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Analyzed of Interactive E-Worksheet Three-Dimensional Shapes with Flat Surfaces in Mathematical Problem Solving

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ABSTRACT

This study analyzed mathematical problem-solving ability reviewed from the Honey and Mumford learning style using Interactive E-Worksheet Three-Dimensional Shapes with Flat Surfaces. The learning style used in this study is the Honey and Mumford learning style, which consists of four types: Reflector, pragmatist, theorist, and activist. This descriptive study uses a qualitative approach with an interview and experiment-based research type. To determine students' learning styles, the researcher provided a questionnaire classified by Honey and Mumford. The subjects of this study were 30 students of class VII A of SMP Negeri 26 Malang. Based on the study results, it is known that the subjects of the reflector learning style are less able to understand the steps to solve problem number 1. The subjects of the pragmatic learning style are less able to understand the steps to solve problem number 1 and do not work on problem number 2. The subjects of the theoretical learning style can understand the problem of solving problem number 1, but there are still mistakes, and they do not work on problem number 2; the subjects of the activist learning style are less able to understand the steps to solve problem number 1. Thus, research is needed to determine the problem-solving ability on different topics and learning media according to students' learning styles.

Keywords: *Problem-solving, Learning style, Interactive E-Worksheet*

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INTRODUCTION

Students learning mathematics must have several skills, including the ability to solve mathematical problems (Citroresmi & Susanti, 2021). Teachers often pay attention to how to teach but do not help students think about how to solve a problem (Pranyata & Ferdiani, 2023). Therefore, teachers are expected to understand students' problem-solving abilities in the learning process.

Problem-solving is an activity where students use their experience and knowledge to achieve a desired goal. (Ramadhani et al., 2019) , and in the problem-solving process, there are differences in results; this is because the ability of each student to solve problems is different (Ramadhani et al., 2019).) There are 4 indicators of problem-solving according to Polya, namely: (1) understanding the problem from the question, (2) finding solutions and ways to solve problems, (3) solving problems, (4) rechecking the results obtained (Citroresmi & Susanti, 2021). However, ability breakdown problems faced by Indonesian students still need to be improved. Things align with the opinion of Inayah et al. (2021), who stated that the results of the 2018 PISA assessment show that Indonesia received an average score of 379, compared to China, which gets the highest score (591).

Several things influence ability breakdown problem students, including style of learning. Each student's learning style affects their learning process, be it understanding concepts, solving mathematical problems, and others (Kuncoro & Ruli, 2022). learning style is the way, characteristics, and behavior of a person or individual absorbing, processing, and understanding information, data, or lessons (Heryani & Ramadani, 2019). Every individual naturally has distinctive features For getting information (Pranyata et al., 2023), and each student has a different way of learning or learning style (Ferdiani, 2022) to understand and solve the problems they face; some students react quickly without thinking hard, and some students respond slowly but think carefully (Islamiyati et al., 2020)

Improvement ability problem can use Interactive E-Worksheet. Interactive E-Worksheet is an ICT (Information and Communication Technology)-based learning tool that can be used for learning activities (Putri & Astawan, 2022). Learning activities it is a means for teachers to provide knowledge, attitudes, and skills to students to create interaction and enjoyment so that learning is not monotonous (Putri & Astawan, 2022). The types of questions contained in Interactive E-Worksheetare very diverse, such as multiple choice questions, drop-down questions, matching answers, drag and drop, listening, and essay answers (Kusumaningrum et al., 2022). Based on this description, research is needed to analyze mathematical problem-solving abilities in learning styles using Interactive E-Worksheet learning media on flat-sided spatial geometry material. Several studies that have been conducted have succeeded in analyzing the mathematical learning styles of high-achieving students in solving mathematics problems with the Pythagorean theorem material (Melinda, 2017). It was found in research results that the analysis of the need for electronic teaching materials in terms of students' mathematical problem-solving abilities have high problem-solving skills so that they can solve test questions well and correctly (Krismawati et al., 2022).

Based on observations at SMP Negeri 26 Malang and the results of interviews with one mathematics subject teacher, the results of the interview showed that the learning process carried out in the classroom used the web-based Interactive E-Worksheet "liveworksheet.com" and applied a visual learning style, where the visual learning style emphasizes more on sight so that the eyes play an essential role in learning style. Each student's learning style is different because not all students can focus on what is seen; some students also need experiments, trying new ideas and techniques to ensure that the theories and concepts being studied can be appropriately applied. The results of tests and interviews with students about solving problems using Interactive E-Worksheet showed that students still had difficulty and were less creative in solving problems on spatial geometry material and were less able to solve problems using reasonable and correct steps, namely, less able to write down what is known and asked from the problem, less able to write a solution plan, less able to complete the solution plan to the final stage, less able to re-correct or draw conclusions from the final results.

Study this has been studied by several researchersresearchers, including Melinda (2017) and Krismawati (2022). The differences study This with study previously is study descriptive use approach qualitative with type study interviews and research based on purposeful experiment for describe ability breakdown problem mathematical reviewed from style learn Honey-Mumford with type activist, Reflector, theorist, and pragmatist using interactive E-Worksheet on the material wide surface and volume of a shape room side flat.

This research is considered important because geometry material is a mandatory material that must be mastered by students from elementary to college. but in reality, geometry is considered difficult material by students because geometry is an abstract concept that requires reasoning, critical thinking, and creative thinking to solve it. for that, learning media are needed that concretize abstract geometry material so that it is easier to understand geometry material, especially Three-Dimensional Shapes with Flat Surfaces. Because so far to understand geometry material, technology has not been utilized and students' learning styles have been ignored. In fact, by understanding students' learning styles, teachers can determine the appropriate learning model or media for students.

METHOD

This research is a case studyusing a qualitative approach. Qualitative research results are not obtained by statistical procedures or computational forms (Melinda, 2017). The type of research used is interview and experimental-based research that aims to gain a deeper understanding of students' mathematical problem-solving abilities in the learning process with their different learning styles. The subjects of this study were 30 students of class VII A of SMP Negeri 26 Malang. They will be selected according to the Honey and Mumford learning style, which consists of four types, namely, reflectors, pragmatists, theorists, and activists. Data collection is used in this research: a learning style questionnaire, a written test based on Interactive E-Worksheet, interviews, observation results, and documentation.

The learning style questionnaire used in this study is Honey and

Mumford's Learning Style Questionnaire (LSQ), which consists of 80 questions and several indicators that will be given and filled in by students. This aims to determine the research subjects based on Honey and Mumford's learning styles. Furthermore, a written test is carried out using the Interactive E-Worksheet, which consists of several types of questions, namely, drop-down, matching, and essay on the material of flat-sided geometric shapes. This test only focuses on essay questions that determine students' mathematical problem-solving abilities. Then, the answers from students are analyzed to determine whether the cognitive process has been completed. The following procedure is an unstructured interview after students have finished the written test using the Interactive E-Worksheet. The interview was conducted to discover students' mathematical problem-solving abilities in more depth. The data analysis used in this study is the Miles and Huberman model: data reduction, data presentation, drawing conclusions, and verifying Sugiyono's data (Islamiyati et al., 2020). The technique used is the triangulation technique.

RESULTS AND DISCUSSION

RESULTS

The Learning Style Questionnaire (LSQ) Honey and Mumford was distributed to class VII A students of SMP Negeri 26 Malang. The following results are from the distribution questionnaire-learning styles.

Table 1. Distribution Results Learning Style Questionnaire

Learning Styles	Subject Number	Number of Students
Activist	2,4,6,10,17,23,24,32,34,38,40,43,45,48,58,64,71,71,74,79	2
Reflector	7,13,15,16,25,28,29,31,33,36,39,41,46,52,55,60,62,66,67,76	17
Pragmatic	1,3,8,12,14,18,20,22,26,30,42,47,51,57,61,63,68,75,77,78	6
Theorist	5,9,11,19,21,27,35,37,44,49,50,53,54,56,59,65,69,70,73,80	3
Reflector & Pragmatist	1,3,4,5,6,7,9,11,13,14,15,16,17,18,19,20,21,23,24,25,28,29,30,31,34,35,36,37,38,39,40,41,43,44,47,49,50,51,52,53,54,55,56,57,59,60,62,63,64,69,73,74,75,76,77,78	1
Reflector & Theorist	1,3,4,5,6,7,8,9,10,11,13,14,15,16,17,18,19,20,23,25,26,28,29,30,31,33,36,37,38,39,40,41,42,43,44,47,48,49,51,52,53,54,55,56,57,59,60,61,62,65,66,68,69,73,74,75,76,77,78	1

From Table 3.2 above, it is known that from a total of 30 students who filled in the questionnaire, 2 students are classified as Activist, a student with an Activist learning style is easily bored, open-minded, optimistic, acts no ready, fast take decisions, like change, challenge, and soul social. Seventeen students classified as style learners Reflector, students with learning styles this careful, thorough, more attention, good listener, systematic, slow to take decisions, wise, happy to be on the bench, less believe self. 6 is classified

as style Study pragmatic. Students with style Study pragmatic students who do not like discussing long and tomuchch theory are, practical, like new ideas, like solving problems with the most prominent and preferred solution namely working together. The remaining 3 students are classified as in- learning style Theorists. A student Theorist is a student, objective, logical, and rejects Uncertainty rejects ambiguity, perfectionism, rational , systematic , and logical . One student was classified as in learning style mixture, namely Reflector and pragmatist, and 1 student was classified as in style learn Reflector and theorist.

From the table results, the grouping style learned above is that students in Class VII A of SMP Negeri 26 Malang have different styles of teaching. Viewed from the number of students who filled in the questionnaire style learning, the style study is more reflective type superior to the type style learning others. In the learning process, teachers should not use the one-sided learning type. Diversity learning style students inside the class is very much utilized by students for workgroups because students who have different learning style differently can each fill in the lack with their respective advantages. Knowing how every study style can help teachers handle participant education during the learning process.

In determining style, the Study researcher takes from several criteria students, namely : (1) Type same sex (gender), (2) Ability mathematical equivalent, (3) Pretest value between 80-100, (4) Same age. The following presented 4 subjects selected based on the criteria participant educate according to style study Honey and Mumford:

Table 2. List of Subjects Selected ased on Criteria Participant Educate With Honey and Mumford Learning Style

Learning Styles	**Student Initial Name**	**Average Ability**	**Gender**	**Age**	**Subject Code**
Activist	NRPA	81.6	Woman	12	S24
Reflector	RDC	87.2	Woman	12	S27
Theorist	HBAPA	80	Woman	12	S11
Pragmatic	SSMA	83.8	Woman	12	S30

Based on the analysis distribution questionnaire style, Study 4 participants were selected to be educated with criteria style learning that fulfills expected criteria. The chosen subjects were coded as S27 for the reflector learning style, S30 for the pragmatic learning style, S11 for the theoretical learning style, and S24 for the activist learning style. After getting the subject activist, Reflector, theorist, and pragmatic, the subject requested a follow-up test To know the ability breakdown problem.

The four selected subjects were given written problem-solving ability test questions using Interactive E-Worksheet on flat-sided geometric shapes. This Interactive E-Worksheet is a student worksheet containing materials and several types of questions used to measure the mathematical problem-solving abilities of students with different learning styles. Furthermore, interviews were conducted to learn in-depth about the mathematical problem-solving skills of students that could not be stated in written form from the previous test results.

Figure 1. Display of Interactive E-Worksheet Flat-Sided Spatial Building

DISCUSSION

This study analyzed mathematical problem-solving ability reviewed from the Honey and Mumford learning style using Interactive E-Worksheet Three-Dimensional Shapes with Flat Surfaces. Based on the results of the study, the following results were obtained:

1. Subject Activist (S24)

Based on the analysis answer test written and interview using Interactive E-Worksheet for results settlement question test number 1, 2, and 3 with subject activist learning style obtained results that: **a) Step understand the problem.** The subject with the activist learning style understands the questions contained in the solution problem so that the subject can know what is asked and what is known. b). **Step plan completion**. Subject with activist learning style not capable of knowing method solution to problem number 1, so subject No can finish plan settlement until stage end, and on question number 2, subject capable of finishing plan settlement until end. However, still, there is an error calculation. c). **Step Completion Problem**. Subject capable of finishing plan settlement until stage end. However, there are still error calculations, as well as not enough capability to conclude from the results. d). **Step inspection return**. The subject activist did not inspect the results obtained and could not draw a conclusion from answer question number 1. The answer worked on by the subject can be seen from the sheet. Then, the subject with the Study activist style was not capable of understanding the mathematical breakdown on question number 1.

2. Subject Reflector (S27)

Based on the results of the work and

interviews regarding the results of completing test questions number 1, 2, and 3 with the subject of reflector learning style, it was obtained results : a). **Steps to understand the problem**, subjects with a reflective learning style understand the problem-solving questions well enough to write down what is asked and what is known. b). **Step plan completion**, subjects with a reflective learning style are less aware of how to solve the problem and do not have enough plans to solve the test questions. So, subjects with a reflective learning style cannot plan the solution to question number 1. In the steps to carry out the solution to question number 1, it is seen that subjects with a reflective learning style do not complete the solution until the final stage. c). **Step carry-out completion**. The subject can complete the solution plan to the final stage, but there is a slight calculation error. In question number 3, the subject can complete the solution plan to the final stage. So, subjects with a reflector learning style arecan still not carry out the solution plan. d). **Step inspection return**. Subjects with a reflector learning style are unsure about their answer to question number 1 in the section for finding volume. For questions 2 and 3, the reflector subject is sure their final answer is correct. So, subjects with a reflector learning style can recheck the final result less.

3. **Subject Theorist (S11)**
   Based on the results of jobs and interviews to results settlement question test number 1, 2, and 3 with subject theorist learning style, obtained results: a). **Step understand the problem**. Subject with Theorists learning style do not understand enough questions contained in the solution problem to write what is asked and what is known from question number 2. b) **Step plan completion**, subject with Theorists learning style is not capable of knowing the method of settlement so that not enough plans to do settlement Because there is no answer to question number 2. c) **Step carry-out completion**. The subject with Theorist learning style finishes settlement until the end of the stage, but there is an error in the calculation process. Then, the subject with Theorist learning style cannot carry out a planned settlement with good. d). **Step inspection return**. The subject with the theory learning style does not do calculations back. The subject with the theory learning style is not capable enough of inspecting the return results end.
4. **Subject Pragmatic (S30)**
   Based on results and interviews to results settlement question test number 1,2 and 3 with subject theorist. a). **Step understanding the problem**. Pragmatic subjects are less able to understand question number 1, so they cannot write down what is asked and what is known. b). **Step plan completion**. Subjects with the pragmatic can know the settlement method so that they can carry out their plan in carrying out settlement question tests. Then, subjects with a pragmatic can plan solutions to the problem. c). **Step carry-out completion**. Subject with style Study pragmatic can mention plan settlement, but from the results settlement question test subject No can finish until stage end, and there is error calculation. The subject with pragmatic No can carry out settlement question test number 1 with good. In the steps carriedttlemfor ent question number

2, see that the subject has no answer question, so the subject pragmatic has no understanding of the breakdown problem. In the step carrying out settlement question number 3, the subject with pragmatic can carry out settlement until the end of the stage. Then, the subject with pragmatic can carry out plan settlement question number 3 with Good. d). **Step inspection return**. Subject No: do inspection return. If the results end with the answer that has been done, then the subject is not capable of carrying out step inspection back to the question test.

This study has been studied by several researchers, including Sari et al. (2024), who studied the Development of Interactive Mathematics E-Worksheets on fraction material. Amalia et al. (2018) conducted a study on the Design of Computer-Based Fraction Worksheets for Junior High Schools. At the same time, Yuliani et al. (2018) surveyed Guided Discovery Worksheets to Improve Mathematical Creative Thinking and Self-Efficacy. Based on the literature study conducted by the researcher, there has been no research on the Application of Interactive E-Worksheets three-dimensional shapes with flat surfaces in solving mathematical problems based on the Honey Mumford learning style. This is a gap for researchers to conduct research related to this. This study focuses on the material of spatial structures. This Interactive E-Worksheet measures students' mathematical problem-solving abilities and aims to create a conducive classroom environment during the research process. Based on the results of this study, we obtained new information about different subject patterns based on different learning styles in solving problems at each stage of problem-solving.

Conclusion

Based on the results of this study, we obtained new information about different subject patterns based on different learning styles in solving problems at each problem-solving stage. Based on the results of this study, new information was obtained about different subject matter patterns based on different learning styles in solving problems at each problem-solving stage. The ability to analyze problems of the reflector type, namely for question number 1, can understand the problem and make a solution plan, less able to complete the solution plan and steps to re-check the results. For questions 2 and 3, the reflector can understand the problem, make a solution plan, complete the solution plan, and re-check the results. The pragmatic type, namely for question 1, can understand the problem and make a solution plan but cannot complete the solution plan and steps to re-check the results. In question number 2, the pragmatic type did not work on the question because the question was difficult to understand and did not memorize the formula used. For question number 3, the pragmatic type could not understand the problem, complete the plan, and re-check the results. The ability to analyze problems of the Theorist type, namely for question number 1, can understand the problem and make a solution plan, less able to complete the solution plan and steps to check the results of the return. In question number 2, the Theorist type did not ask the question because the question was difficult to understand, and the formula used was not memorized. For question number 3, the

Theorist type cannot understand the problem, complete the solution plan, and does not complete the results. In question number 1, the activist type can understand the problem and make a solution plan but cannot complete the solution plan and steps to check the return results. In questions 2 and 3, the activist type can understand the problem, complete the solution plan, complete the solution plan, and check the return results.

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