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Student's Mathematical Problem Solving Abilities Based on Emotional Quotient (EQ)

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Abstract. Problem solving ability is the ability of students to use their previous knowledge to solve problems encountered. Problem solving ability is one of the mathematical abilities that must be considered. This research is a qualitative descriptive study with the aim of describing students' mathematical problem solving abilities in terms of their emotional quotient. The research subjects consisted of 6 students, 2 students each with low, medium and high levels of emotional quotient. Based on the results of the study, it is known that students who have a low level of EQ cannot fulfill all the IDEAL problem solving steps. Students who have a medium level of EQ can fulfill all the IDEAL problem solving steps. Students who have a high level of EQ cannot fulfill the IDEAL problem solving step as a whole.

Key words: Mathematical Problem Solving, Emotional Quotient

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INTRODUCTION

Problem solving is a process to find an answer to a problem by applying the knowledge and cognitive skills possessed by an individual (Chao, Tzeng, & Po, 2017; Amam, 2017). Problem solving is a process of solving a problem by using certain steps to achieve the expected solution (Anggraeni & Herdiman, 2018). Problem solving ability is important to make it easier for students to understand lessons, both mathematics and other fields of study, and is important in everyday life, so it needs to be more attention during the learning process, especially mathematics learning (Ariani, Hartono, & Hiltrimartin, 2017; Yoselin, Kartono, & Soedjoko, 2016). Students often have difficulty in understanding a mathematical problem. Students tend to be reluctant to try to understand the meaning of the questions given, making it difficult to determine the steps to solve them. In addition, students are not accustomed to being given exercises to hone problem solving skills. So that students who have high intelligence also have difficulty in the problem solving process (Kaur & Jain, 2014). Based on several opinions, it can be concluded that problem solving ability is the ability of students to use their previous knowledge to solve problems encountered. Problem solving ability is one of the mathematical abilities that must be considered. Problem solving skills can be used with learning that processes students in understanding, determining settlement strategies and solving problems.

Factors that affect learning consist of internal factors and external factors. Internal factors include physiological aspects, student attitudes, talents, interests, and motivations, while external factors include social, non-social, and structural factors (Mahmud, 2017: 94-102). One of the factors in the psychological aspect is the level of intelligence. According to Efendi in Mirnawati & Basri (2018) intelligence is divided into emotional quotient (IQ), emotional quotient (EQ), and spiritual quotient (SQ). Almost all agree that the level of emotional quotient (IQ) determines learning success, but Daniel Goleman states that IQ only affects 20% of a person's success, while 80% is determined by other factors, one of which is emotional quotient (Mahmud, 2017: 95). Emotional quotient (EQ) is the ability to motivate oneself, set the mood, empathize, and cooperate (Hapsyah, Permana, & Zanthy, 2019). Many opinions state that emotional quotient has a positive influence on academic achievement (MacCann et al., 2020). Emotional quotient describes the ability to recognize, interpret, and productively use emotions in solving problems and making decisions (VanderPal, 2021). Students with a stable emotional quotient are able to control themselves, are not easily angry and are not easily stressed when facing problems, in this case are mathematical problems. According to Ashari, Ilyas, & Halim (2020) emotional quotient affects students' problem solving

abilities, the higher the level of students' emotional quotient, the higher their mathematical problem solving abilities.

Oeleu, Leton, & Fernandez, (2019) conducted research on problem-solving skills in terms of emotional quotient. The result is that subjects with high EQ have a tendency to build understanding of problems, while subjects with low EQ do not have a tendency to build understanding of problems. Similar research was conducted by Hayati & Toyib (2022), students who have a high emotional quotient are able to fulfill all problem solving indicators which consist of understanding the problem, planning problem solving, carrying out problem solving plans, and re-checking answers. However, students with medium and low emotional quotient have not been able to meet the problem solving indicators. This researchers will analyze student steps in solving mathematical problems that are reviewed based on emotional quotient, that grouped into 3 categories, namely low, medium, and high. The results of the study are expected to provide a description of mathematical problem solving abilities according to students' emotional quotients.

METHODS

This research is a qualitative descriptive study with the aim of describing students' mathematical problem solving abilities in terms of their emotional quotient. The research subjects consisted of 6 students, 2 students each with low, medium and high levels of emotional quotient. Research subjects were selected by purposive sampling technique. Purposive sampling is a sampling technique for data sources with certain considerations (Sugiyono, 2021: 400). Subjects were selected based on the results of the emotional quotient test given before learning began. The instruments used in the study were emotional quotient questionnaires, problem solving ability test sheets and interview guidelines.

The research procedure starts from preliminary activities, making instruments and testing validity, determining research subjects, collecting data, analyzing data and drawing conclusions. Data analysis was carried out by analyzing answers and results of interviews with research subjects about the steps for solving mathematical problems. The stages of data analysis consist of data reduction, data presentation, and data verification.

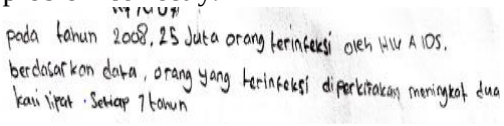
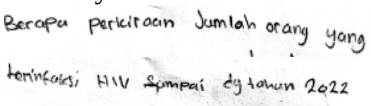
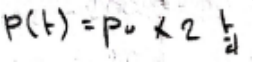
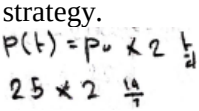
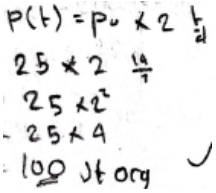
RESULTS AND DISCUSSION

Students' mathematical problem solving abilities are adjusted to the IDEAL problem solving stages. Steps to solve problems in IDEAL problem solving include: 1) Identify problems; 2) Define goals; 3) Explore possible strategies; 4) Anticipate outcomes and act; and 5) Look back and learn (Bransford & Stein, 1993:20). The following are the stages of problem solving by students based on their emotional quotient.

Low Level EQ Subject Mathematical Problem Solving Ability

Based on the analysis of the results of the mathematical problem solving ability test and interviews, it was concluded that students with low EQ levels had not been able to meet the IDEAL problem solving steps. Students with a low level of EQ can write down the information that is known correctly but cannot write down what is asked of the question correctly. Oeleu, Leton, & Fernandez (2019)stated that students with low EQ did not have a tendency to build understanding of the problem. Mulyaningsih, Utami, & Muhtarom (2021) also stated that students with low EQ did not understand the problem because they could not write down the complete information. Students can write a problem-solving plan appropriately and choose the right problem-solving strategy. Students can also carry out plans, write answers and calculations correctly. In line with Mulyaningsih et al., (2021) which states that at the stage of implementing the plan students with low emotional quotient can solve problems according to the plans that have been made previously. Students can solve existing problems correctly and the calculation algorithms performed are also correct. Students do not write conclusions and also do not re-examine the steps and answers to the problems given. Students with low EQ do not re-examine the correctness of the answers obtained and are unable to draw conclusions from the problems given (Hayati & Toyib, 2022). Students with low EQ also tend to have negative traits such as pessimism and give up easily (Meilani & Diana, 2022). The sample of the EC19 subject’s problem-solving ability test results can be written in Table 1 below.

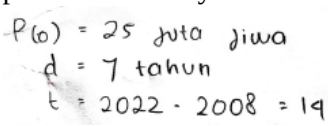
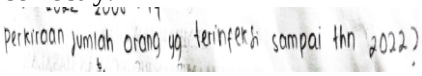
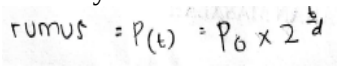
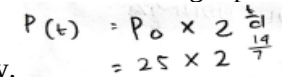
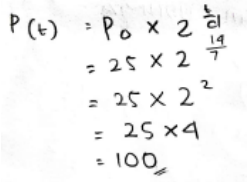
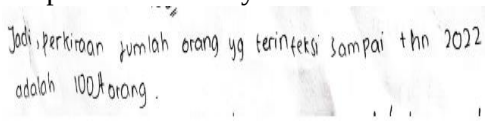
Table 1. EC19 Subject Problem Solving Ability Test Results

No	Steps	Steps Indicator	Description
1.	Identify Problems and Opportunities	Write down the information that is known in the problem	Students write down what they know in the problem correctly. 
2.	Define goals	Write down the problem asked in the question	Students write down what is asked in the question correctly. 
3.	Explore Possible Strategies	Explore strategies/find ways that can be used to solve problems	Students write a problem-solving plan (mathematical model) correctly. 
		Choose a strategy that will be used in solving the problem	Students choose the right problem solving strategy. 
4.	Anticipate Outcomes and Act	Implement the chosen strategy to solve the problem	Students carry out plans, write answers and calculations correctly. 
5.	Look and Learn	Write the final conclusion of solving the problem	Students do not write the final conclusion of solving the problem.
		Evaluate the process and results of problem solving	Students do not evaluate the process and results at each step of problem solving.

Medium Level EQ Subject Mathematical Problem Solving Ability

Based on the analysis of the results of the mathematical problem solving ability test and interviews, it was concluded that students with a medium level of EQ could fulfill every step of the IDEAL problem solving. Students can write down the information that is known and which is asked in the question correctly. Students can write down and choose a problem-solving plan appropriately. Students can also carry out plans, write answers and calculations correctly. At the stage of implementing the plan, students with medium emotional quotient can solve problems according to the plans that have been made previously. Students can solve existing problems correctly and the calculation algorithms performed are also correct (Mulyaningsih et al., 2021). Students can write the final conclusion of problem solving and evaluate the process and results at each step of problem solving. Students with medium EQ are able to write conclusion sentences made after solving existing problems (Hikmah, Purwati, & Endahwuri, 2022). Mulyaningsih et al. (2021) also stated that students with emotional quotient still believe in the truth of the results that have been obtained. Students recheck the results of their answers by correcting them carefully. Students with medium emotional quotient show that they are able to be persistent, willing to try, and have a sense of curiosity (Meilani & Diana, 2022). The sample of the EC20 subject's problem-solving ability test results can be written in Table 1 below.

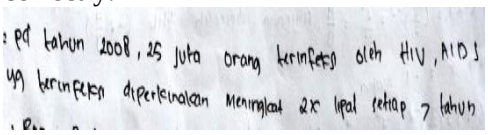
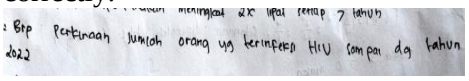
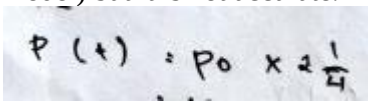
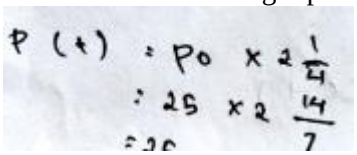
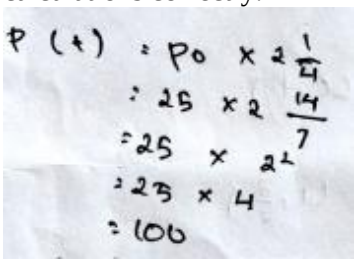
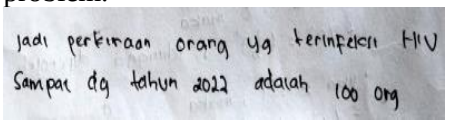
Table 2. EC20 Subject Problem Solving Ability Test Results

No	Steps	Steps Indicator	Description
1.	Identify Problems and Opportunities	Write down the information that is known in the problem	Students write down what they know in the problem correctly. 
2.	Define goals	Write down the problem asked in the question	Students write down what is asked in the question correctly. 
3.	Explore Possible Strategies	Explore strategies/find ways that can be used to solve problems	Students write down a problem solving plan correctly. 
		Choose a strategy that will be used in solving the problem	Stundents choose the right problem solving strategy. 
4.	Anticipate Outcomes and Act	Implement the chosen strategy to solve the problem	Stundents carry out plans, write answers and calculations correctly. 
5.	Look and Learn	Write the final conclusion of solving the problem	Stundents writes the final conclusion of solving the problem correctly. 
		Evaluate the process and results of problem solving	Stundents evaluate the process and results at each step of problem solving.

High Level EQ Subject Mathematical Problem Solving Ability

Based on the analysis of the results of the mathematical problem solving ability test and interviews, it was concluded that students with a high level of EQ could not fulfill the IDEAL problem solving step as a whole. Students with high EQ can write down the information that is known and asked in the questions correctly. In accordance with the opinion of Mulyaningsih et al. (2021) which states that students with high levels of emotional quotient are able to understand problems by writing and mentioning what is known and what is being asked, retells what is known and what is asked using their own sentences. Students with high EQ are able to write problem-solving plans but are not precise, but appropriate in choosing problem-solving strategies. Students carry out plans, write answers and calculations correctly. At the stage of implementing the plan, students with high emotional quotient can solve problems according to the plans that have been made previously. Students can solve existing problems correctly and the calculation algorithms performed are also correct (Mulyaningsih et al., 2021). Oeleu et al. (2019) stated that students with high EQ can carry out plans to solve problems well. Students write the final conclusion of solving the problem. In accordance with the opinion of Hikmah et al. (2022) which states that students are able to write and pronounce conclusion sentences made after solving existing problems. However, in certain questions, they do not evaluate the process and results of problem solving. The sample of the EC09 subject's problem-solving ability test results can be written in Table 3 below.

Table 3. EC09 Subject Problem Solving Ability Test Results

No	Steps	Steps Indicator	Description
1.	Identify Problems and Opportunities	Write down the information that is known in the problem	Students write down what they know in the problem correctly. 
2.	Define goals	Write down the problem asked in the question	Students write down what is asked in the question correctly. 
3.	Explore Possible Strategies	Explore strategies/find ways that can be used to solve problems	Students write a problem-solving plan (mathematical model) but it is not accurate. 
		Choose a strategy that will be used in solving the problem	Students choose the right problem solving strategy. 
4.	Anticipate Outcomes and Act	Implement the chosen strategy to solve the problem	Students carry out plans, write answers and calculations correctly. 
5.	Look and Learn	Write the final conclusion of solving the problem	Students write the final conclusion of solving the problem. 
		Evaluate the process and results of problem solving	Students do not evaluate the process and results of problem solving because there are several errors in writing answers.

CONCLUSION

Students who have a low level of EQ cannot fulfill all the IDEAL problem solving steps. Students with a low level of EQ can write down what is known in the problem correctly, write down what is asked in the problem but it is not quite right, write a problem-solving plan correctly and choose a problem-solving strategy appropriately, carry out the plan, write answers and calculations correctly, and write the final conclusion of solving the problem but it is not precise and does not evaluate the process and results at each step of solving the problem. Students who have a medium level of EQ can fulfill all the IDEAL problem solving steps. Students with a medium level of EQ can write down the information that is known and asked in the problem correctly, can write and choose a problem-solving plan appropriately, carry out the plan, write answers and calculations correctly, and write the final conclusion of problem solving and evaluate the process and results at each step of the problem solving. Students who have a high level of EQ cannot fulfill the IDEAL problem solving step as a whole. Students with high-level EQ can write down the information that is known and asked in

the question correctly, write a problem-solving plan but it is not precise, but it is appropriate in choosing problem solving strategies, implementing plans, writing answers and calculations correctly, and writing the final conclusion of problem solving, but did not evaluate the process and results at each step of problem solving.

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