Jurnal Pembelajaran, Bimbingan, dan Pengelolaan Pendidikan, 3(10), 2023, 1078–1086
ISSN: 2797-3174 (online)
DOI: 10.17977/um065v3i102023p1078-1086

Profile of Mathematics Problem Solving for Fourth Grader on Fractional Material Viewed from the Type of Learning Style

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Abstract

Problem solving is one of the five standard processes that must be developed in mathematics learning. Learning mathematics must prioritize students' ability to solve problems. Problem-solving skills are an important component of learning maths. In order to provide appropriate learning treatment, teachers must know the abilities of students, especially in solving mathematical problems. In this study, an analysis of the stages carried out by students in solving problem solving test questions based on Polya solving steps. But before that, students will be grouped based on their learning style. This research is a qualitative descriptive research. The subjects of this study were 28 grade 4 students of SDN Dinoyo 3 Malang City.After being given a learning style determination questionnaire, 5% of students with visual learning styles, 7% of students with auditorial learning styles, and 28% of students with kinesthetic learning styles were obtained. While 60% of students have the same dominant score on visual-auditorial learning styles. Based on the results of the study, it can be concluded that students show different steps and habits in problem solving. Students with a visual learning style in understanding problems read the questions repeatedly using aloud and fluently and write down important parts of the problem. Students with an auditorial learning style in understanding problems write down parts that they consider important from the problem using mathematical symbols. Students with a kinesthetic learning style in understanding problems write down parts that they consider important from the problem not using their own language.

Keywords: PBL; learning style; Mathematics profile

Abstrak

Pemecahan masalah merupakan salah satu dari lima standar proses yang harus dikembangkan dalam pembelajaran matematika. Pembelajaran matematika harus mengutamakan kemampuan siswa dalam pemecahan masalah. Keterampilan pemecahan masalah merupakan komponen yang penting dalam pembelajaran matematika. Agar dapat memberikan treatment pembelajaran yang tepat, guru harus mengetahui kemampuan siswa, khususnya dalam penyelesaian masalah matematika. Dalam penelitian ini dilakukan analisis terhadap tahapan-tahapan yang dilakukan siswa dalam menyelesaikan soal tes pemecahan masalah berdasarkan langkah penyelesaian Polya. Namun sebelumnya siswa akan dikelompokkan berdasarkan gaya belajarnya. Penelitian ini merupakan penelitian deskriptif kualitatif. Subjek penelitian ini adalah 28 siswa kelas 4 SDN Dinoyo 3 Kota Malang.Setelah diberi angket penentuan gaya belajar, diperoleh 5% siswa dengan gaya belajar visual, 7% siswa dengan gaya belajar auditorial, dan 28% siswa dengan gaya belajar kinestetik. Sedangkan 60% siswa mempunyai skor dominan yang sama pada gaya belajar visual-auditorial. Berdasarkan hasil penelitian, dapat disimpulkan bahwa siswa menunjukkan langkah-langkah dan kebiasaan yang berbeda dalam pemecahan masalah. Siswa dengan gaya belajar visual dalam memahami masalah membaca soal dengan berulang-ulang menggunakan suara keras dan lancar serta menuliskan bagian-bagian yang penting dari soal. Siswa dengan gaya belajar auditorial dalam memahami masalah menuliskan bagian-bagian yang dianggapnya penting dari soal dengan menggunakan simbol-simbol matematika. Siswa dengan gaya belajar kinestetik dalam memahami masalah menuliskan bagian-bagian yang dianggapnya penting dari soal tidak dengan menggunakan bahasa sendiri.

Kata kunci: PBL; gaya belajar; profil matematika

1. Introduction

Problem solving is one of the five standard processes that must be developed in mathematics learning. According to NCTM (2000), problem solving means engaging in tasks for which the method of solving is still unknown. To find solutions, students must use their knowledge, and through this process students can develop a new understanding of mathematics. Problem solving is not only the goal of learning mathematics, but also the primary means of doing so.

Learning mathematics must prioritize students' ability to solve problems. NCTM (2000) states that problem solving is the cornerstone of school mathematics, without problem-solving skills, the usefulness and power of mathematical ideas, knowledge, and skills will be very limited. This is supported by the statement of Adams and Hamm (2010), that problem-solving skills and mastery of theory are needed in mathematics. Polya (1973) states that one of the important tasks of mathematics teachers is to help students develop their ability to solve mathematical problems. Students must be educated to realize mathematics as a branch of science that has an important contribution in their lives (Mullis et al, 2009).

Problem-solving skills are an important component of learning maths. According to Dewanti (2011), problem solving is the most essential component in learning mathematics. Donaldson (2011) states that teaching through problem solving is a very effective way to help students gain an understanding of mathematical concepts. The importance of problem solving skills is also emphasized by Yumiati (2013) that problem solving skills are a common goal of mathematics learning, even at the heart of mathematics.

In the learning process, the success of learning that can be achieved by students does not only depend on the learning process, but also depends on the factors of the students themselves. Slameto (2006) asserts that the learning outcomes achieved by students are influenced by factors from within students and factors that come from outside students (environment). One of the factors that comes from students is their learning style.

According to Luthfiyah (2011), basically it is known that students learn according to their learning style, and each learning style affects the thinking process and learning outcomes. In addition, this opinion is also reinforced by Gunawan (2007) who suggests that students who learn using their dominant learning style, then when taking tests, will achieve higher scores than if they learn in a way that is not in line with their learning style. Based on these two statements, in order for learning objectives to be achieved as expected, in the learning process the teacher must adjust to the characteristics of the learning style of each student.

According to Luthfiyah (2011) states that learning style is an individual's habit of learning strategies (the way in which learning tasks are responded to easily) combined with cognitive styles (by processing and organizing information). DePorter and Hernacki (2003) stated that learning style is the way a person absorbs, processes and organizes information easily. The learning style that each individual has is a capital that can be used when they learn. According to Gunawan (2007) in general there are seven known learning style approaches, but the easiest to identify and find is the learning style with the sensory modality approach developed by Grinder. The three learning styles are visual, auditory and kinesthetic learning styles.

In order to provide appropriate learning treatment, teachers must know the abilities of students, especially in solving mathematical problems. Therefore, in this study, an analysis will be carried out on the stages carried out by students in solving problem solving test questions based on Polya solving steps. But before that, students will be grouped based on their learning style. Based on this description, the researcher is interested in conducting a study entitled "Profile of Solving Mathematics Problems for Fourth Grader on Fractional Material Viewed from the Type of Learning Style".

2. Theoretical Framework

2.1. Mathematical Problem Solving

According to Polya (1978), problem solving is an attempt to find a way out of difficulties and achieve goals that cannot be achieved directly. Solving problems means finding ways to solve problems, finding ways out of difficulties, finding strategies to deal with obstacles, and achieving goals using appropriate tools or strategies.

According to Krulik and Rudnick (1989), problem solving is the process of individuals using their knowledge, skills, and understanding to meet the demands of unfamiliar situations. The problem-solving process begins with the initial approach, the conclusion when the answer has been obtained and determined based on the initial conditions. The student must synthesize what he knows from problem solving and apply it to different new situations.

According to NCTM (2000), problem solving is the activity involved in a task for which the method of solving it is still unknown. To solve problems, students use their mathematical knowledge, and through this process students will develop a new understanding of mathematical concepts. According to NCTM (2000), problem solving is not only the goal of learning mathematics, but also a major means of learning mathematics.

Some experts formulate steps in the solution of mathematical problems. The following Table 1 presents expert-based troubleshooting steps summarized by Carson (2007).

Table 1. Troubleshooting Steps According to Experts

John Dewey (1933)	**George Polya (1973)**	**Stephen Krulik & Jesse Rudnick (1980)**
Understanding the problem *(Confront Problem)*	Understand the problem *(Understanding the Problem)*	Read issues *(Read)*
Diagnose or define the problem *(Diagnose or Define Problem)*	Make a plan Troubleshooting *(Devising a Plan)*	Explore the problem *(Explore)*
Gather Some troubleshooting solutions *(Inventory Several Solutions)*	Implement the plan Troubleshooting *(Carrying Out the Plan)*	Choosing a strategy to solve the problem *(Select a Strategy)*
Suspect consequences from troubleshooting solutions *(Conjecture Consequences of Solutions)*	Checking back *(Looking Back)*	Troubleshooting *(Solve)*
Testing consequences		Revisit

John Dewey (1933)	**George Polya (1973)**	**Stephen Krulik & Jesse Rudnick (1980)**
(Test Consequences)		and discuss settlements *(Review and Extend)*

Based on the description above, it can be concluded that solving mathematical problems is a mental process in which a person uses the knowledge and skills he has to solve a mathematical problem that is still unknown method of solving.

2.2. Learning Style

Learning styles are different ways that each individual has to process, explore and learn information easily. In this study, researchers limited the learning style approach to be used, namely the learning style approach with sensory modalities developed by Bandler and Grinder. The learning styles developed by Grinder in sensory modalities are divided into three types, namely visual, auditory and kinesthetic.

According to Grinder, student learning styles can be divided into 3, namely Visual, Auditory, and Kinesthetic. Visual learning style is a learning style that utilizes more "vision" abilities. DePorter and Hernacki (2003) describe the characteristics of individuals with visual learning styles such as neat and organized, speaking quickly, good long-term planners and organizers, meticulous to detail, good spellers and being able to see actual words in their minds, remembering what is seen, rather than being heard, remembering with visual associations, usually not distracted by commotion, has trouble remembering verbal instructions unless they are written down and often asks people to repeat them.

Auditory learning styles are learning styles that utilize more "auditory" abilities. DePorter and Hernacki (2003) describe the characteristics of individuals with auditory learning styles such as talking to themselves while working, have been distracted by noise, move their lips and say writing in books when reading, enjoy reading aloud and listening, can repeat and imitate tones, rhythms and voice colors, find it difficult to write, but are great at telling stories, Speaking in a patterned rhythm, usually a fluent speaker, learns by listening to and remembering what is discussed rather than seen.

Kinesthetic Learner Kinesthetic learning style is a learning style that utilizes more of its "physical" abilities. DePorter and Hernacki (2003) describe the characteristics of individuals with kinesthetic learning styles including speaking slowly, responding to physical attention, touching people to get their attention, always physically oriented and moving a lot, learning through manipulation and practice, memorizing by walking and seeing, using fingers as indicators when reading, using a lot of body signals, and not being able to sit still for a long time

2.3. The Relationship of Learning Style to Problem Solving

According to Gunawan (2007), each student has a different way that is preferred in thinking, processing, and understanding information, the different way is called learning style. Solving mathematical problems is a process carried out by students to solve given problems using their knowledge and understanding. So with this definition in solving problems, students are required to absorb, process, and understand information and this is the learning style that

students have. Thus there is a relationship between learning styles and problem solving, where students in solving problems are influenced by learning styles.

Based on the description above, researchers concluded that differences in learning styles can cause differences in understanding of information. These differences can cause differences in solving problems for each individual

3. Method

This research is a qualitative descriptive research. The subjects of this study were 28 students of fourth grader at SDN Dinoyo 3 Malang City. The research procedure in this study is described into initial activities, which include determining the research subject, preparing research instruments, namely student learning style questionnaires, fractional material problem-solving test questions, and interview guidelines. Next, the troubleshooting test sheets are validated to expert validators and practitioner validators.

At the implementation stage, the subject will be given a problem-solving test question. Subjects are then interviewed to clarify and affirm the results of working on problem-solving test questions based on Polya problem-solving stages, this is done to explore thoughts and responses given that may not be revealed in the written problem-solving test questions. The next stage is data analysis. Once the data is collected, it is analyzed using qualitative descriptive analysis. The data analysis carried out includes analyzing the results of student learning style questionnaires, student work on problem-solving test questions based on Polya problem-solving stages and analyzing the results of interviews.

In the final stage, researchers compile a final research report based on data and data analysis. The expected result is to obtain a profile of grade 4 students in solving mathematical problems on fractional material based on student learning styles according to the four steps of Polya problem solving.

4. Results and Discussion

After being given a learning style determination questionnaire, 5% of students with visual learning styles, 7% of students with auditorial learning styles, and 28% of students with kinesthetic learning styles were obtained. While 60% of students have the same dominant score on visual-auditorial learning styles. After that, researchers selected three students to be research subjects based on each learning style. Students who are selected to be research subjects will then take a math problem solving test and be interviewed by researchers to check the answers that have been done and re-explain how to do the problem. The three students in question are visual learning style students, auditorial learning style students, and kinesthetic learning style students.

4.1. Profile of Mathematical Problem Solving Students with Visual Learning Style

The visual subject is in the stage of understanding the problem by reading the problem by repeating it several times in a slightly loud, fast, and fluent voice. In addition, the subject in mentioning what is known and asked from the question briefly, quickly and fluently while reading the question and expressing does not use his own language but reads exactly what is written in the question. This is in accordance with what was stated by Ilmiyah (2013), which states that visual subjects are in the stage of understanding problems by reading the problem

by repeating it several times aloud and fluently. Occasionally pause for a moment to think and then underline the information that is considered important.

Visual subjects in the stage of planning the solution can reveal the presence or absence of information that helps the subject in solving the problem clearly and fluently by reading what is in the problem (exactly the same in the problem). In revealing the calculated operations used briefly and without being accompanied by long reasons. In addition, in explaining the work plan in an easy-to-understand and logical way that he made smoothly without provocation questions while looking at the questions. This is in accordance with what was stated by Ilmiyah (2013) stating that revealing the presence or absence of information that helps the subject in solving the problem smoothly and in detail and using image illustrations made by himself to illustrate the situation referred to in the problem, in revealing the presence or absence of relationships between the statements in the question as clues in solving the problem clearly and concisely, In revealing the calculated operations used briefly, smoothly and without reason.

The visual subject carries out problem planning well and according to the plan he has made calmly and focusedly. The subject is able to explain the steps of the work in detail and in order. This is in accordance with what was stated by Ilmiyah (2013) stating that the visual subject confidently said the answer was according to plan and in solving the problem.

Visual subjects are able to explain what is known and asked from a given question, explain what formulas have been used, and when interviewed students re-examine the answers that have been answered by re-explaining the answers so confidently. This is in accordance with what was stated by Indrawati (2017) which states that the visual learning style in re-checking (Looking Back), students feel confident in the answer and to erode the answer. The subject wants to read over and over again the important information in question and recount.

4.2. Profile of Mathematical Problem Solving Students with Auditorial Learning Styles

In the stage of understanding the problem, the auditory subject reads the problem silently while moving his lips in a low voice to say what is being read, in mentioning what is known and asked from the problem. The subject can express it fluently using his own language even if he is a little hesitant. This is in accordance with what was stated by Indrawati (2017), that auditory subjects understand the problem by reading *the* problem silently while moving their lips to read silently. The subject can correctly state what is known from the matter using his own language even if initially something is not mentioned.

In the stage of planning problem solving, the auditorial subject writes down and reveals the presence or absence of information that helps the subject in solving the problem. The subject explained using his own language by occasionally reading the question, which he felt was important information read again silently while moving his lips in a low voice to say what was being read. The subject expresses the calculated operation used briefly and accompanied by a long reason. In addition, the subject reveals the plan made to solve the problem well. This is in accordance with what was stated by Indrawati (2017) stating that subjects with auditory learning styles are able to express the presence or absence of relationships between the

information in the problem as instructions to solve the problem in detail and are a little hesitant in conveying it in their own language.

At the planning stage, the subject did the problem-solving test questions in detail and in order even though the subject was less careful in calculating at the end of the answer, the subject was able to express by looking back at the answer while reading silently by moving his lips and hesitantly saying that it was in accordance with the initial plan he had made. This is also because the subject is disturbed by the surrounding sounds. This is in accordance with what was stated by Ilmiyah (2013) that the auditory subject confidently said the answer was according to plan and in carrying out this auditory subject's plan while talking to himself to concentrate on the steps of completion.

At the stage of re-examining the subject is able to reveal that the result of the answer is correct with hesitation, the subject can. The subject can explain back the answer that has been answered on the answer sheet. This is in accordance with what was stated by Ilmiyah (2013) which states that auditory subjects in the stage of re-examining the results obtained are expressing with doubt if the answer is correct.

4.3. Profile of Student Math Problem Solving with Kinesthetic Learning Style

Kinesthetic subjects understand problems by reading the problem silently and using fingers as pointers. In addition, in writing down what is known and asked from the subject matter using symbols. In explaining it, the subject does not use his own language and while reading the problem with his finger as a pointer to what is known from the problem. This is in accordance with what was stated by Ilmiyah (2013) that the kinesthetic subject is in the stage of understanding the problem by reading the question silently and using fingers as a pointer when reading while lifting the question sheet to read and his hands occasionally holding his face and stroking his hair.

In planning the solution, the subject writes and expresses the presence or absence of information that helps the subject in solving the subject problem using symbols and explaining slowly while reading the problem without a long reason and by playing his pencil and moving his feet. In revealing the calculated operations used briefly, smoothly and without reason. In addition, in revealing the plans that the subject makes to solve the problem smoothly. This is in accordance with what was stated by Indrawati (2017) At the stage of devising a plan, the subject can answer smoothly even though it is not accompanied by reasons, can mention the concepts used to plan problem solving.

At the stage of carrying out planning, the subject solves the problem according to the plan that has been made before by moving the items around him or cannot calm down a lot of moving like he wants to finish quickly. This is in accordance with what was stated by Indrawati (2017) that subjects with a kinesthetic learning style in carrying out their work plans are in accordance with what has been planned before (it appears that at this stage the subject looks uncalm and wants to quickly complete it).

At the re-examination stage, the kinesthetic subject is able to express with confidence that the answer is correct, the subject can explain the results of the answer well. This is in accordance with what was stated by Ilmiyah (2013) expressing with full confidence that the

answer is correct and to correct the answer kinesthetic subject by re-reading important information and recalculating the results obtained.

5. Conclusion

Based on the previous discussion, it can be concluded that students show different steps and habits in problem solving. Students with a visual learning style in understanding problems read the questions repeatedly using aloud and fluently and write down important parts of the problem. Students are able to express their plans briefly without accompanying reasons. In explaining the stages of implementation, students do not use their own language but according to what is seen. In the stage of re-examining the answers. Students with a visual learning style are able to express what is asked in the problem. In addition, students are also sure that the answer is correct.

Students with an auditorial learning style in understanding problems write down parts that they consider important from the problem using mathematical symbols. In addition, he was able to express what was known and asked in the question fluently using his own language even though he was a little hesitant and with occasional reading of the question, which he felt was important information read again silently while twitching his lips. In the stage of implementing the plan, students concentrate on the steps to be used. In the stage of re-examining answers, students can correct answers again by counting again.

Students with a kinesthetic learning style in understanding problems write down parts that they consider important from the problem not using their own language. In addition, it is able to express what is known and what is asked in the question by using the finger to point when reading. In the stage of implementing the plan, students concentrate on the steps to be used. In the stage of re-examining the answers. Students with a kinesthetic learning style correct answer sheets by holding up answer sheets because they want work to be completed quickly.

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