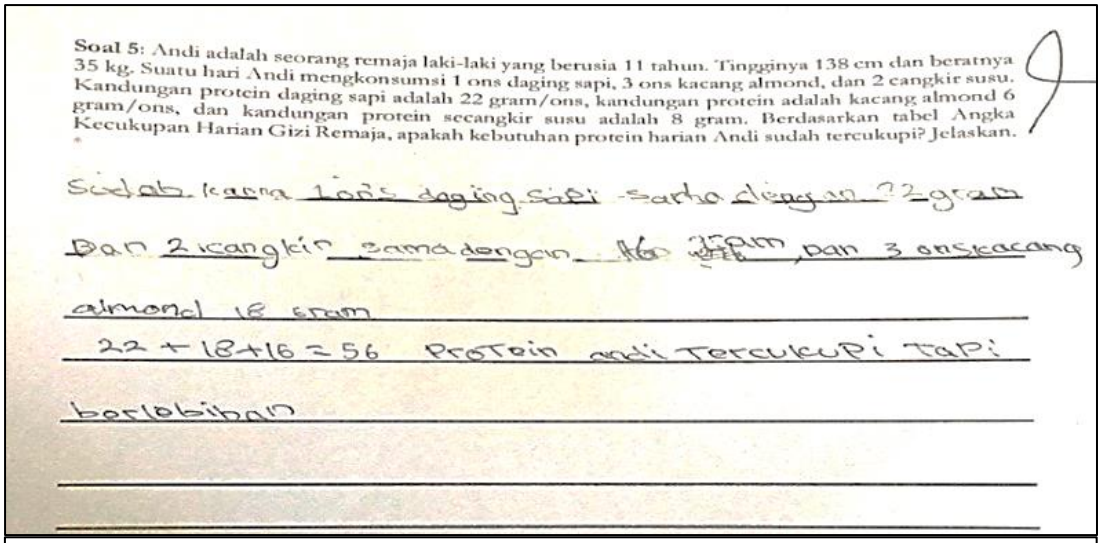
get confused about where to start.

d) General but not specific reasoning.

Although the student's answer contains the logical conclusion that protein affects health, the answer is more general and not specific. There is no direct connection between the mathematical calculations and the conclusions made. This is very unfortunate because reasoning ability is an important thing for students to have. The problem solving process is always followed by the reasoning process (Putri et al., 2019).

In addition, according to Cromley et al., (2016) visual learning styles allow students to form clearer mental representations, especially in tasks involving spatial understanding and visualization of processes. Recent research by Hausmann & Vanlehn (2017) highlights that providing students with opportunities to produce visual explanations—such as graphs or diagrams—can improve their understanding.

2. Auditory Learning Style



Question 5: Andi is a teenage boy who is 11 years old. He is 138 cm tall and weighs 35 kg. One day Andi consumes 1 ounce of beef, 3 ounces of almonds, and 2 cups of milk. The protein content of beef is 22 grams/ounce, the protein content of almonds is 6 grams/ounce, and the protein content of a cup of milk is 8 grams. Based on the table of Daily Adequate Nutrition for Adolescents, has Andi's daily protein requirement been met? Explain

Student 2's answer:

Yes, because 1 ounce of beef is equal to 22 grams and 2 cups is equal to 16 grams, and 3 ounces of almonds are 18 grams.

22+18+16=56 Andi's protein is sufficient but excessive.

Figure 3. Student 2's Problem Solving Results

a) Understanding of Information in Question.

The student demonstrated a basic understanding of the information in the question. He successfully identified the protein content of beef (22 grams), milk (16 grams from 2 cups), and almonds (18 grams from 3 ounces). Here is an excerpt from an interview with Student 2 (S2)

Q : Hi S2, you have done the question about Andi's daily protein needs. Can you tell me how you solved this question?

S2 : Yes, first I read the question softly. I heard some important information, such as beef 22 grams of protein, almonds 6 grams per ounce, and milk 8 grams per cup. From there, I immediately calculated the amount.

b) Conclusion Regarding Protein Needs.

Students conclude that the amount of protein consumed by Andi is sufficient, even excessive. However, students do not explicitly mention the daily protein requirement (50 grams) as in the previous picture, but are quite able to conclude that the requirement is more than sufficient. Here is an excerpt from an interview with Student 2 (S2)

Q : You concluded that the amount of protein that Andi consumed was 56 grams. In your opinion, is that enough or less than his daily requirement?

S2 : I think it's more than enough. I remember there was a number of 50 grams mentioned in the question, so if Andi eats 56 grams, it means it's more than his daily requirement.

Q : Good. You didn't mention the number 50 grams in your answer, but you know that it's more than enough. How did you come to that conclusion?

S2 : I heard in the question that the daily requirement is 50 grams. So, when I calculated and got 56 grams, I immediately knew that Andi had eaten more than enough.

c) Ability to Connect Logic in Answering.

Students demonstrate a fairly good understanding of the concept and are able to construct coherent and contextual answers. The conclusion that Andi's protein is sufficient and even excessive shows a proper understanding of the relat ionship between the amount of protein consumed and daily needs. Here is an excerpt from an interview with Student 2 (S2)

Q : Good. You didn't mention the number 50 grams in your answer, but you know that it is more than enough. How did you come to that conclusion?

S2 : I heard in the question that the daily requirement is 50 grams. So, when I calculated and got 56 grams, I immediately knew that Andi had eaten more than enough.

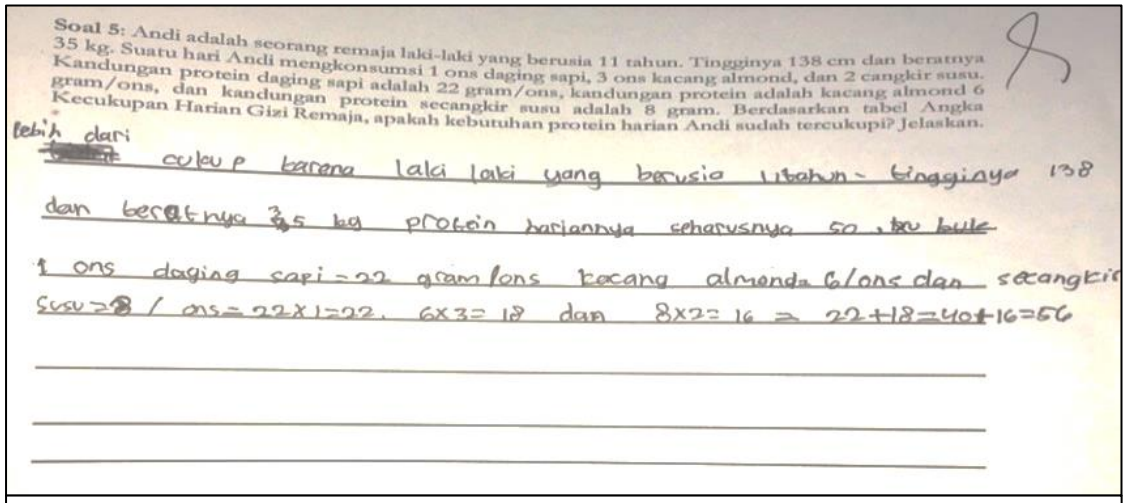
Q : Do you find it easier to understand this question by listening to the information given or is there another way you use?

S2 : I prefer to hear the information and imagine it in my head. By hearing the numbers and foods mentioned, I can immediately calculate it.

Mathematical connection is very important for students. It make them to be sure in dealing with mathematics problem and choose the best way to solve that (Ningrum et al., 2020).

From the above, it can be said that overall, Student 2 is able to understand mathematical concepts in problems well, especially in terms of addition and decision making based on data. Herawati (2023) research shows that students with an auditory learning style are able to meet several important indicators in mathematical reasoning, such as using relationship patterns and checking the validity of arguments. Auditory students tend to be better able to identify examples and anti-examples in solving math problems, but they still need further assistance in several other aspects such as providing logical reasons for mathematical solutions.

3. Read/Write Learning Style



Question 5: Andi is an 11-year-old boy. He is 138 cm tall and weighs 35 kg. One day Andi consumes 1 ounce of beef, 3 ounces of almonds, and 2 cups of milk. The protein content of beef is 22 grams/ounce, the protein content of almonds is 6 grams/ounce, and the protein content of a cup of milk is 8 grams. Based on the table of Daily Adequate Intake of Adolescent Nutrition, has Andi's daily protein requirement been met? Explain.

Student 3's Answer:

More than enough, because an 11-year-old boy is 138 cm tall and weighs 35 kg. His daily protein should be 50.

1 ounce of beef = 22 grams/ounce. 6 ounces of almonds and a cup of milk = 8/ounce = 22 x 1 = 22.

6 x 3 = 18 and 8 x 2 = 16 = 22 +18 = 40 + 16 = 56

Figure 4. Student 3's Problem Solving Result

a) Understanding of Question Information.

Students appear to be able to understand questions related to Andi's daily protein needs and how to calculate the total protein consumed from various sources (beef, almonds, and milk). The following is a conversation between the researcher and Student 3 (S3).

Q : Hi Deka, you have worked on the question about Andi's daily protein needs. Can you explain how you solved the question?

S3 : First, I read the question carefully. I saw that there was important information about the amount of protein obtained from several foods. It states that beef contains 22 grams of protein per ounce, almonds 6 grams per ounce, and milk 8 grams per cup.

b) Ability to Convert and Add. The student demonstrates the ability to convert units and calculate the total amount of protein from each source accurately: 1 ounce of beef = 22 grams of protein. 3 ounces of almonds = 6 grams per ounce (3 x 6 = 18 grams). 2 cups of milk = 8 grams per cup (2 x 8 = 16 grams). The student then adds the total protein obtained (22 + 18 + 16 = 56 grams), demonstrating a good understanding of arithmetic.

Q : Okay. After you got that information, what did you do next?

S3 : I started calculating the protein from each food. For beef, it's only 1 ounce, so it's 22 grams straight away. Then almonds, Andi ate 3 ounces. I multiplied 3 ounces by 6 grams, so I got 18 grams. Then, for milk, he drank 2 cups, so 2 cups multiplied by 8 grams, the result is 16 grams.

Q : What is the total amount of protein that you calculated from all those sources?

S3 : After I calculated everything, I added it up. From beef 22 grams, almonds 18 grams, and milk 16 grams, if you add it up it becomes 56 grams.

c) Calculation of Daily Protein Requirements. Students understand that the daily protein requirement for a boy of Andi's age (weighing 35 kg) should be around 50 grams. This shows that students can relate the information given in the problem to additional knowledge about nutritional needs.

d) Conclusion and Justification. The student concludes that the amount of protein consumed by Andi (56 grams) is sufficient to meet the daily protein requirements, which is indicated by the answer that this is "more than enough". This conclusion is logical and based on correct calculations.

Q : Then, do you think the amount of protein consumed by Andi has met his needs?

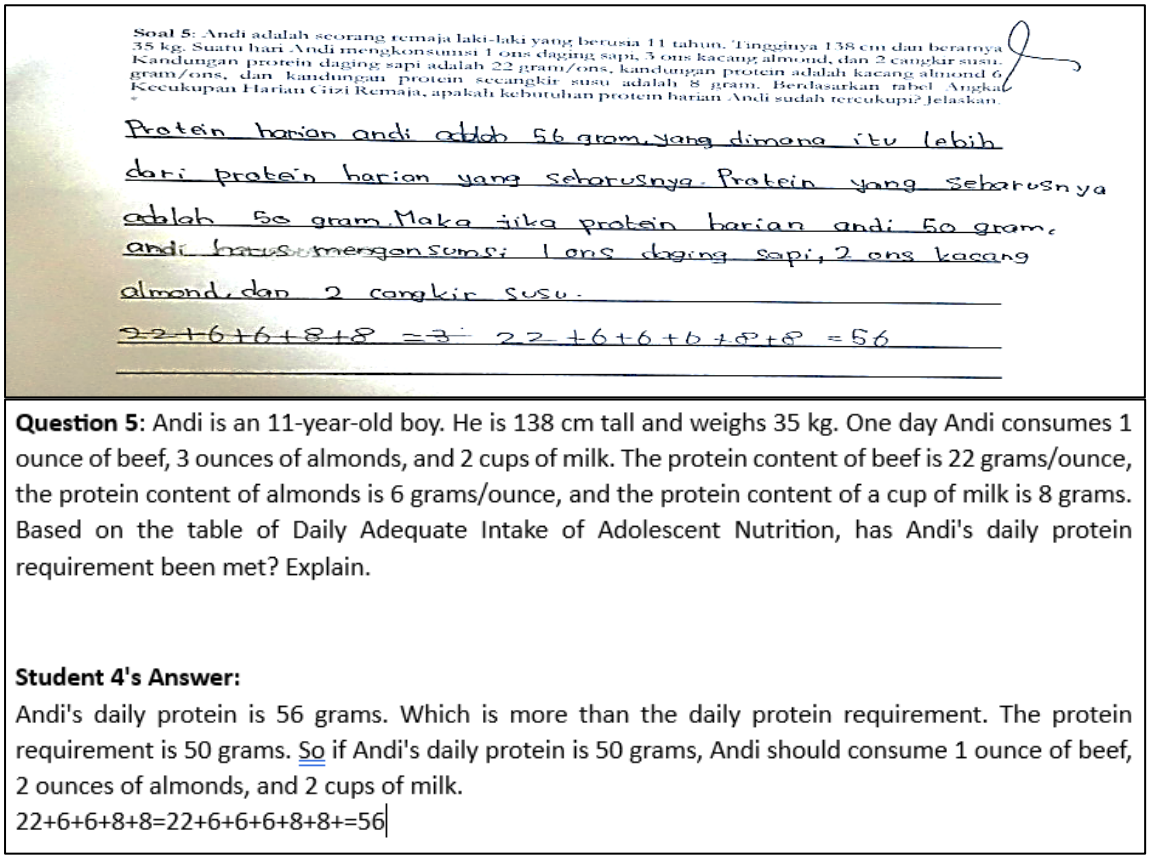
S3 : I remember from the information in the question that Andi's daily protein requirement should be 50 grams. So, since Andi has eaten 56 grams, that is more than enough. I conclude that Andi has met his needs and even a little more.

Q : You have successfully concluded that Andi has gotten more than his protein needs. In your opinion, what makes this conclusion logical?

S3 : Because after I added up all the proteins, the result was 56 grams, while Andi's needs were only 50 grams. So, I know that Andi has consumed enough protein, even more than what is needed.

Thus, overall Student 3 has a fairly good understanding of mathematical concepts in understanding questions and using information in questions to draw conclusions. Understanding of the context of the question is also seen, because Student 3 can connect calculations with daily protein needs accurately. Students who have good problem solving skills can identify information in a problem, can complete calculations accurately, and are able to conclude results with correct reasoning (La'ia & Harefa, 2021).

4. Kinesthetic Learning Style



Question 5: Andi is an 11-year-old boy. He is 138 cm tall and weighs 35 kg. One day Andi consumes 1 ounce of beef, 3 ounces of almonds, and 2 cups of milk. The protein content of beef is 22 grams/ounce, the protein content of almonds is 6 grams/ounce, and the protein content of a cup of milk is 8 grams. Based on the table of Daily Adequate Intake of Adolescent Nutrition, has Andi's daily protein requirement been met? Explain.

Student 4's Answer:

Andi's daily protein is 56 grams. Which is more than the daily protein requirement. The protein requirement is 50 grams. So if Andi's daily protein is 50 grams, Andi should consume 1 ounce of beef, 2 ounces of almonds, and 2 cups of milk.

22+6+6+8+8=22+6+6+6+8+8+=56

Figure 5. Student 4's Problem Solving Result

a) **Understanding of the Question.** The student showed a good understanding of the question regarding the amount of daily protein needed by Andi. The student successfully identified that Andi's protein requirement is 50 grams according to the Nutritional Adequacy Table.

Q: Hi, S4. You have done the problem about Andi's daily protein requirement. Can you tell me how you solved the problem?

S4: So, first I looked at the table and started with the important information. It said Andi's protein requirement was 50 grams, and there was also information about the food he ate. I started to remember the amount of protein in each food while taking notes.

b) **Calculation Process.** The student correctly identifies the amount of protein from the various food sources that Andi consumes: 1 ounce of beef = 22 grams of protein. 3 ounces of almonds = 6 grams of protein per ounce, so 3 x 6 = 18 grams. 2 cups of milk = 8 grams of protein per cup, so 2 x 8 = 16 grams. Andi's total protein intake: 22 + 18 + 16 = 56 grams.

Q : How do you calculate the amount of protein?

S4 : I immediately try to count them one by one. For example, beef is 1 ounce, so that's 22 grams. Then I move on to almonds, he eats 3 ounces, so I multiply 3 ounces by 6 grams, the result is 18 grams. Then milk, he drinks 2 cups, and each cup is 8 grams,

so the total is 16 grams.

Q : Do you do the calculations physically, or is there another way you use to make it easier?

S4 : I count while writing in my notebook. It feels better if you can write and see the numbers directly. Then I also count with my fingers to make sure the calculations are correct. That makes me confident and understands better.

Q : After all that, what is the total amount of protein that you calculated?

S4 : If you add it all up, the total is 56 grams.

c) **Conclusion Drawing.** Students conclude that Andi's daily protein is 56 grams, which exceeds the standard daily requirement of 50 grams. This understanding shows that students are able to compare the calculation results with the specified requirement figures.

d) **Answer Writing Structure.** Students write the calculation process in detail and clearly, with calculation steps that are easy to understand. Students also write the final conclusion that Andi's protein intake is sufficient, even exceeding the recommended amount.

e) **Analysis.** The student demonstrated a good understanding of arithmetic concepts, especially in terms of addition and multiplication. The understanding of concepts in context was also quite good, where the student was able to connect information about the amount of protein from the food consumed with Andi's daily needs. The mathematical calculations were done correctly, although the student did not provide additional justification for the importance of the excess protein obtained by Andi.

Q : Do you feel that this amount of protein is enough for Andi?

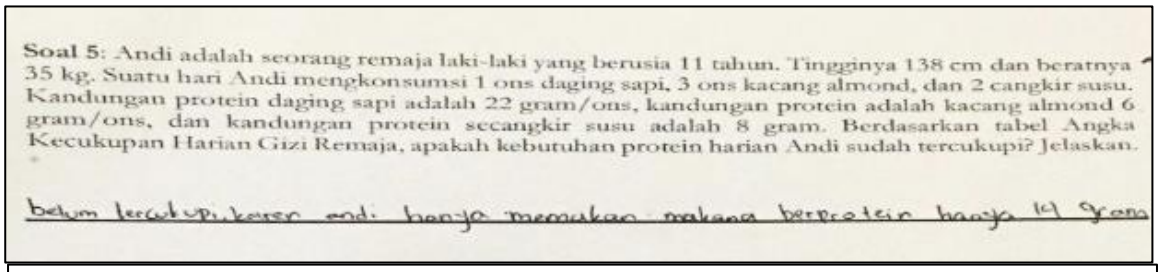
S4 : Yes, because Andi's requirement is only 50 grams, and he has gotten 56 grams. That means it is more than enough, so I conclude that Andi has gotten the protein he needs.

Q : Do you feel more comfortable working on this problem by writing or moving?

S4 : Yes, I feel more comfortable if I move or write down the numbers. So I don't just look at the table, but actually write, count with my fingers, and double-check. That makes me understand the problem better.

Thus, this student shows a good understanding of concepts, especially in the application of basic arithmetic calculations in everyday contexts. Gardner (2015) in his theory of multiple intelligences also mentions that kinesthetic intelligence, which involves understanding through physical movement, is very relevant in facilitating the learning of abstract concepts, including mathematics.

5. Combination Learning Style



Question 5: Andi is an 11-year-old boy. He is 138 cm tall and weighs 35 kg. One day Andi consumes 1 ounce of beef, 3 ounces of almonds, and 2 cups of milk. The protein content of beef is 22 grams/ounce, the protein content of almonds is 6 grams/ounce, and the protein content of a cup of milk is 8 grams. Based on the table of Daily Adequate Intake of Adolescent Nutrition, has Andi's daily protein requirement been met? Explain.

Student 5's Answer:
It's not enough because Andi only eats 14 grams of protein.

Figure 6. Student 5's Problem Solving Result

Based on the students' answers above, it can be seen that. The following is a description of students' mathematical concept understanding abilities:

a) Ability to Calculate Total Protein. Students have not been able to correctly add up the total protein intake from the food consumed by Andi. The actual total amount of protein is: Beef: 1 ounce = 22 grams. Almonds: 3 ounces x 6 grams = 18 grams. Milk: 2 cups x 8 grams = 16 grams. Total = 22 + 18 + 16 = 56 grams. The conversation between researcher and Student 5 (S5) can be seen as follow:

Q : Can you explain how you calculated the protein for each food?
S5 : For beef, I know that 1 ounce is 22 grams of protein. For almonds, I remember 3 ounces, but I wasn't sure when I calculated it. I thought it was just a little bit, so I thought it was 14 grams total.
Q : Did you do any multiplication or addition to calculate the almonds and milk?
S5 : I forgot to do the multiplication. So I kind of just took the numbers from the table, so that's probably why it was wrong. For milk too, I probably didn't factor in the two cups, so the total protein was lower than it should have been.

b) Conceptual Error. The student wrote that the amount of protein consumed by Andi was only 14 grams, which is clearly an incorrect calculation result. This shows the lack of understanding of students in doing multiplication and addition.

Q : Hi, S5. You have done the problem about Andi's protein needs. Can you explain how you calculated the amount of protein from the food that Andi consumes?
S5 : So, I looked at the table first. There are the amounts of protein from beef, almonds, and milk. But when I calculated it, I thought the total was 14 grams. I'm not sure, but that's what I remember.

c) Inability to Connect Data to Daily Needs. Students do not mention how much

daily protein needs should be, and only focus on incorrect calculations. This shows that students do not understand how to use data to draw conclusions about whether daily needs have been met or not.

Q : Did you compare your calculation results with Andi's daily protein needs?
S5 : No, I didn't have time. I focused on the calculations earlier, but because the number was 14 grams, I thought it was still less than Andi's needs.
Q : Do you know how much protein Andi actually needs daily?
S5 : Yes, if I'm not mistaken it's 50 grams. But because my calculation results were 14 grams, I think Andi is not getting enough protein.

Student 5 has not understood the concept of calculating daily protein requirements correctly, because he answered that Andi's protein requirements have not been met because he only eats 14 grams of protein, even though this is an incorrect calculation result. S5 showed that he needed further assistance in understanding basic arithmetic concepts, especially in terms of multiplication and addition, and connecting them to table data. His combination learning style involves the use of tables, written notes, and visually structured steps, as well as physical or kinesthetic activities that can help his learning process more effectively.

In the theory of multimedia cognitive processing states that the combination of visual, kinesthetic, and verbal elements can improve understanding of mathematical concepts better by utilizing various sensory modalities (Mayer, 2021). Mayer argues that combining information through various perceptual pathways (visual, kinesthetic) helps reduce students' cognitive load when processing complex information such as mathematical calculations. Another study by Dewi & Yuliawati (2020) in Indonesia also found that students with a combination learning style involving table visualization, physical modeling, and written notes showed significant improvements in understanding basic mathematical concepts, especially in everyday contexts.

4. CONCLUSION

There are various learning styles that affect students' understanding of mathematical concepts, especially in the context of understanding problems and calculations. From the analysis conducted, most students have a kinesthetic learning style, which shows that they tend to understand material better through physical activity and direct practice. Meanwhile, students with a combination of visual, auditory, and read/write learning styles also show varying abilities in solving mathematical problems. Although some students are able to do calculations correctly and relate the results of the calculations to the information provided, there are still students who have difficulty in adding and converting data correctly. Some students also do not fully understand how to relate data to daily needs, which results in errors in concluding whether protein needs have been met.

5. ACKNOWLEDGMENT

This research was supported by Dana BLU Mataram University under contract number 2077/UN18.L1/PP/2024. The authors would like to express their sincere gratitude to Mataram University for providing the financial support and resources necessary for the completion of this study.

6. RECOMMENDATION

Future studies should explore the development and implementation of differentiated instructional strategies tailored to kinesthetic learners, as well as those with visual, auditory, and read/write preferences, to improve comprehension and application of mathematical concepts. In particular, research should focus on designing hands-on, real-life problem-solving activities that align with students' dominant learning styles to enhance their ability to perform accurate calculations, interpret data, and relate mathematical outcomes to practical, everyday contexts such as nutritional needs.

7. REFERENCE

Asriyanti, F. D., & Janah., L. . (2019). Analisis Gaya Belajar Ditinjau Dari Hasil Belajar Siswa. *Jurnal Kajian Teori Dan Praktik Kependidikan*, *3*(2), 183–187.

Cromley, J. G., Snyder-Hogan, L. E., & Luciw-Dubas, U. A. (2016). Cognitive and Motivational Effects of Multiple Learning Strategies in Mathematics Education. *Journal of Educational Psychology*, *108*(5), 728–741.

Daga, A. T. (2021). Makna Merdeka Belajar dan Penguatan Peran Guru di Sekolah Dasar. *Jurnal Educatio FKIP UNMA*, *7*(3), 1075–1090.

Dewi, R. K., & Yuliawati, S. (2020). Penggunaan Media Visual dalam Pembelajaran Matematika untuk Meningkatkan Pemahaman Konsep pada Siswa Sekolah Dasar. *Jurnal Pendidikan Matematika Indonesia*, *5*(2), 85–93.

Gardner, H. (2015). *Frames of Mind: The Theory of Multiple Intelligences* (3rd ed.). Basic Books.

Hausmann, R. G. M., & Vanlehn, K. (2017). Learning Mathematics Through Kinesthetic and Verbal Modalities: A Study on Embodied Cognition. *Journal of Educational Research*, *110*(3), 290–305.

Herawati, A. N. (2023). *Pemahaman Gaya Belajar Siswa dan Pengaruhnya terhadap Pembelajaran Matematika. Jakarta: Penerbit Eduka.* Penerbit Eduka.

Jampel, I. N. (2016). Analisis Motivasi dan Gaya Belajar Siswa dalam Pembelajaran di Sekolah Dasar. *Jurnal Pendidikan Dan Pengajaran*, *49*(3), 109–119.

Kilpatrick. (2002). Adding It Up: Helping Children Learn Mathematics. *D C Press, Academy*, *34*(6).

Koh, E. T., & Owen, W. L. (2000). Descriptive research and qualitative research. *Introduction to Nutrition and Health Research*, 219–248.

La'ia, H. T., & Harefa, D. (2021). Hubungan Kemampuan Pemecahan Masalah Matematis dengan Kemampuan Komunikasi Matematik Siswa. *Aksara: Jurnal Ilmu Pendidikan Nonformal*, *7*(2), 463. https://doi.org/10.37905/aksara.7.2.463-474.2021

Latifah, D. N. (2023). Analisis Gaya Belajar Siswa Untuk Pembelajaran Berdiferensiasi di Sekolah Dasar. *LEARNING: Jurnal Inovasi Penelitian Pendidikan Dan Pembelajaran*, *3*(1).

Marwah, S. S., Syafe, M., & Sumarna, E. (2018). Relevansi Konsep Pendidikan Menurut Ki Hadjar Dewantara Dengan Pendidikan Islam. *TARBAWY: Indonesian Journal of Islamic Education*,

5(1), 14–26.

Mayarnimar, D., & Taufina, D. (2017). Validity Analysis of the VARK (Visual, Auditory, Read-Write, and Kinesthetic) Model - Based Basic Reading and Writing Instructional Materials for the 1st Grade Students of Elementary School. *Advances in Social Science, Education and Humanities Research*, *118*, 870–874. https://doi.org/10.2991/icset-17.2017.141

Mayer, R. E. (2021). *Multimedia Learning* (3rd ed.). Cambridge University Press.

Moazeni, S., & Pourmohammadi, H. (2013). Smart teaching quantitative topics through the VARK learning styles model. *2013 IEEE Integrated STEM Education Conference (ISEC)*, 1–7. https://doi.org/10.1109/ISECon.2013.6525222

Ningrum, H. U., Mulyono, & Isnarto. (2020). Mathematical Connection Ability Based on Self-Efficacy in IDEAL Problem Solving Model Assisted by ICT. *Unnes Journal of Mathematics Education Research Herlina Ulfa N*, *9*(2), 139–146. http://journal.unnes.ac.id/sju/index.php/ujmer

Nuraini, I., & Afifurrahman, A. (2023). Analisis Kesalahan Siswa Dalam Menyelesaikan Soal Matematika Materi Persamaan Kuadrat. *Journal of Math Tadris*, *3*(2), 15–31. https://doi.org/10.55099/jmt.v3i2.89

Permatasari, K. G. (2021). Problematika pembelajaran matematika di sekolah dasar/ madrasah ibtidaiyah. *Jurnal Ilmiah Pedagogy*, *17*(1), 68–84. http://www.jurnal.staimuhblora.ac.id/index.php/pedagogy/article/view/96

Putri, D. K., Sulianto, J., & Azizah, M. (2019). Kemampuan Penalaran Matematis Ditinjau dari Kemampuan Pemecahan Masalah. *International Journal of Elementary Education*, *3*(3), 351. https://doi.org/10.23887/ijee.v3i3.19497

Ratnasari, I. W. (2017). Hubungan Minat Belajar Terhadap Prestasi Belajar Matematika. *Psikoborneo: Jurnal Ilmiah Psikologi*, *5*(2), 289–293. https://doi.org/10.30872/psikoborneo.v5i2.4377

Rawa, N. R., & Mastika Yasa, P. A. E. (2019). Kecemasan Matematika Pada Mahasiswa Pendidikan Guru Sekolah Dasar. *Journal of Education Technology*, *2*(2), 36. https://doi.org/10.23887/jet.v2i2.16180

Sumarmo, U. (2014). Asesmen soft skill dan hard skill matematik siswa dalamkurikulum 2013. *Seminar Pendidikan Matematika Di Sekolah Tinggi Agama Islam Negeri Batusangkar*, 1–73.

Usqo, U., Roza, Y., & Maimunah, M. (2022). Analisis Kesalahan Siswa Berdasarkan Watson's Error Category dan Perbedaan Gender. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *6*(1), 505–518. https://doi.org/10.31004/cendekia.v6i1.1099

Wassahua, S. (2018). Analisis Gaya Belajar Siswa Terhadap Hasil Belajar Matematika Pada Materi Himpunan Siswa Kelas VIII SMP Negeri Karang Jaya Kecamatan Namlea Kabupaten Buru Sarfa. *Jurnal Matematika Dan Pembelajarannya*, *2*(1), 84–104.

Widharyanto, B. (2017). Gaya Belajar Model Vark Dan Implementasinya Di Dalam Pembelajaran Keterampilan Berbahasa Indonesia. *International Communication Through, Literature, and Arts*, *1999*, 1–16.