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Relevance of the Characteristics of Realistic Mathematics Education in Mathematics Learning in the New Normal Era

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ABSTRACT
In realistic mathematics learning, students acquire concepts based on their experiences which are then linked to mathematics. The characteristics of RME include use of context, use of models, student contributions, interactivity, and intertwinment. In Indonesia, due to the COVID-19 pandemic, mathematics learning is carried out from home online. This online learning is the right solution in the new normal era. Different principles of online and face-to-face learning may make the application of the RME approach also different, especially in terms of the characteristics of the RME approach. This research studies the relevance of RME characteristics in online mathematics learning by reviewing and/or exploring several journals, books, and documents as well as other sources of data and or information deemed relevant (library research). The results of this research indicate that the characteristics of the RME approach are still relevant for use in the new normal era. The following is an explanation of the implementation of online mathematics learning in terms of the characteristics of the RME approach, 1) characteristics of the use of context, applied by using props around students' homes or contextual problems in student activity sheets. Where teachers can monitor students through parental assistance or applications that have virtual face-to-face features; 2) the characteristics of the use of the model, seen when students solve contextual problems by making mathematical models first. In addition, it can also be done by making mathematical models through the practice of using teaching aids with the help of parents supervision; 3) the characteristics of student contributions, in online learning, students have great opportunities to participate through applications such as WhatsApp, Google Classroom, Google Meets, and others. In addition, to activate students in learning, rules or agreements can also be given as well as individual assignments; 4) characteristics of interactivity, during the pandemic the activities are carried out virtually. Various activities and applications can be combined to achieve learning objectives; 5) The characteristics of intertwinment are carried out by giving student activity sheets that begin with contextual problems. Then they are given continuous instructions until they find a solution after passing through formal mathematics.

Keywords: *RME, Mathematics, New Normal Era, Online Learning.*

1. INTRODUCTION

There are many topics in mathematics that are so absurd that it makes them difficult to understand. However, this paradigm in the last few decades has shifted slightly with the approach of realistic mathematics education (RME). Where this approach states mathematics as a human activity carried out in everyday life [1]. According to Freudental, human activity includes problem-solving activities, problem-finding, but also the activities of organizing subject matter [1]. Thus students will be able to feel more tangible benefits from learning mathematics. Students will more easily understand what has been learned.

According to Uzel and Uyangor [2], there are two important things that are at the core of realistic mathematics, namely mathematics must be related to reality and mathematics must be viewed as a human activity, where mathematics must be close to students and relevant to everyday life situations. So in realistic mathematics learning, students acquire concepts based on their experiences which are then associated with mathematics. Gravemeijer revealed that in learning mathematics with a realistic mathematics education

approach, students learn mathematical concepts through real things first before entering the area of abstract mathematics [1].

Like other learning approaches, RME also has its own characteristics. As mentioned by Gravemeijer [1] and Treffers [3] that the characteristics of RME include the use of context, use of models, student contributions, interactivity, and intertwinment. The use of context here means that learning begins with raising contextual problems that are known to students. In solving this contextual problem, students are expected to use modeling. Learning with the RME approach is also very concerned with the contributions of students. The contribution of students in learning can be done through interaction with other students and teachers. In addition, in learning, it is also expected that there is a link between the material being studied.

The new normal era as a result of the COVID-19 pandemic has made changes in various fields, including the learning process. In Indonesia, due to the COVID-19 pandemic, online learning is carried out from home, including learning mathematics [4]. This is to prevent the spread of COVID-19 among students and teachers. Of course, many adjustments must be made so that the learning objectives are still achieved like face-to-face learning.

Online learning is a learning system that is not done face-to-face, but uses a platform that can help the teaching and learning process continue even though it is far away [5]. Online learning connects students with their learning resources who are physically separated or even far apart but can communicate, interact or collaborate (synchronously and asynchronously) [6]. Thus, online learning is the right solution in the new normal era. Circumstances which require to keep a distance, not crowd, also interact directly in a short period of time.

The relevance of the RME approach in online mathematics learning needs to be studied further. Because before the COVID-19 pandemic, this approach was mostly implemented in face-to-face learning. Different principles of online and face-to-face learning may make the application of the RME approach also different, especially in terms of the characteristics of the RME approach. For this reason, it will be studied regarding the relevance of the characteristics of RME approach in online mathematics learning in Indonesia.

2. METHODS

The method used in this study is library research. According to Huda, library research is carried out to solve a problem based on a critical and in-depth study of relevant library materials [7]. According to Zed, literature research has at least four main characteristics, first, the author or researcher deals directly with text or numerical data, not direct data from the field. Second, library data is "ready to use" meaning that researchers do not go directly to the field. Third, that library data are generally secondary sources, in the sense that researchers obtain materials or data from second-hand sources and not original data from first-hand data in the field. Fourth, that the condition of library data is not limited by space and time [8]. Data collection in research is carried out by reviewing and/or exploring several journals, books, and documents (both printed and electronic) as well as other sources of data and or information deemed relevant to the research or study, namely the relevance of RME characteristics in online math learning.

3. RESULT AND DISCUSSION

Based on the literature research that has been carried out, the results of research oriented to the five characteristics of RME can be presented. Where each will be discussed its relevance in online learning in the new normal era. In reviewing this discussion, the researchers limit the learning of mathematics carried out in Indonesia. With the aim that this study can represent the characteristics of RME in online learning applied in Indonesia.

The first characteristic is the use of context. Realistic learning process begins with contextual problems [2]. According to Riajanto, this characteristic in learning can be applied by providing student activity sheets containing contextual problems [9]. In a research conducted by Handayani and Irawan during the COVID-19 pandemic, these characteristics were given by the teacher through the use of teaching aids that were around the house or presumably owned by students. For example, when learning about the parts of a circle, students are asked to observe bicycle wheels, where students usually use bicycles as a means of transportation. In carrying out the research, the use of context through this teaching aid is monitored with the help of virtual meeting applications, such as Google Meet, Zoom, and WhatsApp. [10]. Thus, teachers can still supervise the implementation of learning with this RME approach according to its first characteristics.

Referring to the implementation of the RME approach during the COVID-19 pandemic from some of these studies, the characteristics of the use of context can be carried out as well as face-to-face learning. By utilizing various objects that exist around students as well as through contextual problems. The difference is that during this pandemic, teachers supervise these activities through virtual meeting applications. In addition, it is possible for students to choose different objects as props. However, this will actually make students understand that mathematical concepts have many uses around them.

The second characteristic of the RME approach is the use of models. In student worksheets containing contextual problems, questions and instructions are also given that are integrated with the concept of the material to be achieved [9]. This is where the characteristics of using the model emerge. Students can make models from contextual problems to mathematical models. This mathematical model is solved, then returned to the contextual problem. Like Fauzan's opinion, that in learning mathematics, it is done through the process of mathematizing from the real world and then returning it again [11]. This is also one of the principles of the RME approach, namely the guided reinvention of mathematical ideas and concepts [9].

The application of the characteristics of the use of the model can also be done by using props. Such as finding the concept of circumference and area of a circle from the process of measuring objects in students' homes, for example the surface of glasses, pots, hola hops, and others [10]. According to Nurfauziah and Sartika, learning using concrete problems and media can optimize students' abilities [12]. However, in the conditions of the COVID-19 pandemic, the implementation of this learning would be better if there was the participation of parents who accompany students to study from home. The teacher can direct parents about their role, for example helping to prepare teaching aids, or supervising the use of these teaching aids so that learning objectives are still achieved [10].

The next characteristic is the contribution of students. Online learning during the COVID-19 pandemic, making student contributions a major component. Teachers can ensure student engagement through the results of student activity sheets that must be sent via applications, such as WhatsApp [9]. When students are completing student activity sheets, they are given the freedom to express ideas so that they will indirectly build their own knowledge [12]. Of course, teachers must also be able to compile effective activity sheets starting with contextual problems to achieve learning objectives. In addition, the creativity of teachers in encouraging students to use props around their homes is also very necessary [10].

The RME approach gives students the opportunity to actively participate in a very wide range [12]. However, in another study, it was found that there are students who have not focused on online learning, such as just fill in attendance, not collecting assignments, and so on. This can be resolved when the researcher makes an agreement and gives individual assignments. Which students finally feel they have a responsibility to complete. Such as an agreement that absent through google classroom or assessment using google form. When studying the circumference and area of a circle, students are given individual tasks in the form of making video presentations of student activities in practicing measuring the circumference and area of a circle from objects around their respective homes [10].

Furthermore, in the RME approach there are characteristics of interactivity. During face-to-face learning, this interactivity is carried out by students with teachers and friends directly. However, during this pandemic it is done virtually. Interaction can be done using simple distance learning media, such as the WhatsApp application. Giving student activity sheets, the question and answer process, or sending assignments is done in groups on WhatsApp [9]. Of course the selection of media or applications used must meet several considerations, including effectiveness, efficiency, and ease of use by students and teachers.

Online learning activities can also be done with the teacher making learning videos uploaded on social media. Then after students study the video, the question and answer process continues in the group on WhatsApp [10]. If the teacher provides learning videos like this, it will be an advantage for students to be able to study the material repeatedly if they feel something has not been understood.

Online learning with more complex activities can be done by combining several applications, such as social media, Google Classroom, Google Meets, Zoom Meeting, and the like. For example, attendance is done with Google Classroom, then learning is continued using Google Meets, and the assessment is done by filling out the Google form provided by the teacher [10]. With an application that has a feature to meet face-to-face virtually, learning can be conditioned like in a normal class. Interaction of students with teachers and between students can be carried out smoothly.

The last characteristic is intertwinment. According to Julie, this characteristic emphasizes a series of learning as a fabric from a series of activities to explore and solve contextual problems to find formal mathematical concepts [12]. This can be done by providing student activity sheets that begin with contextual problems. Then they are given continuous instructions until they find a solution [9]. Through this process, students will realize that mathematics is meaningful and useful in human life. For example, students can explain the reason why at the same time and speed, a bicycle with a larger wheel diameter means that it has a longer distance to travel than a bicycle with a smaller wheel diameter [10].

Based on this literature review, it can be said that the characteristics of the RME approach are still relevant for use in online learning. Learning development during the COVID-19 pandemic refers to the characteristics of RME, which can be done by utilizing existing simple media [9]. Through concrete media to understand mathematical concepts, students will understand the meaning of mathematics in everyday life [12]. However,

the ability of teachers to teach online must be more creative and innovative [10]. Especially the ability to use technology for learning.

4. CONCLUSION

The results of this study indicate that the characteristics of the RME approach are still relevant for use in the new normal era. Based on the description related to the implementation of online mathematics learning in terms of the characteristics of the RME approach, it can be concluded that, 1) characteristics of the use of context, applied by using props around students' homes or contextual problems in student activity sheets. Where teachers can monitor students through the help of parents or applications that have virtual face-to-face features; 2) the characteristics of the use of the model, seen when students solve contextual problems by making the mathematical model first. In addition, it can also be done by making mathematical models through the practice of using props with the help of parents supervision; 3) characteristics of student contributions, in online learning, students have a great opportunity to participate. However, participation is through applications such as WhatsApp, Google Classroom, Google Meets, and others. In addition, to activate students in learning, rules or agreements can also be given as well as individual assignments; 4) characteristics of interactivity, during the pandemic the activities are carried out virtually. Various activities and applications can be combined to achieve learning objectives; 5) The characteristics of intertwinment are carried out by giving student activity sheets that begin with contextual problems. Then they are given continuous instructions until they find a solution after passing through formal mathematics.

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