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Profile of open-start problem-solving with context Sarangan Lake viewed students' learning styles in junior high school

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ABSTRACT

This study aims to reveal the profile of open-start problem-solving with ethnomathematics regarding student learning styles. This research is a qualitative research study on 3 out of 31 students of Junior High School of 3 Magetan taken by purposive sampling. The three students carried out four stages: understanding the problem, planning problem-solving strategies, implementing problem-solving strategies, and reviewing again. The results of the research show that students with a visual learning style solve problems by understanding problems through writing known and being asked and drawing illustrations, planning problem-solving strategies by making examples, carrying out solving strategies by working on the calculation process; students with an auditory learning style solve problems by understanding problems through writing known and being asked, planning strategies by making problems and formulating formulas used, implementing solutions by doing calculations and reviewing; students with a kinesthetic learning style solve problems by understanding issues through writing known and being asked, making examples and writing the formulas used, carrying out solving strategies by applying the calculation process and reviewing the results obtained. However, of the three styles, the results of the accepted work were not correct because they did not write down the conclusions and were not thorough enough.

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1. INTRODUCTION

Mathematics supports various aspects of life and is the most urgent thing in the current success of communication and information in technology [1]. The application of mathematics through mathematics lessons in everyday life has an essential role in solving a problem that arises. Therefore, students must understand problem-solving abilities because problem-solving abilities are the heart of mathematics [2], which is one of the goals in the learning process when viewed from the aspect of the curriculum [3], [4]. Problem-solving is also a required skill in the 21st century [5], where there are seven competencies and survival skills needed by students in dealing with real-world life, namely problem-solving abilities [6], [7].

Problem-solving is an attempt to find a way out or an idea from a difficulty to achieve the desired goal [8], [9]. Problem-solving is an action or process carried out by students to solve mathematical problems by applying the stages of problem-solving, namely understanding the problem, devising a plan, carrying out

the plan, and looking back [10]. One of the problems that can be solved is an open problem in the form of an open start. The open-start problem is a multi-strategy test item with one answer [11]. Mathematical problems in the form of open-start mathematics have the characteristic that when students are faced with issues in the form of open-start, they do not immediately know how to solve them. On the contrary, there will be a little doubt in their brains about what is being asked and when the steps will be taken. The solving steps reach the end, and when the answer is found [12].

Open-start mathematical problems can also be found in issues related to local cultural themes known as ethnomathematics. Ethnomathematics is an approach in which learning mathematics is applied by specific cultural groups, workers and professionals, children from certain classes of society, indigenous ethnic groups, and so on [13]. Learning mathematics with an ethnomathematics approach can preserve the existing culture and is effectively applied to learning mathematics so that problem-solving skills increase [14], [15].

However, some factors affect students' understanding skills in solving problems. This factor influences student learning styles, which is also the key to student success in learning [16]. Learning styles that adapt to students' character result in readily accepted learning that influences students' ability to solve problems so that learning effectiveness is high [17]. Learning styles with ethnomathematics can be a place to build student character through cultural elements in the surrounding environment [18]. These cultural elements can be in the form of various objects, buildings, and food. These forms can be related to learning mathematics in shape material.

However, mathematics learning by applying ethnomathematics questions to shape material has not been implemented optimally, as happened at Junior High School of 3 Magetan, so problem-solving abilities are still low. Local wisdom-based learning or ethnomathematics-based learning can teach students to always remember and focus on real situations or circumstances. By having concrete problems and situations, students will be more challenged to find solutions rationally and critically, so that students' ability to solve mathematical problems can increase [19]. Another fact shows that the learning process at Junior High School of 3 Magetan, especially class VII, has not applied ethnomathematics questions in open-start problems. Using ethnomathematics questions for students is essential to make it easier for students to understand and solve problems that arise in everyday life and introduce existing cultural fields [20]–[23]. So, to overcome these problems, the researchers designed a study on open-start problem-solving profiles with ethnomathematics nuances of Sarangan Lake on shape material given learning styles. The learning styles seen in this study are student learning styles consisting of auditory, visual, and kinesthetic. The auditory learning style is a type of learning that prioritizes the senses of the listener. Usually, this learning style does so by listening to something that comes from audio tapes, lectures, discussions, debates, and verbal instructions (orders) [24]. Learning style: visual learning relies on vision as a recipient of information and knowledge. This learning style readily accepts ideas, concepts, data, and information packaged in images [25], [26]. Kinesthetic learning style is a learning style that relies on touch or feeling to receive information and knowledge. Usually, these students like to do, touch, feel, move, and experience directly [27], [28]. For this reason, this study aims to determine the profile of problem-solving starting to open up with ethnomathematics regarding student learning styles. By knowing student profiles, it is hoped that teachers can apply appropriate learning strategies and adapt them to student characteristics.

2. METHOD

2.1. Type of research

The type of research used in this research is qualitative research. Qualitative research produces descriptive data in the observed people's speech, writing, and behaviour [29]–[31]. Research with a qualitative methodology is research with research procedures that have qualitative data, expressions, or notes of the people themselves or their observed behaviour so that they can find out the circumstances and conditions in which the results can be explained in a descriptive research report [32], [33]. This type of research can find out how students solve open-start math problems on ethnomathematics slight flat geometric problems at Sarangan Lake in terms of student learning styles through the use of learning style questionnaires, open-start problem-solving tests with ethnomathematics nuances of Sarangan Lake and interviews to support and strengthen the data obtained from the results of problem-solving tests. The research stages carried out in this study are planning, implementing, and completing [34]–[36].

The planning stage consists of observation, preparation of proposals, preparation of research instruments, and submission of research permits. Observations were carried out by directly observing learning activities in class VII at Junior High School of 3 Magetan. Next, compiling research instruments consisting of the main instruments and supporting instruments. The first instrument is the researcher himself. Meanwhile, the supporting instruments include a learning style questionnaire totalling 30 questions in multiple-choice form with three answer choices, an open-start problem-solving test with ethnomathematics

nuances of Sarangan Lake summing one mathematical problem from flat shape material, which the validator has validated before being distributed to students and compiling guidelines interview.

The implementation phase begins with giving students a study questionnaire to determine their learning styles' differences. Next, collect data from filling out the learning style questionnaire. Students must also complete an open-start problem-solving test with Sarangan ethnomathematics nuances. After the students worked on the test questions, the researcher conducted interviews with students to clarify answers so that they could get further information about problem-solving skills. The interview was carried out according to the interview guidelines in the form of leading questions that will be used when the main questions will be used when collecting interview data. Finally, collecting data from an open-start problem-solving test with ethnomathematics nuances of Sarangan Lake and the results of interviews are then analyzed.

After the implementation stage, data were obtained through a learning style questionnaire data, data from an open-start problem-solving test with ethnomathematics nuances at Saragan lake, and interview data. Furthermore, the data results are processed to separate the data used. The results of the learning style questionnaire are written in tabular form. Meanwhile, data from the open-start problem-solving test were analyzed in terms of the stages of problem-solving and analyzed by adjusting student test results with indicators and descriptions. The results of the interview data are written in transcript form.

2.2. Subject of research

In this study, researchers used three students from one of the VII graders at Junior High School of 3 Magetan. The three students in this study were taken with specific considerations so that the sampling technique was carried out purposively [37], [38]. The selection of the sample has been determined by the researchers and the results of the teacher's observations while holding mathematics learning in class.

2.3. Instrument of research

An instrument is a tool used by researchers to collect data by measuring [39], [40]. The device was used in the form of the researcher himself and supporting instruments in the form of a learning style questionnaire, an open-start problem-solving test with ethnomathematics nuances of a nest, and interviews to strengthen the data on problem-solving test results. The learning style questionnaire is used to classify students according to their respective learning styles. The questions in this questionnaire are 30 questions in a multiple-choice form, which three validators have validated through the learning style questionnaire validity test-the results of the validation show that the instrument can be tested on students with revisions. The test in this question amounts to one question. The questions used are mathematical problems from shape material in the form of open-start problems with ethnomathematics nuances of Sarangan Lake. This one question will be used to see student profiles in solving open-start problems with ethnomathematics nuances according to Polya's indicators of problem-solving stages. The indicators for solving open-start problems according to Polya's stages are shown in Table 1 [41], [42].

The interview guide in this study contains questions that researchers will ask students who have taken a description test on the results of their work. Questions can be developed during direct interviews according to the necessary conditions. Questions include how students understand the problem given, plan a solution strategy, and carry out the solution. Finally, the question reviews the completion steps that have been implemented.

Table 1. Indicators of problem-solving in open-start according to polya stages

Polya's step	Indicators of problem-solving in open-start
Understanding the problem	Students can write down (express) what is known from the problem posed clearly Students can write down (express) what is asked of the problem posed clearly
Devising a plan	Students write about open-start problem-solving strategies in the form of approaches or formulas used
Carrying out the plan	Students explain the process of solving open-start problems using strategies that have been made coherently
Looking back	Students re-examine the problem-solving steps used and make conclusions on the final results obtained

2.4. Technique of data analysis

The data analysis techniques applied are data reduction, data presentation, and conclusion [43]. Reduction is sorting and selecting, simplifying data related to research interests [44], [45]. At the triangulation stage, time triangulation was carried out. Researchers use a multi-method approach when researchers collect and analyze data by observing and comparing student test results at different times to make the research instrument more valid and credible [46]–[48]. Qualitative research analysis usually contains brief descriptions, charts, flowcharts, and the like in data presentation. Conclusion drawing is a pattern depicted in the expression of data, and there is a causal or interactive relationship between the data,

which can then conclude the study as a finding [49]. The data that has been reduced and presented will then be aimed at the conclusion.

3. RESULTS AND DISCUSSION

Data collection was started by distributing a learning style questionnaire given to all students of class VII B at Junior High School of 3 Magetan, with a total of 31 students, and carried out face-to-face in a course. The questionnaire was distributed by distributing 30 learning-style questionnaire sheets to students and filled directly on the sheet by crossing answers describing the students themselves. The researcher then examined the student learning style questionnaire results and grouped them according to their respective learning styles: visual, auditory, and kinesthetic. Furthermore, the provision of an open-start problem-solving test with ethnomathematics nuances of the Sarangan Lake and interviews were conducted face-to-face. Based on the results of the study questionnaire, three students with different learning styles were selected according to the results that have been done and are supported by the results of observations during learning activities in class. The data from students chosen as this study's subject can be seen in Table 2.

Table 2. Subject selection results

No.	Student code's	Learning style
1	JNM	Visual
2	MS	Auditory
3	GV	Kinesthetic

Then, the three subjects were given a math problem-solving test using shape material in the form of open-start questions with the nuances of Sarangan ethnomathematics. This question will be used to look at student profiles in solving open-start questions with ethnomathematics nuances according to Polya's indicators of problem-solving stages. This problem has been validated, and the results obtained are suitable for use in research. The questions used can be seen in Figure 1.

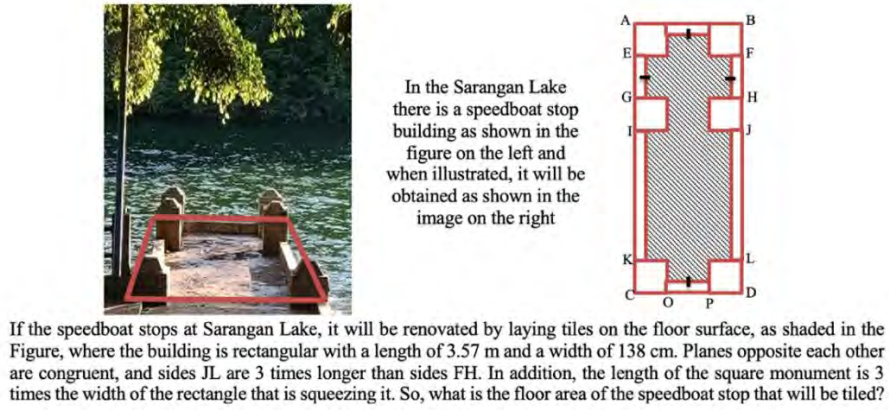

Figure 1. An open-start question with an ethnomathematics nuance at Sarangan Lake

3.1. Visual learning style

3.1.1. Understanding the problem stage

Understanding the problem is the first stage in solving the problem. A person can be said to understand a problem if that person can identify what is known and what is asked about the problem he is facing. Likewise, visual learning style subjects can convey the meaning of questions and find out what is known and asked about the problem, as seen in Figure 2.

At this stage, JNM writes down the information obtained from the problem and what will be asked. In addition, JNM also visualized the situation in the form of images according to the report he got, as shown in Figure 3. Apart from that, this information is also supported by the results of interviews conducted with JNM subjects. The excerpts of visible subject interview results are as:

Q : What do you know from the questions given in question 1?

JNM : The building in the problem is a rectangle with a length of 3.57m and a width of 138cm. Plane shapes that are congruent to each other. The JL side is 3 times the length of the FH side (see Figure 3). Besides that, the length of the rectangle is 3 times the width of the rectangle that squeezes it.
Q : What is meant in question 1?
JNM : At Sarangan Lake, there is a speedboat stop building so that tiles will be on the floor surface. Then, ask for the floor area of the speedboat stop that will be tiled.
Q : Did you write down what you know and what you asked?
JNM : Yes, he wrote.
Q : How do you understand this question 1?
JNM : Read on until you understand.

From the interview, it is known that the JNM subject clearly explained the various information obtained from the questions and their meaning.

This result is in line with the results of previous research, which found that students with a visual learning style in understanding problems can convey the meaning of the questions and know what is known and asked by writing down what is known and what is asked [50]–[53]. Although there are researchers who find that students do not write down what is known and what is asked of the problems they face, from the results of interviews, students can tell what is known and what is asked of the problems [54], [55].

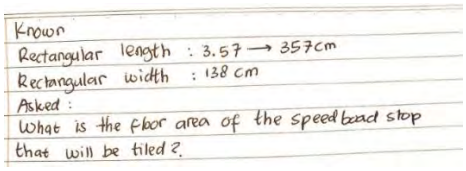

Figure 2. Stages of understanding the problem by JNM

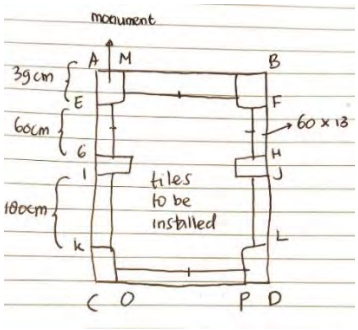

Figure 3. JNM Visualizes the Problem

3.1.2. Stage of planning a problem-solving

When planning a problem-solving strategy, the visual learning style subject writes and explains the approach or method that can be used to solve the problem. Still, there are several strategies that the subject knows but are not written on the answer sheet, such as the formula used. This also aligns with previous research, which revealed that issues with a visual learning style could carry out the planning stage [52], [56] as shown in Figure 4.

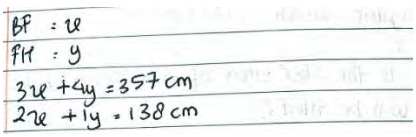

Figure 4. Strategic planning stage by JNM

In Figure 4, JNM plans a strategy by writing down the problems in the questions asked. The excerpts of visible subject interview results are as follows:

Q : Do you plan a process to solve the problem of question 1?
JNM : Yes. To find unknown lengths, I will give an example. My BF will say x, and my FH will be y. then obtained $3x + 4y = 357cm$ and $2x + 1y = 138cm$.
Q : What materials did you use to understand the problem of question 1?
JNM : Matter of rectangles and triangles, and algebra.

From the interviews, JNM explains strategies for solving problems by assuming the problem as variables x and y by applying rectangular, triangular, and algebraic material.

3.1.3. Stage of implementing problem-solving

When implementing the problem-solving strategy, subjects with visual learning styles solve problems by performing calculations according to the planned process. Still, at this stage, the subject experiences a slight error in calculating the final results due to a lack of accuracy. This statement aligns with previous research, which explains that visual learning style subjects can solve problems according to the strategy made in the last stage [52], [56]. Still, some errors appear, which can be seen in Figure 5.

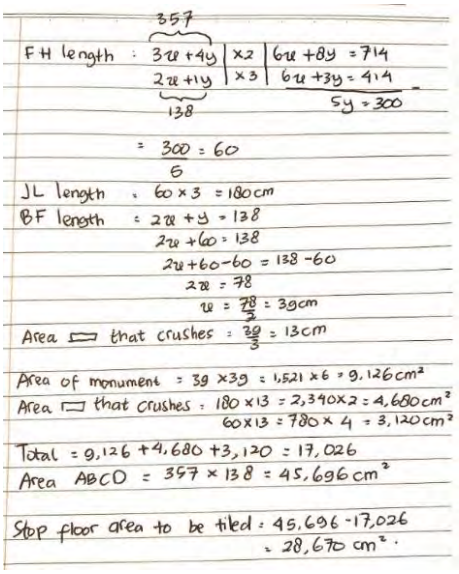

Figure 5. JNM implements a problem-solving strategy

In Figure 5, it can be seen that JNM implements a problem-solving strategy by eliminating and substituting the equations obtained. Then, by applying the rectangular material to find the total area. The excerpts of visible subject interview results are as follows:

Q : Tell me how you solved the problem! (problem number 1).
JNM : First, we find the length of the pillar in the problem and the length of the rectangle on the edges of the stops using equations 1 and 2 (showing the results of the work on the x elimination and y substitution stages). Then, find the area of the entire rectangle ABCD and the place of the shapes on the edges. Then, see the size of the floor to be tiled by subtracting the area of the rectangle ABCD from the area of the edged shapes (indicating the work results).

In the interview excerpt, JNM explained in detail the stages of solving the problem, from substituting to obtaining the final result.

3.1.4. Look at back the results

At the stage of reviewing the results obtained, the subject of the visual learning style was studied again by examining the work steps and pictures. However, the results of the subject's answers still

experienced several errors and did not conclude the final results obtained. This is in line with previous research that the subject of visual learning styles re-examines the answers received [57], [58]. Even though the subject did not directly write down these stages on the answer sheet, the subject showed these stages as the interview results.

Q : Then, did you recheck your answer to question 1?
JNM : Yes, by examining the pictures and the completion steps (pointing to the worksheet), I forgot to write this down (pointing to the last answer).
Q : Did you recheck your answer to question 2?
JNM : Yes, I checked like number 1 but forgot to write the conclusion.

From the interview excerpt, JNM forgot to write a conclusion. In addition, JNM also explained that it had checked the steps. But there are still answers that are not quite right when calculating the final result. This condition's effects align with previous research, which found that students solving mathematical problems mostly did not write down the steps to recheck answers on the answer sheet. Still, they did this step by repeatedly checking for each mathematical step [59], [60].

3.2. Auditory learning style

3.2.1. Understanding the problem stage

Understanding the problem is the first stage in solving the problem. A person can be said to understand a problem if that person can identify what is known and what is asked about the problem he is facing. At the stage of understanding the problem, the subject of the auditory learning style writes and explains information about what is known and asked in the problem. This is consistent with previous research, which found that at the stage of understanding the problem, the subject with an auditory learning style can understand the intent of the problem [50], [61]. This can be seen in Figure 6.

In Figure 6, MS understands the problem by writing down what he knows and is asked as a start to solving the problem. The excerpts from the results of the auditory subject interview are as follows:

Q : What do you know from the questions given in question 1?
MS : The building is a rectangle with a length of 3.57m and a width of 138cm. Planes opposite each other are congruent, and sides JL are 3 times longer than sides FH. In addition, the length of the square monument is 3 times the width of the rectangle that is squeezing it.
Q : What is meant in question 1?
MS : There will be renovations at Telaga Sarangan in the form of laying tiles on the surface of the speedboat stopping floor. Then, what is the floor area of the speedboat stop that will be tiled?
Q : Did you write down what you know and what you asked?
MS : Yes, written down.
Q : How do you understand this question 1?
MS : By reading the questions many times.

3.2.2. Stage of planning a problem-solving

When planning a problem-solving strategy, the auditory learning style subject writes a process in the form of an approach or method and formula that can be used to solve the problem. Still, several procedures are not written down. This also aligns with previous research that found that subjects with an auditory learning style can determine the solution method to work on problems [61], as seen in Figure 7.

In Figure 7, MS determines a problem-solving strategy by, for example, the problem into the variables x and y and arranging them as an equation. Meanwhile, in Figure 7 MS writes the building area formula. The excerpts from the results of the auditory subject interview are as follows:

Q : Do you plan a strategy to solve the problem of question 1?
MS : Yes.
Q : What strategy did you use to solve the given problem? Try to explain!
MS : Suppose BF is equal to x, FH is equal to y, then this equation is obtained (referring to equations 1 and 2). Also, the formula for the area of a building is length × width because the building is a rectangle.

In the interview excerpt, MS explains how he plans a strategy to solve the problem. MS explained that he first assumed BF as x and FH as y (see Figure 7), and then used the formula for the area of a rectangle.

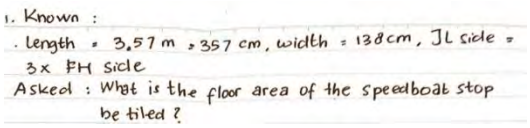

Figure 6. Stages of understanding the problem by MS

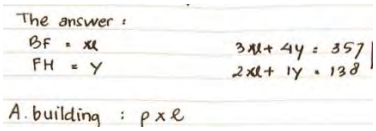

Figure 7. strategic planning stage by MS

3.2.3. Stage of implementing problem-solving

At the stage of the problem-solving strategy, subjects with auditory learning styles wrote down the calculation of the steps following the planned procedure. Still, at this stage, the subject experienced a slight error in calculating the final results and giving area units. There were even several units that the subject did not write down due to a lack of accuracy. This statement is in line with previous research, which explained that the subject of the auditory learning style could complete all the steps used [61]–[63], but there are still some errors, which can be seen in Figure 8.

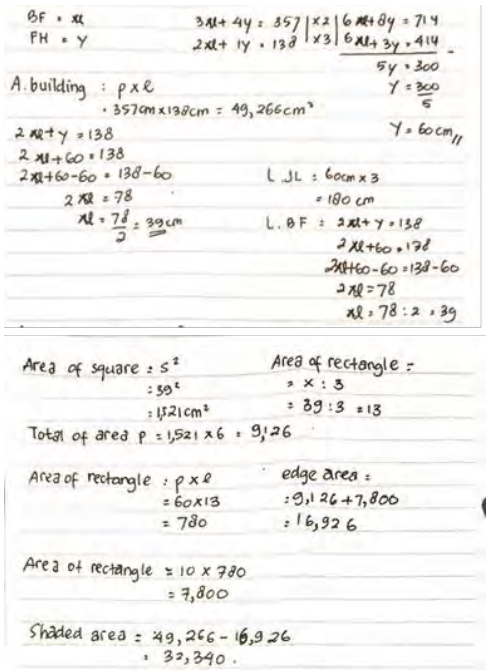

Figure 8. MS implements a problem-solving strategy

In Figure 8, MS implements a problem-solving strategy by eliminating x values to find y values. Then, do the substitution. Next, use the formula for the area of a square and rectangle to find the shaded area. The excerpts from the results of the auditory subject interview are as:

Q : Tell me how you solved the problem of question 1!
MS : I made the example earlier and then eliminated $\boldsymbol{x}$ in equations 1 and 2 and got the value $\boldsymbol{y}$ (showing the result y) and got the value $\boldsymbol{x}$ (showing the substitution work $\boldsymbol{y}$ and obtained the value $\boldsymbol{x}$) and received all the lengths and found the area of each. Then, the area of the shaded shape is obtained by subtracting the building with the edge area obtained at 32,340 (referring to the work order).

In the interview excerpt, it is known that the MS subject explained coherently the implementation of problem-solving strategies.

3.2.4. Look at back the results

After reviewing the results, the auditory learning style subject was reviewed again by examining the calculations. However, the subject's answers still experienced several errors and did not conclude the final

results. This aligns with previous research, which found that auditory learning style subjects re-checked the answers by repeating counting the solutions [61]. In general, at this stage, the same as the JNM subject, the MS did not write anything on the answer sheet, but the interview results showed that the MS subject carried out the stages of re-checking the answers that had been obtained. The excerpts from the results of the auditory subject interview are as follows:

Q : Then, did you recheck your answer to question 1?
MS : Yes, I rechecked the calculations, but I didn't write down the conclusions because I wasn't used to it, so I forgot.
Q : OK, what units are in your answer to question 1?
MS : The units for length and width are cm, and the area is cm^2.
Q : Then why didn't you write the unit in your answer?
MS : Oh yes, I forgot, sorry.

In the interview excerpt, MS has re-examined the answers obtained. However, MS is not used to writing conclusions and area units.

3.3. Kinesthetic learning style

3.3.1. Understanding the problem stage

Understanding the problem is the first stage in solving the problem. A person can be said to understand a problem if that person can identify what is known and what is asked about the problem he is facing. At the stage of understanding the problem, the kinesthetic learning style subject writes and mentions information about what is known and asked in the problem. Following previous research, this is that at the stage of understanding the problem, subjects with a kinesthetic learning style can understand the problem well [62], [63], as seen in Figure 9.

Figure 9 shows that GV writes information into known and asked. The excerpts from the kinesthetic subject interview results are as follows:

Q : What do you know from the questions given in question 1?
GV : Where the building is in the form of a rectangle with a length of 3.57m and a width of 138cm, the planes facing each other are congruent, and the JL side is 3 times the length of the FH side. In addition, the length of the square monument is 3 times the width of the rectangle that is squeezing it.
Q : What is meant in question 1?
GV : Asked for the floor area of the speedboat stop that will be tiled.
Q : Did you write down what you know and what you asked?
GV : Yes.
Q : How do you understand this question 1?
GV : By reading over and over again.

In the interview excerpts, it can be seen that GV explained in detail and sequentially the various information he found in the problem given. GV also knows what problem must be solved. Namely, the floor area of the speedboat stops to be tiled.

3.3.2. Stage of planning a problem-solving

When planning a problem-solving strategy, the subject of the auditory learning style also knows and writes down strategies in the form of approaches, methods, and formulas that can be used to solve problems. This is also in line with previous research, which revealed that subjects with kinesthetic learning styles could design steps that can be used in working on questions [62], [63]. The design of these steps can be seen in Figure 10.

Figure 10 shows that GV writes the strategy by, e.g., BF as x and FH as y and writes them in equation form. GV also wrote down the formula to be used. The excerpts from the kinesthetic subject interview results are as follows:

Q : Do you plan a strategy to solve the problem of question 1?
GV : Yes.
Q : What strategy did you use to solve the problem given in question 1? Try to explain!
GV : Suppose that side BF equals x and side FH equals y, so $3x + 4y = 357cm$ and $2x + 1y = 138cm$ (indicating the process in the example step). This is also how to find the area to be installed in the

building area – side area. To find the area of the building is length × width.

The interview snippet shows that GV explained sequentially regarding problem-solving strategies.

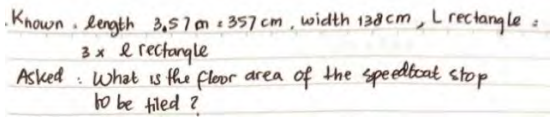

Figure 9. Stages of understanding the problem by GV

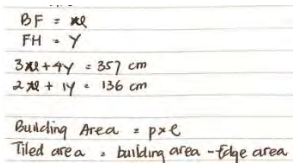

Figure 10. Strategic planning stage by GV

3.3.3. Stage of implementing problem-solving

At the stage of the problem-solving strategy, subjects with kinesthetic learning styles carry out calculations according to the planned procedure in a relatively coherent and transparent manner. Still, at this stage, the subject experiences a slight error in giving area unit number 1 due to a lack of accuracy. This statement is in line with previous research, which explains that the subject of the kinesthetic learning style can complete and write down all the steps used according to the plan [62], [63], but there are still some errors. The implementation stage of the problem-solving strategy can be seen in Figure 11.

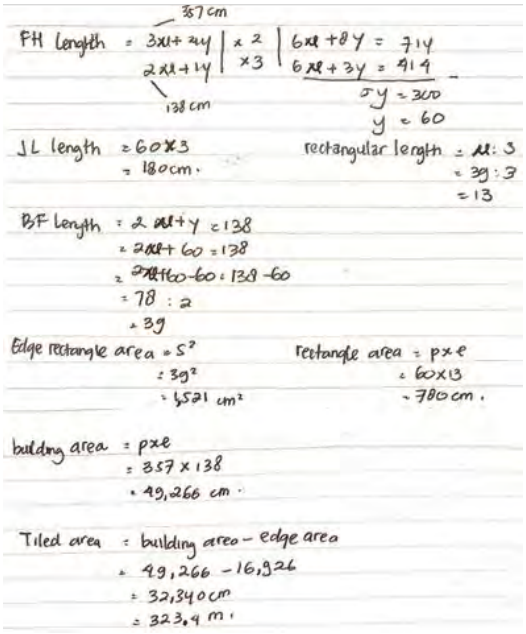

Figure 11. GV subjects using the area of a plane formula

Basen on the Figures 11 show that GV uses a two-variable system of linear equations to determine the coefficients x (length of BF) and y (length of FH). Next, the subject substitutes in the formula to select the area of the shape being asked from the problem. The excerpts from the kinesthetic subject interview results are as follows:

Q : Tell me how you solved the problem of question 1!
GV : By eliminating x, then finding the result y and the lengths of the other sides. Then, after the lengths of all sides have been found, the next step is to find the area of the shape on the edge and the area of the whole building (showing the steps for the process). Then, you can find the area tiled by means of the total building area minus the area of the shape on the edge (referring to the results of the last step).

Figure 11 shows that GV implements a sequential and detailed solution strategy. GV explains the steps from the beginning to finding the results achieved, even with inaccurate results.

3.3.4. Look at back the results

At the stage of reviewing the results obtained, the kinesthetic learning style subject was reviewed again by examining the calculations on the answers. However, in the results of the subject's responses, they still experienced errors in giving area units. In addition, GV subjects also did not conclude the final results obtained. This aligns with previous research, which found that the kinesthetic learning style subject repeated the review stage by examining the effects of the answers by looking at the formulas and numbers done and recalculating [62], [63]. The excerpts from the kinesthetic subject interview results are as follows:

Q : Did you recheck your answer to question 1?
GV : Yes, sis. I rechecked my calculation to see if it was correct, but I forgot to write the conclusion of the final result.
Q : What units of area do you know?
GV : cm^2.
Q : Why did you write cm units in the area results you got?
GV : Oh yes. I wasn't careful enough.

4. CONCLUSION

Based on the research results and the discussion, it can be concluded that visual students, in solving open-start problems with an ethnomathematics nuance in Lake Sarangan, carry out problem-solving stages. The stages of problem-solving carried out by students include understanding the problem, planning the problem, implementing the plan and rechecking the answers. At the stage of understanding the problem, this is done by writing, knowing and asking questions and drawing illustrations. The stage of planning a problem-solving strategy by creating examples or parables. The stage of implementing a problem-solving strategy by carrying out a complete calculation process. The stage of reviewing the results obtained by paying attention to the steps and pictures but not writing a conclusion on the final results.

Auditory students, when solving open-start problems with ethnomathematics nuances of Sarangan Lake, carry out the stages of problem-solving, which include understanding the problem by writing known and asked, planning a problem-solving strategy by making examples and writing some of the formulas used, carrying out problem-solving strategies by working on the calculation process in completion, as well as reviewing the results obtained by examining the calculations acquired but not writing conclusions in the final results. Meanwhile, kinesthetic students, when solving open-start problems with ethnomathematics nuances of Sarangan Lake, perform problem-solving stages which include understanding the problem by writing known and asked, planning problem-solving strategies by making examples and writing formulas used, implementing problem-solving strategies by working on the calculation process in completion, as well as reviewing the results obtained by examining the calculations acquired but not writing conclusions on the final results.

Suggestions for this research should the teacher, when conducting learning in class, get used to teaching students to solve problems on questions according to the stages of problem-solving in a coherent, clear, and correct manner without realizing that habits will arise in students over time. Teachers can apply generative learning models to improve students' problem-solving abilities in teaching and learning activities. In addition, the teacher should balance it with contextual learning that elevates culture, namely ethnomathematics, according to the circumstances in the surrounding environment so that students can more easily understand the questions and introduce cultural elements to students.

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