Teachers’ perception of learning mathematics with medical waste management context

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Abstract. This study aims to reveal teachers’ perceptions of mathematics learning in the context of medical waste management. The study was conducted by surveying 54 mathematics teachers in Banda Aceh using a questionnaire based on three perceptual indicators made by researchers, namely cognition, affection, and conation. The data were analyzed by classifying the answers based on perceptual indicators. The results showed that all the teachers had a good perception of mathematics learning by utilizing medical waste management as a learning context. They believe that the context of medical waste management would encourage students to contribute to protecting the environment and foster positive attitudes in students. Nevertheless, some teachers think that the context of medical waste management is a context that is difficult to use in learning mathematics. Also, the teachers are difficult to use medical waste management as a context for learning mathematics and increase their workload. This is due to a lack of knowledge about the use of the context of medical waste management in mathematics learning caused by the limited training on learning mathematics in the context of medical waste management and the unavailability of the teaching materials and learning tools needed, besides requiring more time.

1. Introduction

Perception is one aspect of human cognitive that is crucial in understanding the world around him. Perception can be defined as the process of organizing, interpreting stimuli received by the organism or individual, so that it becomes something meaningful and integrated within the individual [1]. However, what a person perceives can differ from objective reality [2]. This is because each individual manages and interprets their respective sensory impressions in order to give meaning to the conditions around him. In order to see each individual's perception of a condition, it is necessary to have appropriate indicators so that any perceived can be understood and leads to conclusions are drawn.

A person’s perception can be seen through 3 indicators, namely aspects of cognition, aspects of affection, and aspects of conation [2]. Indicators on the aspect of cognition relate to an individual’s view of something based on experiences he has heard or seen in everyday life. Indicators on the aspect of affection related to the organization of stimuli. Indicators in the conation aspect related to the organization and interpretation of stimuli that cause individuals to incline to behave and act in accordance with the interpreted stimuli. in order to avoid misconceptions about a condition, the three aspects of these indicators must be known and investigated in detail.

Information about teacher perceptions is useful for determining solutions to problems that will occur. The problems are related to the obstacles in the activities carried out by the teacher when managing and organizing mathematics learning in the classroom [3]. Teacher’s perception is defined as the process of
a teacher selecting, organizing, and interpreting input information to create a meaningful picture in mathematics learning [4]. The perception given by the teacher in learning mathematics does not only depend on physical stimuli but also depends on the relationship between these stimuli and the environment surrounding them [5]. Therefore, teacher perceptions in relation to the surrounding environment can be seen through the process of organizing and interpreting sensory impressions, so that teachers are able to give meaning to the importance of using problems in the environment to students in the learning process of mathematics.

The mathematics teacher's perception of the use of problems in the environment relates to their consideration of how environment problem context is important in learning mathematics, one of which is the context of medical waste management. In the medical waste management context, teacher perceptions are measured by identifying teachers' perceptions about the importance of habituating medical waste management for students. Furthermore, teacher perceptions are also related to teachers' perceptions of curriculum support for the learning context [6]. Teachers should be able to identify mathematical competencies in the curriculum that can accommodate medical waste management in the context of learning. However, this ability is not possessed by the teacher, so the context of medical waste management has not been utilized by the teacher in the mathematics learning process.

Any efforts to foster student awareness for the environment in learning mathematics are seen as a necessary alternative to provide knowledge to students about the importance of medical waste management [7]. The success of implementing a context of medical waste management in learning mathematics is influenced by teachers' perceptions of the learning. Learning outcomes that utilize a context will be maximized if the teacher's perception is positive about the learning to be carried out [6]. Yet, the information on teachers' perceptions of mathematics learning combined with the context of medical waste management is not available. They rarely involved in designing learning that integrates a certain value so that instruction outcomes are less optimal [8].

Various countries in the world, including Indonesia, are currently experiencing problems regarding waste management in general. Indonesia got the second rank in the world as a producer of plastic waste into the sea, amounting to 187.2 million tons per year [9]. The increase in waste production also has an impact on the increasing rate of global warming [10]. In addition, the increase in waste production is also supported by the current environmental conditions that are being hit by the Covid-19 pandemic. Wise and mindful management of COVID-19 medical waste is critical to break the chain of transmission and reduce the spread of COVID-19. Currently, medical waste such as used masks, gloves, and other personal protective equipment (PPE) does not only come from the referral hospital medical team and the COVID-19 emergency hospital, but also from the local community. The use of PPE which is only used once has caused medical waste to increase dramatically in Indonesia. Therefore, the use of data about medical waste in mathematics learning is expected to grow students' awareness to care about the environment by properly managing medical waste.

Efforts to foster student awareness of the environment in mathematics learning are seen as an important alternative to provide knowledge to students about the real importance of medical waste management [9]. The success of implementing mathematics learning in the context of medical waste management is influenced by teachers' perceptions of the learning. According to Agustrianita, Suherdi, & Purnawarman, learning outcomes that utilize a context will be maximized if the teacher's perception is positive about the learning to be carried out [6]. However, the research that discusses teacher perceptions associated with the use of medical waste in mathematics learning is not conducted yet, so information on teachers' perceptions of mathematics learning combined with the context of medical waste management is still not available. Teachers are usually asked to apply a lesson to a certain context without paying attention to their perceptions [10]. Teachers are rarely involved in designing learning that integrates a value so that learning outcomes are less than optimal [8]. Therefore, before the context of medical waste management is used by teachers in mathematics learning, it is very important to know in advance about their perceptions of the learning.

Knowing teachers' perceptions of mathematics learning that utilizes the context of medical waste management is important because it is useful for seeing the assumptions and creativity of teachers in
providing understanding of this context to students [9]. One way that teachers can do this is by utilizing medical waste data as material in mathematics learning, so that students feel the need to deal with real medical waste problems in everyday life, especially during a pandemic. Therefore, the formulation of the problem of this study is how the teacher’s perception of mathematics learning in the context of medical waste management.

2. Method
This research is quantitative research with survey type. The population were 540 mathematics teachers from elementary and high schools in Banda Aceh. Purposive sampling deploys to obtain 54 mathematics teachers as a sample of research. Furthermore, the sample is divided into two, namely (1) teachers who have attended training on mathematics learning that combines the context of real problems around students, and (2) teachers who have never attended the training. The purpose of this sampling is to determine the differences in the insights and understanding of teachers about the context of medical waste management in learning mathematics. In addition, the aim is to determine the constraints of teachers in integrating this context in solving mathematics problems.

The data is in the form of the teacher's answers from the questionnaire which are quantified in the form of values of 1, 2, 3, 4, and 5. Data was collected through a questionnaire adapted from [11], which is consisted of 15 statements. There are three indicators in the questionnaire [2], namely; (1) cognition, (2) affection, and (3) conation. The first indicator has five statements regarding teacher perceptions if mathematics learning is combined with the context of medical waste management. The second indicator has six statements regarding the challenges and difficulties of teachers in utilizing the context of medical waste management in mathematics learning. The third indicator has four statements regarding teacher suggestions for a curriculum that will take advantage of the context of medical waste management in learning mathematics. The adapted questionnaire was then validated by two experts of mathematics education at Syiah Kuala University. The questionnaire test was carried out with the aim of getting the Cronbach alpha value and obtained Alpha = 0.782. After all the teacher's perception data have been collected, then data analysis is carried out by grouping the questionnaire answers based on the aspects of the three perception indicators by [2].

3. Result
This study has obtained the teacher's perception of mathematics learning in the context of medical waste management based on three indicators, namely cognition, affection, and conation. The results of teacher perceptions based on indicators of cognitive aspects are presented as in figure 1.

![Cognition Aspect Percentages](image-url)

Figure 1. Percentage of statements based on indicators on the aspect of cognition.

Figure 1 shows the percentage of statements on teacher's perception of combining mathematics learning with medical waste management context. Of the five statements given, it can be seen that in statement
It means that teachers think that learning mathematics which utilizes the context of medical waste management can encourage students to contribute to protecting the environment as part of society. Furthermore, in statement 2, 74.10% of teachers thought that learning mathematics using medical waste management could help students gain skills in managing waste in everyday life. Further, in statement 3, 70.40% of the teachers thought that learning mathematics which used the context of medical waste management could foster positive attitudes in students. In statement 4, 57.40% of teachers think that learning mathematics which utilizes the context of medical waste management can encourage students to work together in groups to solve given contextual problems. Then in statement 5, 61.10% of teachers thought that the context of medical waste management is a context that is difficult to use in learning mathematics. When viewed in broad terms, for this aspect of cognition, an average of 63.34% of teachers have a good perception of learning mathematics by utilizing medical waste management as a learning context. The results of teacher perceptions based on indicators of affection aspects are presented as in figure 2.

![Affection Aspect Percentages](image)

**Figure 2.** Percentage of statements based on indicators on the aspect of affection.

Figure 2 presents the percentage of the challenges and difficulties of teachers when utilizing the context of medical waste management in mathematics learning. From the 6 statements given, it can be seen that in statement 1 42.60% of teachers thought that this context contains a lot of workload for the teacher if it takes advantage in mathematics learning. Furthermore, in statement 2, 66.70% of teachers thought that they suffer a lack of knowledge in utilizing the context of medical waste management in mathematics learning. Then in statement 3, 77.80% of teachers thought that there was a lack of training, seminars, debriefing on learning mathematics instruction in the context of medical waste management. In statement 4, 61.10% of teachers thought that there was a lack of supporting teaching materials and learning tools. Further, in statement 5, 53.70% of teachers thought that learning mathematics instruction by utilizing the medical waste management context is recommended to involve students with large class sizes. Finally, in statement 6, 72.20% of the teachers thought that if they took advantage of the context of medical waste management in mathematics learning, there must be plenty of time for the learning process in the classroom. Overall, for this affection aspect, an average of 62.35% of teachers thought that there were many challenges and difficulties for teachers when utilizing the context of medical waste management in mathematics learning, thus increasing their workload. The results of teacher perceptions based on indicators of conation aspects are presented as in figure 3.
Figure 3 shows the percentage of suggestions for the upcoming curriculum. From the 4 statements given, it can be seen that in statement 1, 74.10% of the teachers gave suggestions to try out the new curriculum first. Furthermore, in statements 2 and 3, 96.30% of teachers suggest to prepare books or teaching materials and supporting learning instruction and involve teachers in designing learning instruction. Then in the last statement or statement 4, 94.40% of the teachers gave suggestions in order to first train teachers in implementing the new curriculum for the upcoming curriculum. Broadly speaking, for this conation aspect, an average of 90.27% of teachers suggested many positive things for the upcoming curriculum, one of which is that teachers must be involved in the development of learning instruction. This is done so that the various challenges and difficulties faced by teachers now can be overcome, thereby creating a more meaningful learning process.

4. Discussion

Based on the explanation that has been presented, it can be seen that the teacher's perception of mathematics learning combined with the context of medical waste management is already positive. This can be seen from Figures 1, 2, and 3 that the percentage of teacher perceptions on each indicator is above 50% on average. In addition, the perceptions of teachers who have attended the training are not much different from those of teachers who have not attended the training. This is because according to them, the context of medical waste management is pivotal in learning mathematics. However, almost all teachers in Banda Aceh find it difficult to take advantage of this context in their classroom learning. This statement is supported by the results of interviews by researchers with several respondents, and they claimed to have attended training on the use of a context in mathematics learning. But the training they have taken has not completely overcome their difficulties.

The training that teachers participate in usually only provides provision in the form of theory, while teaching materials and learning instruction that support the use of a context are still not available. This is in accordance with the statement [8] that the needs and difficulties of teachers in learning have not been fully resolved by the training they attended. The same thing was stated in the findings [12], which stated that learning instruction by integrating the context of problems in the environment was still not available. Teachers need special training and reading material in the form of examples of mathematics learning instruction that utilize a context such as medical waste management so that they can be integrated into the learning process. This is consistent with the statement [13] that appropriate training contributes significantly to overcoming teacher difficulties in teaching and can improve the quality of
Finding out teacher's perception of a context is important before the context is used in mathematics learning. This because the teacher acts as a motor of progress in the learning process. The success of a lesson really depends on the teacher who teaches the learning. This statement is in accordance with the opinion expressed [14] that it is a paradox that if everyone talks about improving education, increasing the ability of teachers should be prioritized. Teacher improvement can be made if the problems and obstacles experienced by the teacher are known in the learning process. Therefore, the indicator of teacher perceptions of a context is the first step in increasing professionalism to produce quality learning.

5. Conclusion and Suggestion
In general, the results of this study found that teachers have a good perception of mathematics learning in the context of medical waste management (the average teacher's perception is above 50%). Based on the three indicators of perception applied, teachers' perceptions on the cognition aspect obtained an average of 63.34%, an average of 62.35% was obtained in the affection aspect and an average of 90.27% in the conation aspect. Research on teacher perceptions can be used as an initial basis for teachers' views on mathematics learning in the medical waste management context. However, almost all teachers in Banda Aceh stated that it was difficult to take advantage of the context in mathematics learning. This is because the training they have participated in is dominated by theory and has not touched practical aspects. In fact, training followed by hands-on practice will impress the participants more so that the results of the training will be more satisfying. One way to overcome this can be done by making real learning devices related to managing medical waste. Therefore, future research should design or develop mathematics learning instruction that integrates the context of COVID-19 pandemic medical waste management, so that it can be used as a model by teachers to develop other useful contexts for students.

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