UNNES JOURNALS

*Kreano*, Jurnal Matematika Kreatif-Inovatif
Volume 15, number 1, 2024, pp. 327-341

# Analysis of Numeracy Literacy for each Student's Learning Style through Differentiated Learning assisted by ORIENT based on Thinglink

**Detalia Noriza Munahefi[1], Sintya Maharani[1], Danika Dian Khoirunnisa'[1], Nailin Nafiah Azzahra[1], Angela Vivian Budianto[2]**

[1]Mathematics Education Study Program, Universitas Negeri Semarang, Semarang, Indonesia
[2]Master of Commerce, University of Sydney, Australia

Correspondence should be addressed to Detalia Noriza Munahefi:
detalia@mail.unnes.ac.id

**Abstract**

Numeracy literacy is an ability that junior high school students must have. The facts show that junior high school students' numeracy literacy is still low because learning activities are not supported by learning media that can optimize the performance of students with various learning styles. The research aims to analyze the numeracy literacy of each student's learning style through differentiation learning assisted by thinglink-based geometry in learning style (ORIENT) media. The research method is a combination of sequential explanatory which begins with quantitative data analysis followed by qualitative data. The population is class VIII students at SMP Negeri 22 Semarang. Samples were taken using the cluster random sampling technique. The results of the mean difference test with theshowscoxon test show a significance value of 0.000 < 0.05 so there is an increase in students' numeracy literacy with ORIENT-assisted differentiation learning. The N-gain result of 0.4031 shows that there is an increase in numeracy literacy in the medium category. Students with an auditory learning style have difficulty analyzing information. Students with a visual learning style have difficulty using mathematical skills in making decisions. Students with a kinesthetic learning style have difficulty using numbers or mathematical symbols.

**Keywords**: learning style; numeracy literacy; differentiation learning; ORIENT is thinking-based

*Information of Article*
*Subject classification* *97M10 Modeling and interdisciplinarity (aspects of mathematics education)*
***This paper presented at ICMSE 2023 (international Conference on Mathematics and Science Education) UNNES***
*Conference day* *4 October 2023*
*Full Paper Submission* *31 January 2024*
*Editor Decision* *4 February 2024 (selected to be published at Kreano, Jurnal Matematika Kreatif-Inovatif)*
***Processed at https://journal.unnes.ac.id/journals/kreano***
*Submitted* *5 February 2024*
*Reviewed* *8 to 11 June 2024*
*Accepted* *11 June 2024*
*Scheduled online* *11 June 2024*
*Similarity Check* *10%*

***Abstrak***

*Literasi numerasi merupakan kemampuan yang harus dimiliki oleh siswa sekolah menengah pertama. Fakta menunjukkan bahwa literasi numerasi siswa SMP masih rendah dikarenakan kegiatan pembelajaran yang tidak didukung dengan media pembelajaran yang mampu mengoptimalkan kinerja siswa dengan berbagai gaya belajar. Penelitian bertujuan menganalisis literasi numerasi tiap gaya belajar siswa melalui pembelajaran diferensiasi berbantuan media geometry in learning style (ORIENT) berbasis thinglink. Metode penelitian yakni kombinasi sequential explanatory yang diawali dengan analisis data kuantitatif dilanjutkan data kualitatif. Populasi yakni peserta didik kelas VIII SMP Negeri 22 Semarang. Sampel diambil dengan teknik cluster random sampling. Hasil uji beda rataan dengan uji Wilcoxon menunjukkan nilai signifikansi 0,000 < 0,05 sehingga terdapat peningkatan literasi numerasi siswa dengan pembelajaran diferensiasi berbantuan ORIENT. Hasil N-gain 0,4031 menunjukkan terdapat peningkatan literasi numerasi dalam kategori sedang. Siswa dengan gaya belajar auditori mengalami kesulitan dalam menganalisa informasi. Siswa dengan gaya belajar visual mengalami kesulitan menggunakan kemampuan matematika dalam mengambil keputusan. Siswa dengan gaya belajar kinestetik mengalami kesulitan dalam penggunaan angka atau simbol-simbol matematika.*

## INTRODUCTION

Numeracy literacy is an ability that students must have, especially at the junior high school level. Permendikbudristek No. 5 of 2022 stated that strengthening numeracy literacy is a government priority program at every level of education. Strengthening literacy and numeracy is key to establishing quality learning at every level of education and curriculum area (Wyatt-Smith, 2011). Barham, et al (2019) also stated that numeracy literacy is seen as an important need for students to master. The learning process at school also emphasizes the importance of numeracy literacy. Students' achievement of numeracy literacy will be maximized if supported by adequate facilities and environment. Every teacher from various fields of study is expected to relate the relevance of numeracy to their subject (Coffey & Sharpe, 2023). Teachers are also given facilities to develop more reflective teacher professionals aimed at achieving a shared understanding of numeracy to build professional capital in schools (Goos, et al., 2011). Therefore, Venkat and Winter (2015) stated that numeracy is a context that needs to be given special attention so that it can be implemented and applied adequately.

Numeracy Literacy as a competency, especially in mathematics learning, is very much needed and must be possessed by the current generation. Students with numeracy literacy focus on using mathematical concepts to explain and predict phenomena in everyday life such as income, health, and social participation, as well as results at the macro level such as economic growth (Hanushek, et al., 2015). Numeracy literacy is closely related to the field of mathematics, but there are challenges in developing numeracy literacy for all teachers. Gravemeijer, et al (2017) stated that the abstract aspects of mathematics are useful in helping prepare students to solve problems in everyday life related to numeracy literacy. Numeracy literacy provided an important impetus for exploration as a social practice about the creation of a classroom social space that has mathematical and cultural dimensions as its main features (Ares and Evans, 2014).

Facts show that students' numeracy literacy at the secondary school level in Indonesia is relatively low. The 2018 PISA results show that the mathematics ability scores of Indonesian students are ranked 74th with a score of 396, below the OECD average of 489. Early numeracy skills influence early mathematical development. Children with low initial numeracy skills were at risk of facing mathematics learning difficulties (Lopez-Pedersen, et al., 2023; Aunio, et al., 2021). Low initial nu-

meracy performance is also a potential indicator of later mathematics learning difficulties (Morgan, et al., 2011; Jordan, et al., 2006; Morgan, et al., 2009). Therefore, increasing students' numeracy literacy must be the focus, especially in mathematics learning.

The cause of low student numeracy literacy is that the learning process in schools does not support students enough to facilitate the development of numeracy literacy. The limited use of tools in learning shows a lack of emphasis on how rich tasks can be taught across the curriculum which has been shown to develop students' numeracy skills and understanding of mathematical concepts (Geiger, et al., 2015). Mathematical activities not only involve content, but also involve values and beliefs, context, and social and institutional relationships that shape numeracy skills in certain situations (Street, et al., 2005). The low numeracy literacy is caused by students' difficulties in solving mathematical problems related to everyday life, especially in geometry material.

Geometry is considered a difficult learning material (Annizar, et al., 2020; Cesaria, et al., 2019). Even Miftah & Setyaningsih (2022) stated that students' numeracy literacy in geometry material is very worrying. Anwar, et al., (2022); Sholihah & Afriansyah, (2017); and Yuan (2013) stated that many Indonesian students need help in solving geometry problems, even junior high school students experience difficulties in understanding the concept of flat shapes, limitations in solving contextual geometry problems, and difficulty concluding deductively. Students have difficulty translating geometric problems into mathematical models, establishing appropriate procedures or strategies, and carrying out correct calculations (Jalinus, et al., 2020; Rokhima et al., 2019). The results of interviews with students at SMPN 22 Semarang also showed that students did not like geometry material because students had difficulty imagining abstract geometric shapes. In fact, according to Altun (2019), students unconsciously accept geometric concepts and shapes around them before they start school life. Geometry learning that is not supported by learning media that suits students' learning characteristics causes students to experience difficulties in visualizing geometric objects.

Sholihah (2020) stated that the factors that influence student success in achieving learning achievement are influenced by the learning process that suits the student's learning style. Mathematics teachers should also be encouraged to look for and implement strategies that can improve more students' abilities which can also attract other students with different learning styles to participate more actively in the teaching and learning process (Zales and Vasquez, 2022). Differentiated learning is learning that accommodates students' various learning needs according to their learning styles. The complexity and diversity of today's classrooms are important factors that need to be considered to ensure maximum student learning competence. Canque, et al. (2021). Differentiated learning according to Bal (2016); Sugianto, et al (2017) can increase student success as indicated by positive cognitive and affective development. Bikić, et al (2016) showed that a differentiated problem-based learning approach contributes to better student performance in teaching geometry.

Learning media is very necessary to visualize geometric shapes to support differentiated learning. Golafshani (2013) stated that appropriate manipulative objects are very necessary in learning geometry to bring mathematics to life and make invisible mathematical concepts visible. ORIENT (Geometry In Learning

Style) is an innovative learning media in geometry material that accommodates different student learning styles. ORIENT media was created using the Thinglink website. Thinglink is very flexible in its creation (Jeffery, et al., 2022). Mokhtar, et al, (2021) stated that Thinglink facilitates the creation of innovative learning media so that it can attract and maintain students' focus in class. The use of Thinglink has received a positive response from educators because it makes it easier to present material that is interesting to students (Izzah, 2022). Therefore, Thinglink makes it easy to prepare ORIENT media which consists of three features that suit the three learning styles of students. The auditory feature contains songs related to geometry material. The visual features include illustrations and images related to geometric material. The kinesthetic feature displays problems in the form of games that can be played offline or online. Therefore, the research aims to analyze the effectiveness of differentiated learning assisted by thinglink-based ORIENT media on students' numeracy literacy and to describe students' numeracy literacy for each learning style in differentiated learning assisted by thinglink-based ORIENT media.

## METHOD

The research uses mixed research methods with a sequential explanatory design. Figure 1 shows a sequential explanatory design that starts from the quantitative research stage and then continues with qualitative research. The objective of the quantitative research is to analyze the effectiveness of differentiated learning assisted by thing link-based ORIENT media on numeracy literacy. Meanwhile, qualitative research aims to analyze the numeracy literacy of students for each learning style through differentiated learning with the help of thinglink-based ORIENT media. Quantitative research uses a one-

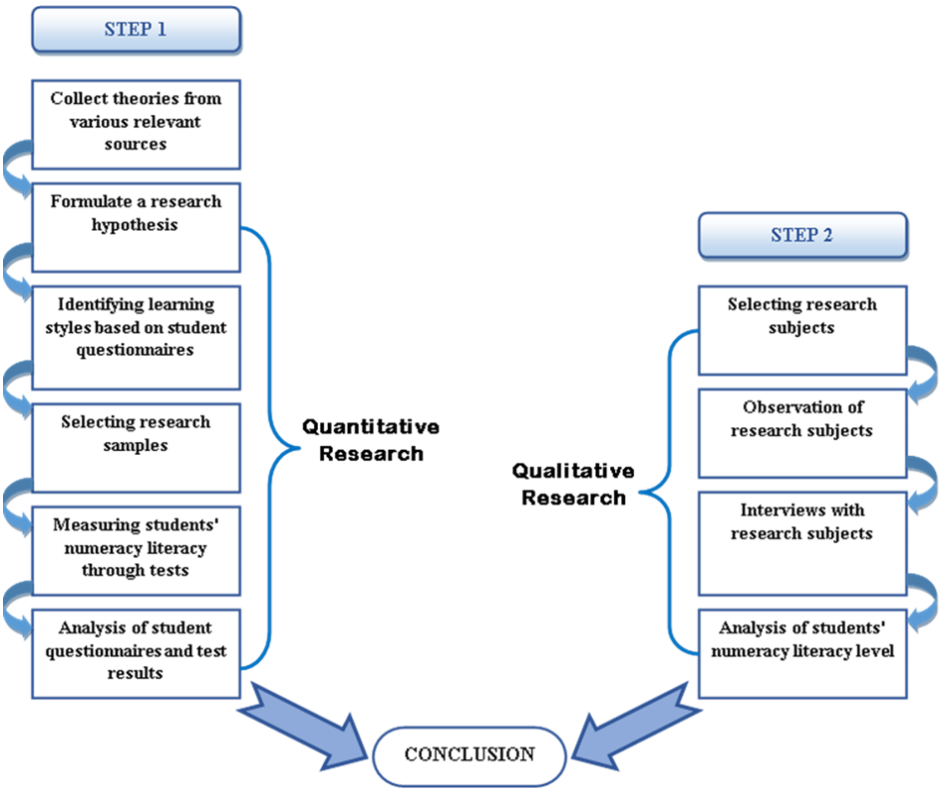


*Figure 1. Sequential Explanatory Research Scheme*

group pretest-posttest design, namely research conducted in one group by giving a pretest sheet first before being given treatment, then students will be given a post-test question sheet after being given differentiated learning assisted by ORIENT media (see Figure 1).

The research was conducted at SMP Negeri 22 Semarang in the odd semester of 2023/2024. The population in this study were all students in class VIII of SMP Negeri 22 Semarang. Samples were taken using the cluster random sampling technique. According to Sugiyono (2022), the cluster random sampling technique is a technique used when the object being studied is very broad by taking representatives from each existing group. The subjects of the research were determined based on the specifications of two students from the auditory learning style, two students from the visual learning style, and two students from the kinesthetic learning style.

Data collection techniques use tests, questionnaires, and interviews. The test is used to measure students' numeracy literacy through pretest and posttest. Questionnaires are used to identify students' learning styles which are classified as visual, auditory, or kinesthetic. Interviews were conducted to explore detailed information about the description of students' numeracy literacy for each learning style.

The data analysis technique begins with quantitative data analysis followed by qualitative data. Quantitative data analysis techniques use the mean difference test and the n-gain test. The mean difference test is used to analyze the difference in means before and after using ORIENT media. The N-gain test is used to analyze the increase in students' numeracy literacy. The mean difference test and N-gain test can be used to analyze the effectiveness of Thinglink-assisted learning media according to students' learning styles to improve numeracy literacy. Qualitative data analysis techniques in this research consist of data reduction, data presentation, and conclusion. Data reduction is carried out after the interviews are conducted and then categorized according to the research problem, while data that is not used is then discarded. The presentation of qualitative data in the form of numeracy literacy interview results based on learning styles is presented in the form of narrative text. Conclusions were drawn by comparing the data from the numeracy literacy test with the data from the interviews.

## RESULT AND DISCUSSION

### Differentiated learning assisted by thing link-based ORIENT media increases students' numeracy literacy

The research began with quantitative data analysis from the results of the students' numeracy literacy pretest and posttest. Results of pre-test and post-test numeracy literacy prerequisites through normality test. Table 1 shows the results of the pretest and posttest normality test for numeracy literacy. The significance value in the numeracy literacy pretest is 0.116 > 0.05 so the data is normally distributed. Meanwhile, the significance value in the numeracy literacy posttest results is 0.008 < 0.05 so the data is not normally distributed.

Table 1. Normality Test Results

| Value | Sig. |
|---|---|
| Pre-test | 0.116 |
| Post-test | 0.008 |

The normality test shows that the results of the numeracy literacy posttest are not normal, so the mean difference test uses the Non-Parametric Wilcoxon

Test which is shown in Table 2. The significance value of the Non-Parametric Wilcoxon Test is 0.000 < 0.05 so there is a difference in the mean of the numeracy literacy pretest and posttest. The N-gain test results were obtained at 0.4031, which shows that the pretest and posttest increases are in the medium category.

Table 2. Analysis Wilcoxon Non-Parametric Statistical Tests

| | | | | | |
|---|---|---|---|---|---|
| Z | | | | -4,941 | |
| Asymp. Sig. (2-tailed) | | | | 0,000 | |
| | N | Min | Max | Mean | Std. Dev. |
| Ngain | 3 | 0,04 | 0,081 | 0,4031 | 0,18417 |
| Valid N (lists) | 2 | | | | |

Differences in student learning styles allow students to adapt to different learning environments. Classroom learning situations require the use of more than one learning style, and students who have not developed adaptive flexibility in learning may face learning difficulties in these situations (Kablan, 2016). Thinglink-based ORIENT media supports the differentiated learning process because it can accommodate differences in student learning styles by delivering material through learning videos, songs, AR-based snakes and ladders games, and teaching aids. Learning videos that can meet the learning needs of students with a visual learning style. Songs as a means of delivering material to meet students' learning needs with an audio learning style. AR-based snakes and ladders game to meet the learning needs of students with a kinesthetic learning style. The teaching aids used are audio-visual based which can be used directly by students to provide a stimulus to students' long-term memory. The existence of abstract concepts in mathematics learning, especially geometry material, causes students to have difficulty understanding the material (Altun, 2019). Therefore, the geometry material delivered through differentiated learning assisted by thinglink-based ORIENT media makes it easier for students with various learning styles to understand abstract geometry material. Students' basic geometry skills improved after receiving treatment with media (Nurwijayanti, et al., 2019).

The evaluation provided through thinglink-based ORIENT media is equipped with games with mathematical problems that match numeracy literacy indicators and worksheets that encourage skills in using various types of symbols and numbers related to mathematics in solving practical problems in various contexts of daily life. Therefore, students with various learning styles can achieve numeracy literacy indicators. Yerizo, et al, (2023) stated that students should be introduced from an early age to contextual problems related to numeracy literacy. Orient learning media is made according to students' learning styles to meet students' learning needs and the material and questions presented in ORIENT are designed according to numeracy literacy indicators. Learning using ORIENT media according to learning styles ensures that students' needs are met so, and this affects numeracy literacy.

**Student Numeracy Literacy for each Learning Style through Differentiated Learning assisted by Thinglink-based ORIENT media**

The numeracy literacy of class VIII students at SMPN 22 Semarang in solving problems was described by analyzing the results of interviews conducted with selected research subjects. Interviews were conducted with subjects with different learning styles, namely auditory subjects (A), kinesthetic subjects (K), and visual subjects (V). Each subject is analyzed for the achievement of numeracy literacy indicators which consist of (1) the use of

numbers or basic mathematical symbols when solving real-life problems, (2) Students can analyze information displayed in various forms (graphs, tables, charts, diagrams, etc. so on), (3) Students can use their mathematical skills in real life, especially at the stage of interpreting analysis results in predicting and making decisions.

*Students with an Auditory Learning Style*

Figure 2 shows subject A's achievement in indicators of using numbers or basic mathematical symbols when solving real-life problems. Subject A can interpret mathematical problems in the form of mathematical models so that Subject A can identify the length, width, and height of blocks. Figure 2 shows that after Subject A can define the length, width, and height of the block, Subject A can determine a solution strategy to calculate the amount of wrapping paper needed to wrap the block-shaped box.

*Q : Do you understand the meaning of question number 1?*
*Subject : Yes, you understand, in question number 1 you are asked to find the area of the paper.*
*Q : What information did you get from the question?*
*Subject : The item that will be wrapped using wrapping paper is in the shape of a block. It is also known that its length is 80 cm, width is 60 cm and height is 40 cm.*
*Q : Are you only told to find the area of the paper?*
*Subject : I agree, yes.*
*Q : Why did you do number 1 this way?*
*Subject : Because what is sought is the area of the paper, which is the surface area of a block.*
*Q : Why use the formula for the surface area of a block?*
*Subject : Because a rectangular prism has edges with different lengths, widths, and heights, finding the surface area of the block requires finding the area of each side.*

The results of the interview showed that Subject A could explain the reasons underlying the use of formulas in solving problems related to the surface area of blocks. Subject A can also carry out an analysis of the various properties possessed by blocks so that they can identify the steps needed to calculate the surface area of the block correctly. These results show that Subject A can use numbers or basic mathematical symbols from the information in the problem to solve real-life problems.

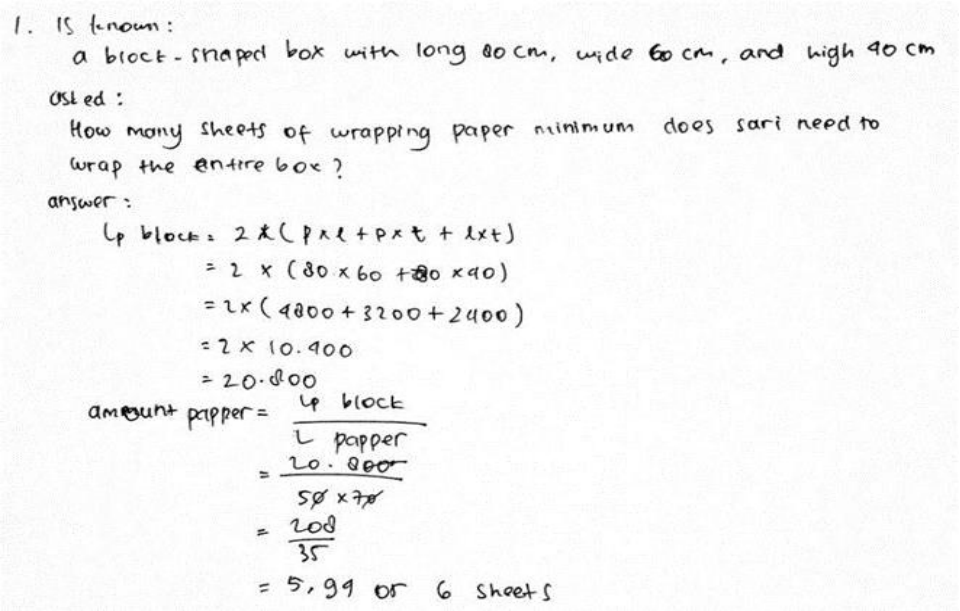
1. Is known:
a block-shaped box with long 80 cm, wide 60 cm, and high 40 cm
Asked:
How many sheets of wrapping paper minimum does sari need to wrap the entire box?
answer:
Lp block = 2 (p x l + p x t + l x t)
= 2 x (80 x 60 + 80 x 40)
= 2 x (4800 + 3200 + 2400)
= 2 x 10.400
= 20.800
amount papper = Lp block / L papper
= 20.800 / 50 x 70
= 208 / 35
= 5,94 or 6 sheets

*Figure 2. Subject A's Answer*

Figure 3 shows Subject A's achievement in the indicator of being able to use numbers or basic mathematical symbols when solving real-life problems, demonstrated by being able to model length with p, width with l, and height with t. Apart from that, students can also find out the formula used to solve the problem. Subject A can interpret mathematical problems into the form of a mathematical model so that Subject A can identify the length, width, and height of a block. Subject A can determine a solution strategy to calculate the amount of wrapping paper needed to wrap a block-shaped box after Subject A can define the length, width, and block height.

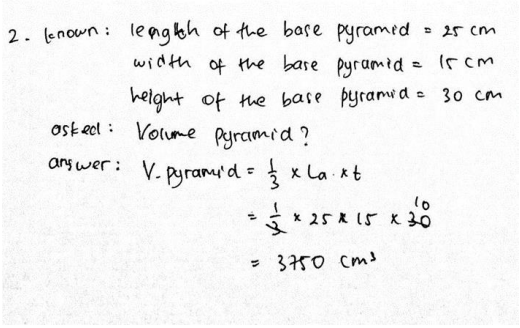


*Figure 3. Subject A's Answer*

*Q : Do you understand what question number 2 means?*
*Subject : Understand, it's just difficult because time is limited. Meanwhile, to understand the story, it takes me a long time, and usually need to read it over and over again.*
*Q : What information did you get?*
*Subject : in question number 2 you are asked to find the volume of the item. The item is in the shape of a triangular pyramid, so to find the volume of the item I used the triangular pyramid formula.*

The interview results showed that Subject A understood the meaning and information of the questions. Subject A could solve the problem accurately and correctly based on the analysis process of the information. However, Subject A experienced difficulties when analyzing the questions and writing down the information contained in the problems. This can be seen in the interview and the results of Subject A's answers. Subject A only understands how to look for volume, even though in the question he was asked to look for price. Subject A also needs to read the questions several times so that Subject A can understand the problem well can give the right answer. The interview results showed that Subject A was less able to analyze information displayed in various forms (graphs, tables, charts, diagrams, etc).

Figure 4 shows the achievement of Subject A in the indicator that students can use their mathematical skills in real life, especially at the stage of interpreting analysis results in predicting and making decisions. Subject A can interpret mathematical problems as shown by Subject A can identify illustrations of geometric blocks with balls in them and be able to identify the height and volume of the blocks. Figure 4 shows that Subject A can determine a solution strategy to calculate the volume of a block containing a ball after Subject A can define the height of the block and the volume of the ball.

*Q : Which question number is difficult?*
*Subject : Question number 6 is about a cardboard cube which contains the most difficult ball.*
*Q : How difficult is it?*
*Subject : I'm confused and don't know what to look for first.*
*Q : Is there any information you can take from this question?*
*Subject : Yes, the height of the cube is 12 cm and the volume of the ball is 14,130 cm3.*
*Q : Can you do it despite difficulties?*
*Subject : Yes, the ball has the same diameter as the side of the cardboard base, so find the volume of the cube by first finding the diameter of the ball.*

The interview results showed that Subject A had difficulty analyzing information, but the subject could answer the questions well. This shows that Subject A

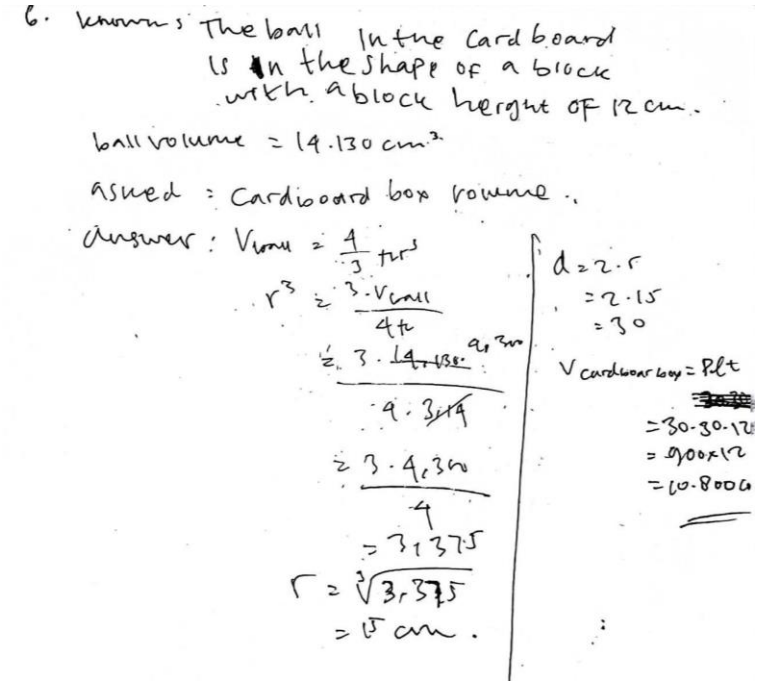


*Figure 4. Subject A's Answer*

can use his mathematical abilities in real life, especially at the stage of interpreting analysis results in predicting and making decisions.

Students with an auditory learning style do not only read the questions once to understand the information contained in the questions. The repetition technique is the best method used by students to learn and improve their understanding of information. Therefore, students with an auditory learning style can achieve mastery of several indicators of numeracy literacy, namely being able to use numbers or basic mathematical symbols when solving real-life problems and indicators of being able to use their mathematical abilities in real life, especially at the stage of interpreting analysis results in predicting and taking decision. In line with Apipah, et al (2018) who stated that students with an auditory learning style can write down the steps to solve them systematically. Students with an auditory learning style also usually repeat the information they have learned to their friends so the advantage of the auditory learning style is that they can understand and remember well the information they read orally so they can conclude the information. However, students with an auditory learning style have difficulty mastering indicators to analyze information displayed in various forms (graphs, tables, charts, diagrams, and so on). They are not good at sketching the problems that need to be solved. in evaluating or checking the validity of the arguments given (Ishartono, et al., 2021).

*Kinesthetic Category Subject*

Figure 5 shows Subject K's achievement in indicators of using numbers or basic mathematical symbols when solving real-life problems. Subject K can interpret mathematical problems in the form of a mathematical model so that Subject K can identify the length, width, and height of the block and the existing problem. Figure 5 shows that Subject K can determine a solution strategy to calculate the amount of wrapping paper needed to wrap a block-shaped box after Subject K can define the length, width, and height of the block.

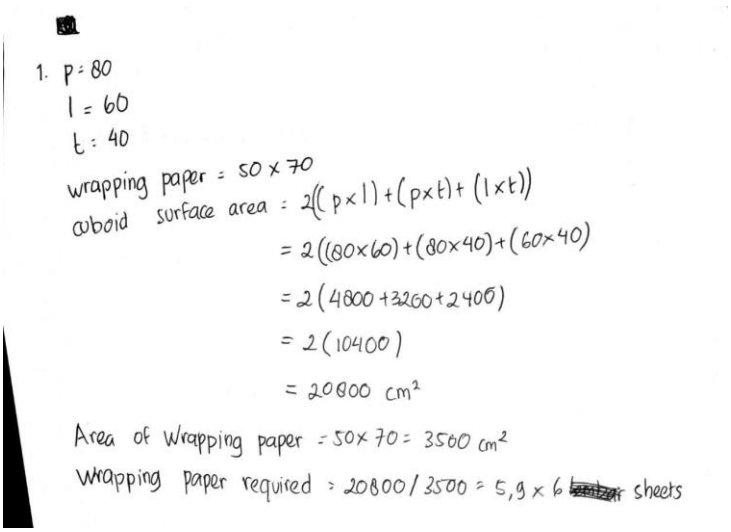


*Figure 5. Subject K's Answer*

The results of the interview showed that subject K understood the questions and used the formula for surface area and volume of blocks. Subject K also understands the information presented on the problem. Subject K understands the meaning of the question in the problem and the information needed to solve the problem so that Subject K can determine the formula that can be used to solve the problem. However, Subject K had difficulty determining the answer in decimal form. Subject K can analyze the information displayed in the questions using graphs, this shows mastery that Subject K can achieve indicators of analyzing information displayed in various forms (graphs, tables, charts, diagrams, and so on).

*Q : Why do you do it this way?*
*Subj. K : Because it only enters into the formula.*
*Q : What is the name of this spatial shape?*
*Subj. K : Box, but in block shape.*
*Q : Do you know what formula this is?*
*Subj. K : Formulas for surface area and volume of blocks.*
*Q : Can the information in the question be used to do this?*
*Subj. K : Yes.*
*Q : Overall, do you understand this matter?*
*Subj. K : Understand, only difficulty with the comma part, difficult to determine the answer with the comma).*
*Q: What information did you get from the question?*
*Subject K: yes, told you to find the unit price per volume. The item is in the form of a block with length, for example, p, which is 25 cm, width, for example, l, which measures 15 cm, height, for example, t, which measures 30 cm.*

Figure 6 shows that Subject K can model problems in real life into a mathematical model by assuming existing information, such as length, for example, p, which has a length of 25 cm, width, for example, l, which has a size of 15 cm, height, for example, t, which has a size of 30 cm. cm, and the problem is the price per unit volume of the box. Subject K could model the information he got into mathematical form, namely the volume formula for a 4-sided pyramid. These results showed that Subject K could analyze information displayed in various forms (graphs, tables, charts, diagrams, and so on). However, Subject K could not solve the problem shown in Figure 6, namely that Subject K only determined the volume of the rectangular pyramid, so he did not solve the problem. Subject K has not solved a problem so Subject K has not reached the indicator of being able to use his mathematical abilities in real life, especially at the stage of interpreting analysis results in predicting and making decisions.

The results of the interview showed that Subject K had difficulty analyzing information from a problem accompanied by pictures. Subject K finds it easier to identify problems that clearly state the information needed and the problems that must be resolved. Subject K experienced difficulty in creating mathematical models based on problems as shown by interviews with students who stated that they worked on problems using known formulas without going through the stages of preparing mathematical modeling.

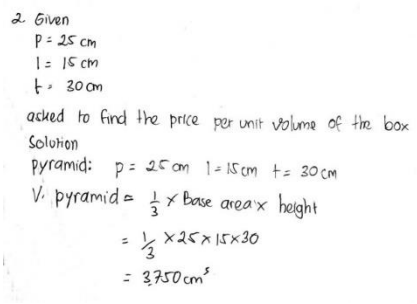


*Figure 6. Subject K's Answer*

*Q : Have you encountered problems like this before?*
*Subj. K : Yes, but sometimes it's still difficult to solve it because when faced with a story problem, I sometimes still don't understand it.*
*Q : When (have you ever experienced a similar problem)?*
*Subj. K : Mostly in 6th grade elementary school*
*Q : So you understand, right?*
*Subj. K : Yes, but I don't like questions in story form*
*Q : What kind of questions do you like?*
*Subj. K : The one with the picture and number*
*Q : Please explain which answer got the maximum score*
*Subj. K : This is question number 3. Fira's room is a cube with sides 400 cm long. The question is, what is the minimum cost that must be incurred? Because it is a cube, s = 400 cm and the total area is 4×400×400, the area wal = 6400 cm is squared and rounded up.*

Figure 7 shows that Subject K knows the information on the problem as indicated by Subject K being able to name a cube-shaped room, the side length of which is for example, which is 400 cm, for example, the cost of painting every 1 square meter is x. Subject K can ask questions about the problem which is indicated by the minimum cost required to paint the entire wall. Subject K can construct a mathematical model based on this problem which is shown by the surface area of the wall being 4 times the surface area of 1 wall. Subject K could formulate the surface area of the wall and change the units from cm to m but there was an error in the conclusion of the problem.

The results of the interview showed that Subject K could explain information on the problem. Subject K can also solve problems by using the correct formula, namely the surface area of all walls is 4 times the surface area of 1 wall. Subject K can identify a cube-shaped room, so the surface area of 1 wall is 400*400 in cm. Subject K could explain well based on the analysis process of the information that was known until the final stage which showed the change in units of the results obtained. This change in units shows that Subject K uses his mathematical abilities to make decisions to solve problems. This shows that Subject K masters the indicators of analyzing information displayed in various forms (graphs, tables, charts, diagrams, and so on). However, the difficulty experienced by Subject K in dealing with story problems shows a lack of mastery of the first indicator, namely the use of numbers or basic mathematical symbols when solving real-life problems.

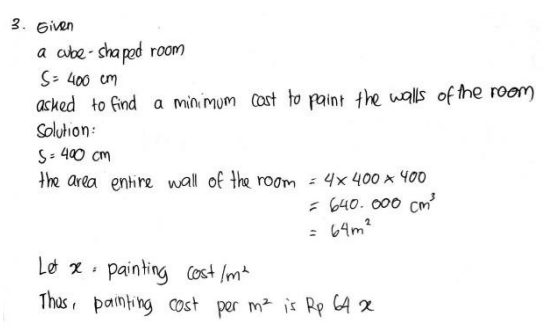


*Figure 7. Subject K's Answer*

*Q : Please explain which answer got the maximum score*
*Subj. K : This is question number 3. Fira's room is a cube with sides 400 cm long. The question is, what is the minimum cost that must be incurred? Because it is a cube, s = 400 cm and the total area is 4×400×400, then the area wal = 6400 cm is squared and rounded.*
*Q : Rounded or converted to meters?*
*Subj. K : Converted to meters*
*Q : Why was it changed to meters?*
*Subj. K : knowing how much painting costs.*

Students with a kinesthetic learning style can identify important information on a problem which is then interpreted in the form of sketches based on the problem. As Hananto, et al., (2018) stated that a kinesthetic learns through manipulation and practice in physical response activities, using movement to help concentration. Preparing picture sketches is a form of physical response by students with a kinesthetic learning style. Kinesthetic students tend to carry out the learning process accompanied by physical activity through movement, touch, and action (Sholihah, et al., 2020). Students with a kinesthetic learning style can also interpret various problem information and then students can solve problems by choosing the right resolution strategy. Kinesthetic students can carry out analysis which begins by interpreting the problem based on the mathematical concepts involved. However, students with a kinesthetic learning style do not achieve optimal indicators of using various kinds of numbers and symbols related to basic mathematics to solve problems in various contexts of daily life. This is because students with a kinesthetic style are less focused on understanding problems by reading in depth.

*Subjects in the Visual category*

Subject V can interpret the mathematical problems presented in the problem as shown by the answer. Subject V can model the sides of a cube into an s symbol and identify it. Figure 8 shows that after Subject V could define the sides of the cube, he could find a solution to the problem by calculating the surface area of the cube.

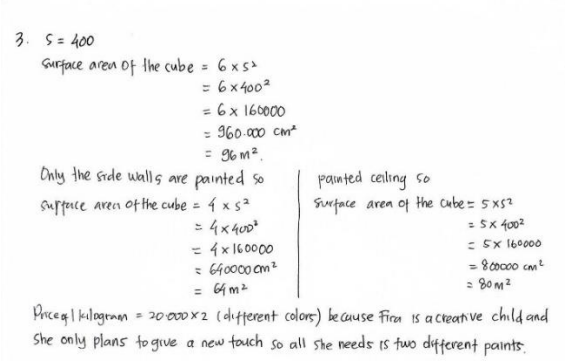


*Figure 8. Subject V's Answer*

*Q : Do you fully understand the information requested in question number 3?*
*Subj. V : I understand, question number 3 only asks how much it costs to paint the bedroom walls.*
*Q : What information did you get from the question?*
*Subj. V : Vertex V The edge length of a cube is 200 cm.*
*Q : So what steps do you take next?*
*Material V: Finding the Surface Area of a Cube.*
*Q : Why are you looking for the surface area of a cube?*
*Subj. V : Because what is being asked is the area of the wall, where the side of the wall is the surface of the room.*

The results of the interview showed that Subject V could explain the reasons underlying the use of formulas in solving problems related to the surface area of a cube. Subject V can also carry out an analysis of the various properties possessed by the cube so that he can identify the steps needed to calculate the surface area of the cube correctly. These results show that Subject V can use numbers or basic mathematical symbols from the information in the problem to solve real-life problems.

Subject V can analyze the information from the question which contains a picture of a mattress along with a description of its size so that Subject V can identify the length, width, and height of a block-shaped mattress. Figure 9 shows that after Subject V could define the length, width, and height of the beam, he could calculate the surface area of the beam. Subject V can determine a solution strategy to calculate the surface area of the mattress.

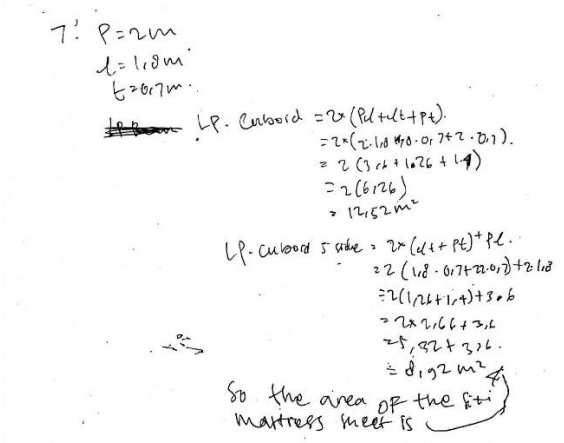


*Figure 9. Subject V's Answer*

*Q : Can you do question number 7?*
*Subj. V : Yes. Asked to determine the size of Siti's bed sheets.*
*Q : In this question, what information can you get through the pictures and statements?*
*Subj. V : Siti's bed is in the shape of a block with a length of 2m, a width of 1.8 m, and the height of the bed sheet is 0.7 m.*
*Q : What do you know from the meaning of the question?*
*Subj. V : Told to find the size of the bed sheet.*
*Q : Why do you find the surface area of a block?*
*Subj. V : Because according to my thoughts, the bed is shaped like a block; That's why I looked for the surface area of the block.*

The results of the interview showed that Subject V could explain the reasons underlying the use of formulas in solving problems related to the surface area of blocks. Subject V can also carry out an analysis of the various properties possessed by blocks so that they can identify the steps needed to calculate the surface area of the block correctly. These results show that Subject V can analyze information displayed in various forms (graphs, tables, charts, diagrams, and so on).

Figure 10 shows subject V's achievements in indicators of using his mathematical abilities in real life, especially at the stage of interpreting analysis results in predicting and making decisions. Subject V had difficulty concluding the results that Subject V had obtained. Figure 10 shows that Subject V did not formulate an answer based on the problem. Subject V only carried out volume calculations without providing an interpretation of the answer to the problem.

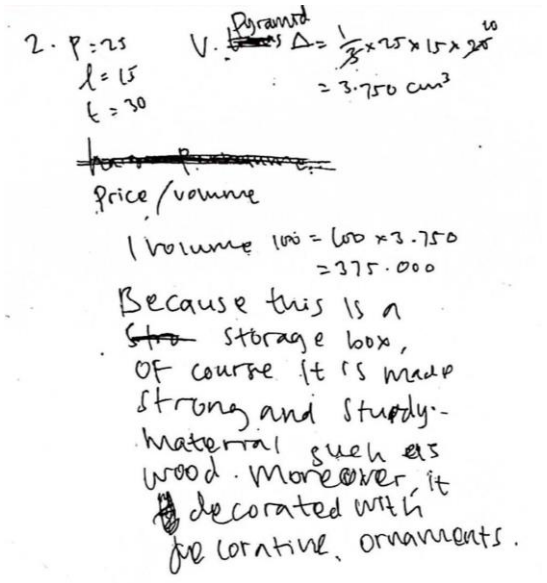


*Figure 10. Subject V's Answer*

*Q : Can you solve the problem in question number 2?*
*Subj. V : Yes. The question asked to find out the price per volume of the item.*
*Q : In this question, what information can you get through the pictures and statements?*
*Subj. V : the item is in the shape of a triangular pyramid with a length (p) of 25 cm, width (l) of 15 cm, and height of the pyramid (t) 30 cm.*
*Interviewer: What do you know from the meaning of the question?*
*Material V: Finding the volume of a pyramid.*

*Q : So, what can you conclude from your answer?*
*Subj. V : Because it is a storage box, of course, it is made of strong material, for example, wood, it would be better if it was decorated with decorations.*
*Q : So what is the volume of the pyramid?*
*Subj. V : The volume of the pyramid is 3,750 cubic cm.*

The results of the interview showed that Subject V already understood the meaning and information of the questions as well as the process of solving problems with known concepts. Subject V was also able to explain well based on the information analysis process. However, Subject V had difficulty making decisions at the answer conclusion stage. This shows that Subject V lacks mastery of the third indicator, namely using mathematical skills in real life, especially at the stage of interpreting analysis results in predicting and making decisions.

Students with a visual learning style can achieve the numeracy literacy indicator, namely being able to use numbers or basic mathematical symbols when solving real-life problems, demonstrated by being able to model the sides of a cube into symbols and identify them.

Students also achieve indicators of mastery of indicators of analyzing information displayed in various forms (graphs, tables, charts, diagrams, and so on) demonstrated by identifying the length, width, and height of a block-shaped mattress so they can find its surface area. However, students experience difficulties in mastering indicators of their mathematical abilities in real life, especially at the stage of interpreting analysis results in predicting and making decisions, indicated by the absence of interpreting answers and only carrying out calculations.

The advantage of students with a visual style is that they can create strong images that help them remember facts and concepts and process information quickly. Yerizon, et al., (2023) stated that students with a visual learning style find it easier to remember what they see. Students with a visual learning style can understand information well through pictures. Subjects with a visual learning style analyze information well so they can solve problems systematically. As Apipah, et al., (2018) stated that students with a kinesthetic style can record problem-solving steps systematically and clearly. They tend to think using systematic illustrations, so they are used to making illustrations first before solving problems. However, students with a visual learning style have not yet reached the indicators of interpreting analysis results in predicting and making decisions because they have difficulty in concluding the results. Students with a visual learning style sometimes fail to make analogies, resulting in them drawing wrong conclusions (Ishartono, et al., 2021).

## Implication of Research

The results of the research show that there is an impact on increasing students' numeracy literacy. Apart from that, the application of ORIENT-assisted Thinglink-based Differentiated Learning can be a learning alternative to treat students with different learning styles so that they are able to achieve the expected learning goals. Analysis of students' numeracy literacy provides information to education regarding the achievement of students' numeracy literacy indicators so that educators have an idea of the strengths and weaknesses of students in each visual, audio and kinesthetic learning style.

## Limitation

This research has limitations, namely that this research did not test the increase in

numeracy literacy in each learning style so it cannot compare differences in student improvement in each learning style. This is due to the limited research sample, therefore it is hoped that future research can reach a wider population and research sample. Apart from that, this research only focuses on analyzing students' numeracy literacy on visual, auditory and kinesthetic learning styles even though it is possible if each student has more than one learning style such as visual auditory, visual kinesthetic or auditory kinesthetic. Therefore, it is hoped that through Thinglink-based ORIENT-assisted Differentiated Learning, the numeracy literacy of students who have more than one learning style can be identified

## CONCLUSION

There is an influence of ORIENT learning media on increasing the numeracy literacy skills of class VIII students at SMPN 22 Semarang by 0.403 and is in the medium category. Students with an auditory learning style can use numbers and mathematical symbols to solve problems and can make good decisions, but students with an auditory learning style have difficulty analyzing information. Students with a visual learning style can use numbers and mathematical symbols to solve problems and can analyze information well but have difficulty using mathematical skills when making decisions. Students with a kinesthetic learning style can analyze information and make decisions well but have difficulty using numbers or mathematical symbols.

## REFERENCES


Altun, H. (2019). Investigation of High School Students' Geometry Course Achievement According to Their Learning Styles. *Higher Education Studies*, *9*(1), 1–8. https://doi.org/10.5539/hes.v9n1p1

Annizar, A. M. R., Maulyda, M. A., Khairunnisa, G. F., & Hijriani, L. (2020). Kemampuan Pemecahan Masalah Matematis Siswa dalam Menyelesaikan Soal PISA Pada Topik Geometri. *Jurnal Elemen*, *6*(1), 39–55. https://doi.org/10.29408/jel.v6i1.1688

Anwar, A., Turmudi, T., Juandi, D., Wahyuni, R., & Muntazimah, M. (2022). Visual Thinking Skills in Solving Geometry Problems Based on Learning Style: a Grounded Theory Study. *European Online Journal of Natural and Social Sciences*, *11*(3), 635.

Apipah, S., Kartono, & Isnarto. (2018). An Analysis Of Mathematical Connection Ability Based On Student Learning Style On Visualization Auditory Kinesthetic (VAK) Learning Model With Self-Assessment. *Journal of Physics: Conference Series*, *9831*, 012138. https://doi.org/10.1088/1742-6596/983/1/012138

Ares, N., & Evans, D. M. (2014). Mathematics and Numeracy as Social and Spatial Practice. *Education Research International*, 1–14. https://doi.org/10.1155/2014/742197

Aunio, P., Korhonen, J., Ragpot, L., Törmänen, M., & Henning, E. (2021). An Early Numeracy Intervention for First-Graders at Risk for Mathematical Learning Difficulties. *Early Childhood Research Quarterly*, *55*, 252–262. https://doi.org/10.1016/j.ecresq.2020.12.002

Bal, A. P. (2016). The Effect of The Differentiated Teaching Approach In The Algebraic Learning Field On Students' Academic Achievements. *Eurasian Journal of Educational Research*, *16*(63), 185–204. http://dx.doi.org/10.14689/ejer.2016.63.11

Barham, A. I., Ihmeideh, F., Al-Falasi, M., & Alabdalah, A. (2019). Assessment of First-Grade Students' Literacy and Numeracy Levels And The Influence Of Key Factors. *International Journal of Learning, Teaching and Educational Research*, *18*(12), 174–195. https://doi.org/10.26803/ijlter.18.12.11

Bikić, N., Maričić, S. M., & Pikula, M. (2016). The effects of differentiation of content in problem-solving in learning geometry in secondary school. *Eurasia Journal of Mathematics, Science and Technology Education*, *12*(11), 2783–2795. https://doi.org/10.12973/eurasia.2016.02304a

Budi, E. S. (2023). Pengaruh Gaya Belajar terhadap Prestasi Belajar pada Peserta Didik. *Journal of Education on Social Issues*, *2*(2), 130-154. https://doi.org/10.26623/jesi.v2i2.31

Canque, M. S., Trinidad, B. A., & Cortes, M. J. P. (2021). Differentiated Instruction through Tiered Activities in Teaching Geometry to the Junior High School Students. *Turkish*

*Journal of Computer and Mathematics Education (TURCOMAT)*, *12*(6), 5373–5380. https://doi.org/10.17762/turcomat.v12i6.9358

Cesaria, A., & Tatang, H. (2019). Learning obstacles in geometry. *Journal of Engineering Science and Technology*, *14*(3), 1271–1280.

Coffey, P., & Sharpe, R. (2023). An investigation into the teaching of numeracy in subjects other than mathematics across the curriculum. *International Journal of Mathematical Education in Science and Technology*, *54*(5), 860–887. https://doi.org/10.1080/0020739X.2021.1978570

Geiger, V., Goos, M., & Forgasz, H. (2015). A rich interpretation of numeracy for the 21st century: A survey of the state of the field. *ZDM - International Journal on Mathematics Education*, *47*(4), 531–548. https://doi.org/10.1007/s11858- 015-0708-1

Golafshani, N. (2013). Teachers' beliefs and teaching mathematics with manipulation. *Canadian Journal of Education*, *36*(3), 137–159. https://eric.ed.gov/?id=EJ1057978

Goos, M., Dole, S., & Geiger, V. (2011). Improving numeracy education in rural schools: A professional development approach. *Mathematics Education Research Journal*, *23*(2), 129–148. https://doi.org/10.1007/s13394-011-0008-1

Gravemeijer, K., Stephan, M., Julie, C., Lin, F. L., & Ohtani, M. (2017). What mathematics education may prepare students for the society of the future? *International Journal of Science and Mathematics Education*, *15*(1), 105–123. https://doi.org/10.1007/s10763-017-9814-6

Hananto, R. B., Kusmayati, T. A., & Riyadi. (2018). Analysis of the critical thinking process of junior high school students in solving geometric problems by utilizing the Vak learning styles model. *Journal of Physics: Conference Series*, *1013*(1), 012132. https://doi.org/10.1088/1742-6596/1013/1/012132

Hanushek, E. A., Schwerdt, G., Wiederhold, S., & Woessmann, L. (2015). eturns to skills around the world: Evidence from PIAAC. *European Economic Review*, *73*, 103–130. https://doi.org/10.1016/j.euroecorev.2014.10.006

Ishartono, N., Faiziyah, N., Sutarni, S., Putri, A. B., Fatmasari, L. W., Sayuti, M., & Yunus, M. M. (2021). Visual, Auditory, and Kinesthetic Students: How They Solve PISA-Oriented Mathematics Problems? *Journal of Physics: Conference Series*, *1720*(1), 012012. https://doi.org/10.1088/1742- 6596/1720/1/012012

Izzah, N. (2022). Tutorial Pembuatan Media Thinglink dalam Pembelajaran di SD. *Humantech : Jurnal Ilmiah Multidisiplin Indonesia*, *1*(7), 843–852. https://doi.org/10.32670/ht.v1i7.1703

Jalinus, N., Ganefri, Syahril, Wulansari, R. E., Nabawi, R. A., Yunos, J. M., & Kiong, T. T. (2020). Comparison of learning style between engineering and non-engineering students in vocational education. *International Journal of Innovation, Creativity and Change*, *13*(12), 283–294.

Jeffery, A. J., Rogers, S. L., Pringle, J. K., Zholobenko, V. L., Jeffery, K. L., Wisniewski, K. D., & Haxton, K. J. (2022). Thinglink and the laboratory: interactive simulations of analytical instrumentation for HE science curricula. *Journal of Chemical Education*, *99*(6), 2277–2290. https://doi.org/10.1021/acs.jchemed.1c01067

Jordan, N. C., Kaplan, D., Oláh, L., & Locuniak, M. N. (2006). Number sense growth in kindergarten: A longitudinal investigation of children at risk for mathematics difficulties. *Child Development*, *77*(1), 153–175. https://doi.org/10.1111/j.1467- 8624.2006.00862.x

Kablan, Z. (2016). The effect of manipulatives on mathematics achievement across different learning styles. *Educational Psychology*, *36*(2), 277–296. http://dx.doi.org/10.1080/01443410.2014.946889

Lopez-Pedersen, A., Mononen, R., Aunio, P., Scherer, R., & Melby-Lervåg, M. (2023). Improving numeracy skills in first graders with low performance in early numeracy: A randomized controlled trial. *Remedial and Special Education*, *44*(2), 126–136. https://doi.org/10.1177/07419325221102537

Miftah, R. N., & Setyaningsih, R. (2022). Pengembangan LKPD berbasis asesmen kompetensi minimum (AKM) pada materi geometri untuk meningkatkan kemampuan literasi numerasi. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *11*(3), 2199–2208. https://doi.org/10.24127/ajpm.v11i3.5780

Mokhtar, M. M., Jamil, M., Mansor, E. I., Sharef, N. M., & Khambari, M. N. M. (2021). Inovasi Video Pengajaran 360 Darjah: Penerimaan Bakal Guru Bahasa Melayu Terhadap Penggunaan Teknologi Realiti Maya dan Aplikasi Thinglink. *International Journal of Modern Education*, *3*(10), 19–31. https://doi.org/10.35631/IJMOE.310002

Morgan, P. L., Farkas, G., & Wu, Q. (2009). Five-year growth trajectories of kindergarten children with learning difficulties in mathematics. *Journal of Learning Disabilities*, *42*, 306–321. https://doi.org/10.1177/0022219408331037

Morgan, P. L., Farkas, G., & Wu, Q. (2011). Kindergarten children's growth trajectories in reading and mathematics: Who falls increasingly behind? *Journal of Learning Disabilities*, *44*(5), 472–488. https://doi.org/10.1177/0022219411414010

Nurwijayanti, A., & Fitriana, L. (2019). Combining Google SketchUp and Ispring Suite 8: A Breakthrough to Develop Geometry Learning Media. *Journal on Mathematics Education*, *10*(1), 103–116. https://eric.ed.gov/?id=EJ1204826

OECD. (2018). What 15-Year-Old Students In Indonesia Know And Can Do. 2018. Diakses Tanggal 10 Maret 2023.

Rokhima, W. A., Kusmayadi, T. A., & Fitriana, L. (2019). Mathematical problem solving based on Kolb's learning style. *Journal of Physics: Conference Series*, *1306*(1), 012026. https://doi.org/10.1088/1742-6596/1306/1/012026

Sholihah, A. N., Riyadi, & Triyanto. (2020). Students' mathematical communication abilities in solving geometry problems viewed from learning styles. *Journal of Physics: Conference Series*, *1538*(1), 012102. https://doi.org/10.1088/1742-6596/1538/1/012102

Sholihah, S. Z., & Afriansyah, E. A. (2017). Analisis kesulitan siswa dalam proses pemecahan masalah geometri berdasarkan tahapan berpikir Van Hiele. *Mosharafa: Jurnal Pendidikan Matematika*, *6*(2), 287–298. https://doi.org/10.31980/mosharafa.v6i2.451

Street, B. V., Baker, D., & Tomlin, A. (2005). Navigating numeracies: Home/school numeracy practices. *Springer Science & Business Media*.

Sugianto, R., Darmayanti, R., Amany, D. A. L., Rachmawati, L. N., Hasanah, S. N., & Aji, F. B. (2017). Experiment on Ability to Understand Three Dimensional Material Concepts Related to Learning Styles Using the Geogebra-Supported STAD Learning Model. *Al-Jabar: Jurnal Pendidikan Matematika*, *8*(2), 205–212. http://dx.doi.org/10.24042/ajpm.v8i2.16430

Sugiyono. (2022). Metode Penelitian Kuantitatif, Kualitatif, Dan R&D. *Alfabeta*.

Venkat, H., & Winter, M. (2015). Boundary objects and boundary crossing for numeracy teaching. *ZDM - The International Journal on Mathematics Education*, *47*(4), 575–586. https://doi.org/10.1007/s11858-015-0683-6

Wyatt-Smith, C., Elkins, J., & Gunn, S. (2011). *Multiple perspectives on difficulties in learning literacy and numeracy*. Springer.

Yerizon, Y., Arnellis, A., & Cesaria, A. (2023). Deskripsi Kemampuan Literasi Numerasi Siswa Smp Ditinjau Dari Gaya Belajar. Studi Kasus Di Kota Padang. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *12*(3), 2862–2871. http://dx.doi.org/10.24127/ajpm.v12i3.8393

Yuan, S. (2013). Incorporating Polya's problem solving method in remedial math. *Journal of Humanistic Mathematics*, *3*(1), 96–107. https://doi.org/10.5642/jhummath.201301.08

Zales, J. P., & Vasquez, R. S. (2022). Learning styles and achievement in geometry. *South Florida Journal of Development*, *3*(4), 5542–5548. https://doi.org/10.46932/sfjdv3n4-117