

RME Learning Model in Urban And Rural Elementary Schools: A Comparative Study

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ABSTRACT

This study aims to (1) determine the application of Realistic Mathematics Education (RME) learning model in urban and rural elementary schools, (2) describe the comparison of the application of RME learning model in urban and rural elementary schools. The research was conducted at urban and rural elementary schools. The research participants were school principals, class teachers, and students. Data collection techniques were participatory observation, interviews, and document analysis. The validity of the data in this study was tested by testing the credibility, transferability, dependability, and confirmability tests. Data analysis uses the Miles and Huberman models. The results showed that the application of the RME learning model at urban and rural elementary schools applied almost the same aspects. The difference is that urban elementary schools emphasize the principle of guided discovery, and rural elementary schools put forward the principle of connecting informal knowledge to formal mathematical knowledge. The implementation characteristics of the RME learning paradigm were similar in both Elementary Schools. Those elementary schools underwent the same four stages during the implementation phase. The application element exhibited the most notable disparity. The urban primary school extensively utilised contemporary and readily available media, equipment, and teaching resources. Meanwhile, the rural primary school implemented environment-based media and other instructional materials. The mathematics learning outcomes in both elementary schools were equitable. The RME learning concept is applicable in both urban and rural schools.

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1. INTRODUCTION

The learning model is the main framework of learning so that it can take place properly. One model whose implementation is popular in learning mathematics is Realistic Mathematics Education (RME). The RME model is an instructional approach in mathematics education that facilitates learning by guiding students to construct and rediscover mathematical concepts based on their own experiences and existing knowledge, in order to solve mathematical problems (Akgül & Kahveci, 2016).. Furthermore, (Makonye, 2014) also stated that RME helps students see the close relationship between conceptual knowledge and

mathematical procedural knowledge. Thus, the use of this model also helps reduce students' fear of mathematics while promoting productive and more meaningful mathematics (Ndiung et al., 2021). The implementation of the RME model has also proven effective in increasing students' motivation to learn mathematics. Previous research has proven that RME can improve students' performance in learning mathematics, especially in the activity of constructing their knowledge through real-world contexts and students' thought processes (Zakaria & Syamaun, 2017). RME can improve students' logical, critical and creative thinking skills. It was also found that RME helps students improve their affective factors such as motivation, positive cooperative relationships between students and the development of harmonious relationships between students and teachers (Ch. Krisnandari Ekowati et al., 2015).

The proper application of the RME model has been shown to increase effectiveness in developing various mathematical activities, even those that are often considered difficult (Yetim Karaca et al., 2017). The application of this model can be so successful when its principles are implemented to the fullest (Heuvel-Panhuizen & Drijvers, 2014) formulated that there are six principles of RME that need attention, namely the principles of action, reality, hierarchy, connection, interaction, and guidance. Each of these principles is related to one another and all of them need to be implemented. But it should be emphasized that the principles of action and reality cannot be overlooked in the application of RME (Laurens et al., 2017). This is because the main principle of RME is that students must participate actively in the learning process and learning must be able to bridge informal knowledge to formal knowledge on a contextual basis (Rezan Yilmaz, 2020).

The RME model does not seem to have explicit requirements on the school qualities necessary for its implementation, while emphasising the need of adhering to its application principles. Despite the contrasting educational, facility, and infrastructure disparities between rural and urban schools, as well as variations in teaching resources (Ramadhani, 2022), RME shows promise for being adaptable to both types of schools. The RME model is applicable to urban schools that possess sufficient facilities, infrastructure, and contemporary human resources. Furthermore, this model can be customised to suit the specific attributes of schools located in isolated regions with limited resources and inadequate infrastructure for educational purposes (Zaenuri et al., 2021). It is important to recognise that education needs to be tailored to the specific environment, experiences, and advantages of the local community, taking into account the existing natural resources and potential (Darman & Sidi, 2000).

The basic difference between schools located in cities and villages is the infrastructure and accessibility of various facilities that might support learning (Anas et al., 2015). But this cannot be generalized, considering that the environmental conditions of each region in Indonesia are very varied. In general, schools in urban areas have adequate access to technology and transportation. Automatically, this convenience will support the availability of learning facilities. In contrast, schools in rural areas are generally simpler and do not fully facilitate access to adequate technology and transportation (Anas et al., 2015). In terms of students' learning knowledge and parental characteristics, rural schools are also several steps behind urban schools (Khusaini Khusaini & Muvera Muvera, 2020). Nonetheless, the characteristics of teachers are not much different so that quality learning can grow in both rural and urban schools if it is in the hands of the right teacher (Khusaini Khusaini & Muvera Muvera, 2020), and also students who attend schools in villages and cities still have the same potential in develop himself (Aris Prasetyo, 2017). Positive things like this are a big chance for the successful implementation of RME in all school conditions.

The RME model has great potential to be applied to various school characteristics. The need for integration of the real environment and linkages with everyday life in the application of RME does not demand the need for certain learning environment conditions. This statement can be proven through research that specifically examines the implementation of RME in schools with these different backgrounds. Thus, the research questions was (1) how was the application of RME learning model for geometric materials in urban elementary school?, (2) how was the application of RME learning model for geometric material in rural elementary school?, (3) how was the comparison of the application of RME learning model for geometric materials in urban and rural elementary schools?

Based on that research questions, the research benefits was (1) theoretical benefits: this research can add to the body of knowledge in the field of education, especially regarding the RME learning model, (2) practical benefits for teachers: this research can provide benefits for teachers, namely providing information, especially regarding learning using effective RME learning model for those who teach in suburban and rural elementary schools along with their various characteristics; practical benefits for schools: as information that can be used as material for consideration or input to obtain an effective learning model, one of them is rme, especially in geometric subjects; practical benefits for researchers: provide an overview to researchers regarding the application of rme learning in suburban and rural schools so that it can be used as a reference for developing ideas.

2. METHODS

This type of research includes comparative research using qualitative research methods. Comparative research aims to find similarities or differences between two or more facts and object characteristics. According to Nazir (in usmianah et al., 2020), comparative research is a type of descriptive research that wants to find answers fundamentally about cause and effect, by analyzing the factors that cause the occurrence or emergence of a particular phenomenon. Comparative research is to compare between two or more groups of a particular variable.

The phenomenon described is the application of the RME learning model in elementary schools in urban and rural elementary schools. More precisely, this research was conducted in grade five. The unique phenomenon raised is the success of the two elementary schools in implementing the RME learning model even though they have different characteristics.

Data collection techniques and research instruments were carried out through participatory observation, interviews, and document analysis. Students, teachers, and school principals from each elementary school were the participants who were involved as sources of information for this research. In the observation, researcher did non-participatory observations by not being involved in learning in class. Researcher observed interaction, class conditions, facilities, and how the teacher played a role in the learning process. Observations were doing in January-March 2022 with 10 meetings in each school. In one meeting, the research was only carried out during math class hours around 2 hours of lessons. Things that are observed are regarding place (atmosphere/class conditions during learning), participants (teachers and students during learning), and activities during the implementation of RME learning model in geometry. Researcher used an observation sheet that has been validated.

Interviews were done with the principal, class teacher, and two student representatives. The researcher utilised a verified interview sheet. Each participant receives distinct questions from every validated sheet.

In this study, the documentation used was as follows: (1) visual documentation: lesson plans, worksheets, textbooks, modules, handouts, models/models, visual teaching materials, student daily assessment sheet, student midterm assessment sheet, sheet End of semester test for students, (2) audio documentation: audio teaching materials, (3) video documentation: audio-visual teaching materials, interactive teaching materials, etc.

Furthermore, the validity of the research data is proven by a series of stages which include the credibility test, transferability test, dependability test and confirmability test (Andriani, 2015). Data that has passed the test will be continued with data analysis using the Miles and Huberman models (Sugiyono, 2015).

3. FINDINGS AND DISCUSSION

3.1 Findings

The findings obtained from the research, describing the application of the RME learning model based on the coding process, found 4 aspects. These four aspects are the principles, characteristics, stages, and learning elements in applying the RME learning model. Each school fulfills these aspects, and the results of this study will compare each school's results regarding aspects of implementing the

RME learning model.

The following are the results of research obtained through the all observations that have been made in urban and rural elementary school. The results of research on the principles applied when implementing the RME learning model at urban and rural elementary school are as follows.

Table 1. Comparison of the Principles of RME Learning Model Implementation at Urban And Rural Elementary School

Urban Elementary School	Rural Elementary School
<ul style="list-style-type: none"> • <i>Guided discovery</i>, in which students always receive teacher guidance in their learning activities to discover for themselves the concept being studied consistently based on the material being studied at the meeting. • <i>Liaison of informal knowledge to formal mathematical knowledge</i>, in which when delivering material, teachers often use instructional media, both those owned by the school and those that use objects or stationery in class as learning media. • <i>Student activities individually and in groups</i>. The group activity that is most often carried out is discussion, both discussions with peers, groups and one class. 	<ul style="list-style-type: none"> • <i>Guided discovery</i>, for example student activities to find and calculate the elements of the cube themselves. The discovery of the cube elements was carried out under the guidance of the teacher using real objects used as learning media, namely dice and rubrics. • <i>Linking informal knowledge to formal mathematical knowledge</i>, which can be seen from the learning process which initially introduces students through real objects that function as learning media. • <i>Student activities dominated by group activities</i>, namely group discussions. Students are also active in participating in learning which can be seen from the actions of students in class. • <i>The principle of relatedness to mathematics topics</i>, meaning that the topics taught to students are related to one another. One example is learning to link the mathematical topics of addition and multiplication. • <i>The principle of interactivity with group activities</i>. This principle grows because the intensity of group activities is quite high.

Furthermore, each school also shows certain characteristics when implementing the RME learning model. The following are the results of research obtained through the all observations that have been made in urban and rural elementary school. The results of the study regarding the characteristics of the application of the RME learning model at urban and rural elementary school are as follows.

Table 2. Comparison of the Characteristics of RME Learning Model Implementation at Urban And Rural Elementary School

Urban Elementary School	Rural Elementary School
<ul style="list-style-type: none"> • <i>Use of context</i>, which means that the teacher always uses context problems during class learning. • <i>Utilization of the results of students' understanding construction</i>, in which the teacher stimulates students to optimize learning materials that have been constructed in students' understanding to complement and even start the material to be studied. • <i>The teacher gives students the opportunity to solve various problems found during the implementation of learning</i>. Two of the most frequently applied methods are practice and discussion. • <i>The teacher encourages interaction</i>, especially through discussion activities. • <i>The teacher acts as a facilitator</i> starting from preparing learning tools, media facilities and learning materials, to providing guidance and direction for students. 	<ul style="list-style-type: none"> • <i>The use of context</i>, especially at the beginning of learning and applied by the teacher in the form of contextual questions. • <i>Utilization of the construction results of students' understanding</i>, where students understand the material in stages from the easiest to the most difficult. Students can understand the next material based on the construction of material that has been studied before • <i>The teacher gives students the opportunity to solve math problems</i>. Its application is done in a variety of ways. Group assignments can be completed by discussion. Individual assignments can be completed by looking for references to answers in the textbook • <i>The teacher encourages interaction</i>. The teacher deliberately designs learning with lots of group activities and assignments. The result is that students are quite active in learning, for example actively asking questions, answering questions, giving opinions, listening to the opinions of other friends, and making learning notes. • <i>The teacher acts as a facilitator</i>, where the teacher has a role in facilitating students to get the material well and also preparing the learning media needed to support the meeting that will be held

The application of the RME model in each school also has certain stages. The following are the results of research obtained through the all observations that have been made in urban and rural elementary school. The following are the results of research regarding the stages of implementing the RME model at urban and rural elementary school.

Table 3. Comparison of the RME Learning Model Implementation Stages at Urban And Rural Elementary School

Urban Elementary School	Rural Elementary School
<ul style="list-style-type: none"> • <i>Solving problems</i>, this stage is always carried out in every meeting and is dominantly carried out at the opening of the learning core. • <i>Identify the mathematical concepts relevant to the problem</i>. Students apply this stage to connect between problems and concepts that need to be applied, for example in solving the volume of objects in class, students use the calculation of the volume of blocks and cubes (adjusted to the shape of the object being calculated). • <i>Solving math problems</i>, at each meeting there must be a mathematical problem that must be solved by students. • <i>Organizing learning material</i>, meaning that the material being taught is organized so that it is sequential and level. That is, the material is sorted from the most basic and easy to the more difficult. Students can understand the next material with the material that has been studied before. 	<ul style="list-style-type: none"> • <i>Solving problems</i>, this stage is a consistent stage that is carried out in every meeting. But the implementation time is quite varied from the beginning to the end of the core of learning. • <i>Identify mathematical concepts that are relevant to the problem</i>. Students apply this stage to connect between the problem and the concept that needs to be applied, for example to find out the elements (sides, edges and vertices) and the volume of an orange, a suitable mathematical concept is the calculation of the volume of a solid ball. • <i>Solving math problems</i>. This is also the stage that always appears in every meeting because every lesson has a math problem that must be solved. • <i>Organizing learning material</i>, meaning that the material being taught has been well organized. Sort and level from easy to difficult. Students can understand the next material because they have understood the material studied before

The final aspect of implementing the RME model is the learning element. The following are the results of research obtained through all observations that have been made in urban and rural elementary schools. The following are the results of research on learning elements in the application of the RME model at urban and rural elementary schools.

Table 4. Comparison of Learning Elements for the Implementation of RME at Urban And Rural Elementary School

Urban Elementary School	Rural Elementary School
<ul style="list-style-type: none"> • <i>Instructional media</i>, where many of these media have been provided by schools and are also often used by teachers. Almost every teacher meeting involves media to support the mathematics learning process. • <i>Learning materials</i>, elements that must exist in every lesson. The teacher adjusts the overall range of material that must be learned by students with the amount of learning. • <i>Learning atmosphere</i>, in general the learning atmosphere from meetings 1 to 10 is conducive in supporting learning in class. The class atmosphere is comfortable, the relationship 	<ul style="list-style-type: none"> • <i>Learning media</i>, where the media most often used are real objects around. For example, to introduce geometric shapes using rubik's cubes, tissue boxes, erasers, cupboards, and shapes made by yourself from paper. • <i>Learning materials</i>, elements that must also exist in every lesson. The entire range of material that must be learned by students is divided according to the amount of learning. • <i>The learning atmosphere is generally supportive and quite conducive</i>. Even though the class is located right next to the farm animals, it doesn't really disturb the class condition significantly

Urban Elementary School	Rural Elementary School
<p>between fellow students and students with teachers is also good.</p> <ul style="list-style-type: none"> • <i>Teaching materials</i>, where the teaching materials used in class V of Urban elementary school are worksheets and textbooks. • <i>Learning tools and materials</i>, each meeting has a variety of learning tools and materials. These learning tools and materials are adapted to learning materials and activities. 	<ul style="list-style-type: none"> • <i>Teaching materials</i>, where the teaching materials used in class V at Rural elementary school are also worksheets and textbooks. • <i>Learning tools and materials</i>, each meeting has varied learning tools and materials but in essence they are simpler and in accordance with the availability in the learning environment.

3.2 Discussion

3.2.1 Principles

The principles applied to the use of RME in grade five at urban and rural elementary school both started with guided discovery. This means that students always receive teacher guidance in their learning activities to discover for themselves the concepts being studied by solving various contextual problems (Astuti, 2018). The application of guided discovery has a significant effect on students' mathematics learning outcomes so that the application of this principle is quite effective for optimizing learning objectives (Tia Dyastana et al., 2015). This guided discovery principle is also the most prominent principle in urban elementary schools.

Furthermore, these two schools also apply the principle of connecting informal knowledge to formal mathematical knowledge. By using various media and objects around them to support solving contextual problems, students are expected to be able to build their own mathematical knowledge through their own experiences (Ni Wayan Nipi Liwis & Putu Aditya antara, 2017). In contrast to urban elementary school, at rural elementary school, this second principle is the most prominent principle. Furthermore, both schools in both urban and rural areas prioritize student activities. This principle is one of the bases of implementing RME which is useful in training students to solve problems both individually and in groups (Nita Handayani, 2015). In general, both schools apply this principle with the same intensity.

In addition to the principle similarities that have been described, there are several differences between the principles of these elementary schools. Rural elementary schools pay more attention to the principle of relatedness to math topics, which indicates that the topics being taught to students are related to one another. Teachers tend to often remind students of topics that have been previously studied in order to be able to solve their current problems. The importance of this principle is related to its function which can make it easier for students to understand a mathematical concept on the topic being studied (Alam Burhan Iskandar, 2012). However, this principle is not visible at urban elementary school. Another principle that is only applied at rural elementary school is interactivity with group activities. This principle is highly developed in the rural elementary school due to the high intensity of group activities. Interactivity is important to make the learning atmosphere more dynamic and feel alive. Of course, this will foster fun and motivation to learn in students and the exchange of knowledge will be more optimal between one student and another (Alam Burhan Iskandar, 2012).

3.2.2 Characteristics

The characteristics of the application of the RME model at urban and rural elementary schools are generally the same, namely applying the five characteristics of the RME model. The first character is the use of context, the application at urban elementary schools are more comprehensive and appears almost as long as the learning takes place, while in rural elementary school is more prominent only at the beginning of learning. This difference still has the potential to produce maximum learning outcomes because the use of this context is best placed from the beginning of learning which is the source of the

problem (Olivera Djokic, 2015). The application of the second characteristic, namely the utilization of the construction results of students' understanding, has many similarities between these two schools. The teacher stimulates students to optimize learning materials that have been constructed in students' understanding to complement and even start the material to be studied. This application is very important in helping students develop more meaningful formal mathematics (Dwirahayu et al., 2020).

Furthermore, the third characteristic is that the teacher gives students the opportunity to solve various problems found during the implementation of learning. Urban elementary school often packs learning through practice and discussion, while rural elementary school through discussions, group assignments, and discovery of concepts from various references, especially from LKS. The selection of this group activity is quite appropriate because this activity can facilitate the interpretation of shared perspectives and determine the best decisions in solving problems (Marta Magiera & Judith S. Zawojewski, 2011). The fourth characteristic is that the teacher encourages interaction, especially through discussion activities. The basic differences were also seen from the many planned group activities at rural elementary school, while this characteristic was evident at urban elementary school from the discussion activities. The last characteristic is that the teacher acts as a facilitator. Teachers at these two schools prepared learning tools, media facilities, and learning materials, as well as provided guidance and direction for students. By entrusting problem solving to students and strengthening the role of the teacher facilitator, students can develop a practical, logical, critical, and honest mindset that is oriented towards mathematical reasoning (Candra Chisara et al., 2019).

3.2.3 Stage Of Implementing

The next aspect is the stage of implementing the RME learning model. In these two schools, the application of the RME model went through 4 stages, namely (1) solving problems, (2) identifying mathematical concepts relevant to problems, (3) solving mathematical problems, and (4) organizing learning materials. This stage already reflects the proper implementation of RME (Ariyadi Wijaya, 2012; Wibowo, 2017). In general, the step-by-step implementation of the two SD did not show any significant differences. At the problem solving stage, urban elementary school is more emphasized as opening the core of learning while rural elementary school applies it throughout learning. This difference does not indicate a problem because basically, problem solving can be applied from start to finish (Mulyati, 2017). Furthermore, at the stage of identifying mathematical concepts that are relevant to the problem, the application in these two elementary schools in general is to direct students to connect problems with concepts that need to be applied and make use of concrete objects around the learning environment. This stage is very important, especially in translating real world problems into more formal mathematics (Ariyadi Wijaya, 2012).

Furthermore, in the application of solving math problems, each school will definitely present a math problem at every meeting. This means absolutely that in these two elementary schools there must be mathematical problem solving activities. The last stage is organizing the learning material, meaning that the material being taught is organized so that it is sequential and multilevel. Materials are sorted from the most basic and easy to the more difficult. The organizing strategy applied in these two schools is in accordance with the elaboration theory in which a single unit of spatial material is discussed and detailed at each meeting (Hermansyah & Aras, 2019). This method is effective in helping students understand the next material using the material that has been studied before (Hikmah, 2017). Both schools have packaged the material well where at the beginning of learning students are introduced to various types of spatial structures and in the last meeting students have understood the concept of combined spatial structures. This means that this stage has been carried out properly with indications of the material and various kinds of activities needed that have been able to optimize the achievement of learning objectives (Arifandi, 2020)

3.2.4 Learning Element

The last aspect of implementing the RME model is the learning element. As with the implementation stage, the learning elements in these two schools are more or less the same which

includes (1) learning media, (2) learning materials, (3) learning atmosphere, (4) teaching materials, and (5) tools and materials learning. These elements are fulfilled in both schools in both urban and rural areas. From all aspects of implementing the RME model, elements are the aspects that show the most striking differences between the two schools.

One comparison of the elements of implementing RME in this study is that urban elementary school has enough ready-to-use media provided by the school and is also often used by teachers. Meanwhile, rural elementary school relies more on objects and phenomena that are around or simply created by oneself. Almost every teacher meeting at these two elementary schools involved media to support the mathematics learning process. This difference in learning media has been researched by shows that media based on the natural environment produces better learning achievement because students focus on real objects and are close to their lives. Such objects do not take long for students to understand. Meanwhile, the use of media as a kind of audio-visual requires the ability to translate informal to formal knowledge that is higher. But the comparison of these achievements is not far adrift and can still run in balance. Alfahmi (2019) also found that environment-based media can develop students' mathematics learning potential and creativity well. This is one of the keys that proves that the RME model can still be applied in urban and rural schools without having to be equipped with modern facilities.

Furthermore, for the elements of learning material, the teachers have adjusted the overall range of material that must be learned by students with the meeting allocation for each school. The learning atmosphere, in general, is observed to be conducive so that it is suitable to support learning in the classroom. The class atmosphere is comfortable, the relationship between fellow students and students with teachers is also good. Furthermore, the teaching materials in these two schools are also the same, namely worksheets and textbooks. And the last element is learning tools and materials, both schools use a variety of learning tools and materials. These learning tools and materials are adapted to learning materials and activities. The difference is that rural elementary school seems simpler and adjusts to the availability of the learning environment.

The most striking difference between the two schools is that schools in urban areas have more modern elements of RME implementation, while rural schools, in this case rural elementary school, make more use of environment-based elements. And the result is that the use of the surrounding environment is not an obstacle for rural elementary school in implementing the RME model. In line with research by (Alfahmi, 2019) which proves that mathematics learning achievement can be increased by utilizing the environment. The use of video media showed better learning outcomes than environment-based media. Different results are proven by (Desriana et al., 2018) that the use of nature-based media with internet media has no significant difference in improving student learning outcomes. Thus, these results indicate that modern and environment-based elements of media and other teaching materials have the potential to contribute to the application of the RME model in mathematics learning. These results also strengthen the evidence that the RME model does not require special needs, especially modern supporting facilities which only exist in urban areas. The teacher's role in managing learning and utilizing existing facilities is the key to the success and application of this learning model in both urban and rural schools.

4. CONCLUSION

The application of the RME model at urban elementary schools and rural elementary schools applies almost the same overall aspects. The main distinction between rural and urban elementary schools is that the former promotes the idea of linking informal knowledge to formal mathematical knowledge, while the latter places an emphasis on guided exploration. Both of these SD include features that are similar to RME implementation. In the same way, there are identical four-stage implementation processes at both primary schools. The most noticeable variation is in the last component, the application element. Modern, ready-to-use media, tools, and other instructional materials are extensively used in urban elementary schools. At the same time, elementary schools in rural areas use

media and other resources that focus on the environment. The two primary schools had comparable maths learning outcomes. This opens the door for the RME model to be used in schools in both urban and rural areas. Researchers have suggested that, going forward, it would be beneficial to compare the rme learning model in elementary schools across districts or provinces, ideally with a greater range of subjects.

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