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Didactic Assessment in Realistic Mathematics Education

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A B S T R A C T

An essential component of learning is assessment. To make decisions about any component of learning, assessment is required. Assessment is used, for instance, to evaluate the effectiveness of a learning process and to ascertain whether target learners are eligible to move on to the next educational level. Assessments are frequently used for diagnostic purposes, or to identify the learning challenges that pupils are facing. A diagnostic assessment can be used to guide particular actions that will enhance learning results. Assessment is also used by teachers to assess the prepared learning design and determine how successful the design is. How to evaluate student learning outcomes is a common query about realistic mathematics education (RME). Does RME evaluation vary from other forms of assessment? Maybe people just view evaluation as the last phase of a learning process that takes place at the end of a specific amount of time and determines how well pupils have understood the material in mathematics. People perceive RME differently from learning methodologies that have been used in schools, therefore this question makes a lot of sense. RME necessitates distinct ways of assessment because of three things: philosophy, principles, and characteristics. According to RME philosophy, mathematics is a human activity. Three guiding ideas of RME are self-model development, didactic phenomena, and re-invention. The assessment ought to be in line with this principle as well. The five aspects of RME—the utilization of context, models, student contributions, interactivity, and intertwine—must also be discussed during the evaluation. In this essay, I will go into further detail on RME assessment, including its features, some problem instances, student work analysis, and scoring.

Keywords: *Assessment, Mathematics Learning, Elementary Education RME*

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INTRODUCTION

Assessment is the process of collecting information and data to measure a person's abilities, knowledge, skills, attitudes, and potential in a certain field. The main purpose of assessment is to assess the extent to which a person has achieved a set target or standard. Assessments can be carried out with various techniques, ranging from freelance observation, direct observation, asking questions, and conducting interviews with students. In addition, assessments can be carried out by assigning assignments and tests done by students. Teachers can also ask students to conduct self-assessments, analyze students' work, use journals, and portfolios.

Observation as an assessment technique is carried out by observing student behavior in learning activities. Teachers can get an idea of students' attitudes and mastery of mathematical concepts. This picture is necessary to encourage students to work on their strengths, strive and realize their weaknesses. Meanwhile, asking questions as a complement to observation aims to help students understand the difficulties they face in learning mathematics.

Interviews are a combination of questions and answers, which are usually conducted with students in a quiet place. A key factor in conducting an interview is to report what the teacher knows about the student, accept the student's answers without judging them, and encourage them to speak and debate. Meanwhile, information about students' level of

understanding of mathematics can be seen from the assignments they complete. Therefore, certain tasks can be sorted from simple to complex. Perhaps students are the best appraiser for their own work and feelings. If students learn to judge their work on their own, they will feel responsible for their learning. This can start with examining whether the work is right or wrong, analyzing the strategies used by other students, and seeing which way best fits their thinking.

Analyzing student work results is also one of the assessment techniques. Student work includes written assignments, projects, or student-created products that can be collected and evaluated. The important thing that can be seen from the results of students' work is what and the extent of students' understanding of mathematics.

Journaling is an important technique in assessment because it can measure verbal and written mathematical communication skills. Mathematical communication competence is an important competence. A simple way to start training students in communication skills is to ask students what they understand and don't understand, how they feel about the activity and what they have learned, and what they like about math.Through the test we can get information and instructions about the learning that has been done and what to do next. Tests are not only to determine a student's learning outcome score, but it is much more important to help students achieve optimal learning outcomes.

A portfolio is a collection of work results that have been done by students, including assignments, projects, journals, exam results, reports, teacher notes, and so on. Portfolios are a complete source of information for teachers about student achievements. In addition, portfolios have added value for students in assessing themselves. Therefore, it is very important for students to write down the date on each portfolio entry.

Discussing assessment as an integral part of learning, we recognize the term authentic assessment, which is an assessment that is carried out using various sources, and is carried out during learning activities. Authentic assessments typically examine the student's knowledge and skills at the time (actual), and the expected mastery of knowledge from learning activities. Various forms that show evidence of learning activities are collected over a period of time and in various contexts (situations).

Assessments should be done throughout the learning process to provide information to teachers, not just as an exam at the end to see how well students are performing in a given situation. Teachers use the results of the evaluation to inform their decisions about what to do during learning. In order for students to learn as much as possible, teachers must help them overcome barriers to learning. Thus, evaluations should be carried out for students (as subjects), not just for them (as objects), with the aim of helping them in their educational process.

Assessments serve as a key tool for modeling effective learning, tracking student competency improvement, and directing behaviors necessary for learning. Teachers are assisted in identifying strategies or tactics that must be applied to make learning valuable and productive for students through assessment.

METHOD

An important component of learning is assessment. To make decisions about any component of learning, an assessment is required. Assessments are used, for example, to evaluate the effectiveness of the learning process and to ensure whether the target learners are qualified to proceed to the next level of education. Assessments are often used for diagnostic purposes, or to identify learning challenges that students face. Diagnostic assessments can be used to guide specific actions that will improve learning outcomes. Assessments are also used by teachers to assess the learning design prepared and determine how successful the design is. How to evaluate student learning outcomes is a common question about realistic mathematics education (RME). Is the RME evaluation different from other forms of assessment? Perhaps one only sees evaluation as the final phase of the learning process that takes place at the end of a certain period of time and determines how well students understand

the material in mathematics. People view RME differently from the learning methodologies that have been used in schools, therefore this question makes a lot of sense. RME requires a different way of assessing because of three things: philosophy, principles, and characteristics. According to RME's philosophy, mathematics is a human activity. The three guiding ideas of RME are the development of self-models, didactic phenomena, and reinvention. The assessment must also be in line with this principle. The five aspects of RME—context utilization, models, student contribution, interactivity, and interconnectedness—should also be addressed during the evaluation. In this essay, I will go into more detail about RME assessments, including their features, some example problems, student work analysis, and assessments.

FINDINGS AND DISCUSSION

RME as a New Paradigm in Mathematical Learning Theory

Constructivism and contextual learning (CTL) are two prominent contemporary learning theories that are said to be in line with RME. Although learning theory is generally represented by constructivist and CTL methods, RME is a learning theory created specifically for mathematics. In addition, it is recognized that the idea of RME is in line with the need to improve mathematics education in Indonesia, whose main focus is on developing students' capacity to reason and improving their understanding of the subject.

In order for students to participate in the learning process in a meaningful way, RME requires that learning begins with something tangible. The teacher's sole responsibility in this process is to help students recreate mathematical ideas and concepts by acting as guides and facilitators. In RME, mathematics learning is referred to as "the art of not teaching" (De Lange, 1991). According to Gravemeijer (1994), the teacher's position must also change from a validator—who dictates whether the student's work and response is correct or not—to a guide—someone who acts as a mentor and appreciates every contribution—student.

The elements of mathematics learning using the Realistic Mathematics Education (RME) technique according to De Lange (1995) include several important things. Learning begins by asking students "real" problems, according to their experience and level of knowledge, thus allowing students to participate directly and meaningfully. The problems given must be directed in accordance with the learning objectives to be achieved. Next, students develop or create symbolic models of informally posed problems. The teaching process takes place interactively, where students explain and give reasons for their answers, understand and respond to answers from other students, agree or disagree, look for alternative solutions, and reflect on each step or learning outcome obtained.

Students in RME cannot be considered empty vessels that need to be filled with water. Instead, they view students as human beings with a collection of experiences and information gained from contact with the surrounding environment. Students also have the opportunity to learn this information on their own. In the field of mathematics education, it is recognized that students can gain knowledge and understanding of mathematics if they are given the opportunity to do so. Through practice and investigation of a variety of topics, including routine problem-solving and math, students can rebuild discoveries in the field of mathematics.

These ideas have led RME to develop the perception that students have an alternative set of concepts about mathematical ideas that influence further learning. Students acquire new knowledge by forming the knowledge itself, where this process of formation involves changes that include addition, creation, modification, refinement, rearrangement, and even rejection of previous concepts. The new knowledge built by students comes from a diverse set of experiences, and every student, regardless of race, culture, or gender, is believed to be able to understand and do math.

Active learning is recommended in the new educational paradigm. According to a Chinese proverb, "I saw, then I remembered; I heard, then I forgot; I did, then I understood." Therefore, instead of lectures, educators must be able to design and produce engaging learning

opportunities for their students. Students are expected to participate in group activities in addition to individual activities even in RMEs. We call it interactivity. Teachers must not only focus on the content specified in the curriculum, but also keep it updated with new challenges that are difficult to drive this engagement.

So, the definition of the teacher's function in the Realistic Mathematics Education (RME) approach includes the role of a learning facilitator who not only delivers material, but also builds interactive teaching. Teachers should provide opportunities for students to actively contribute to their own learning process as well as actively assist students in interpreting and understanding real problems. In addition, teachers are not fixated on the material contained in the curriculum alone, but actively connect the curriculum with the real world, both in physical and social contexts, so that learning becomes more relevant and meaningful for students.

RME Assessment Principles

Learning outcomes are determined by effective assessments. Therefore, the assessment needs to be carried out with careful consideration. There are three things to think about when preparing to take an assessment. First, how do you best get a unique contextual situation to use as assessment material? Second, how can assessment tools be created to accurately represent student learning objectives? Third, how should the results of student work be evaluated?

We can start by investigating the circumstances within the classroom, the school environment, and the surrounding social and physical context to come up with unique contextual situations. Classroom furniture that can be used to create interesting issues include tables, chairs, vases, globes, wall clocks, cabinets, as well as classroom walls, floors, and ceilings. Markets, zoos, and other congested areas can serve as additional context. Price-labeled convenience stores are a very rich environment that can serve as useful instruments for valuation.

Assessment tools should be able to provide details about student learning outcomes, regardless of the context chosen. The information, learning objectives, and abilities that students are expected to achieve should not be obscured by the situation. Conversely, the setting chosen as the evaluation instrument can provide more accurate data. For example, students can convince the teacher that they have mastered a question by responding to a question or working on a given question.

It is essential to evaluate student work, and in particular, you must be able to investigate the way children think. It is possible that the child's seemingly erratic work indicates a more sophisticated level of reasoning. The assessor in this situation needs to consider a number of possible outcomes. Although the two answers are different, they are equally valid based on supporting evidence. As a result, it is crucial to give students enough space to explain their responses. If necessary, student annotations on the paper can include valuable information for assessment.

The purpose of the assessment and its framework are reflected in the previous explanation, and the principles of assessment can be summarized as follows based on the reasons put forward by De Lange (1987). Assessments aim to improve teaching and learning standards. Instead of focusing on what students don't know, assessment techniques should be designed to allow students to demonstrate what they already know. Operational assessments are necessary to support the achievement of mathematics learning objectives. In addition, the ability to assess an evaluation objectively does not necessarily reflect the quality of the evaluation. Assessments must also be practical and easy to apply in the context of learning.

In RME, evaluation is carried out through a didactic method. This shows that assessment is an important component of regular classroom learning and is closely related to the teaching and learning process. The purpose of assessment is didactic, meaning that assessment seeks to gather convincing data about students and their learning process to make specific educational decisions. The content of the assessment is also didactic, meaning that the content of the assessment is not only limited to skills that are easy to assess, but also some competencies mentioned in the curriculum. In addition, the assessment instrument must be didactic—that

is, it must be able to cover every student. The instruments used for these purposes are subject to change based on the data required.

The main assessment tool in RME is a problem or task. There are several good problem features. In RME, 'what' is more important than 'format' or how something is asked. Then the problem should be meaningful and challenging, which encourages curiosity and creates motivation to work on it. The problem should also be informative, can be accompanied by pictures. It's not just math problems that are made in the form of narratives. Crucially, the problem in RME should use a context that the student is already familiar with. The context does not have to be real, it can also be something fictitious, the important thing is that students can imagine.

Table 1. Three Levels of Problems in RME

	**Low level** includes knowledge of objects, definitions, and leads to the use of basic skills	Mother bought a sack of rice weighing 5 kg. The price of one kg of rice is Rp11,500. How much money does he have to pay?
	Intermediate level characterized by the student's demands to be able to connect two or more concepts or procedures	Mother bought a sack of rice weighing 5 kg. If the price of one kg of rice is Rp11,500 and he pays with Rp100,000, how much change does he receive?
	High level contains demands to use a variety of different strategies in solving problems	Mother bought 5 sacks of rice, each sack contained 5 kg. If he cooks 3/4 kg of rice every day, how many days of rice will he buy be enough?

The characteristics of good problems in learning math include several important aspects. Problems should be balanced, involving low, intermediate, and high-level skills, include application as well as pure mathematics, and vary from short writing assignments to long practical problems. In addition, the problem must be meaningful and useful, easy to understand, and use a context that is familiar to students. A good problem also involves more than one answer, encourages high-level thinking, and is relevant to the student's personal knowledge and experience. The problem is open-ended, in accordance with the assessment objectives because it is able to measure various aspects of learning, as well as emphasize the process, including the development of strategies and problem-solving techniques.

There are three levels of questions in RME, namely low, medium, and high. Low-level questions include knowledge of objects, definitions, and lead to the use of basic skills, such as addition, multiplication, subtraction, and division with standard algorithms. Meanwhile, intermediate level questions are characterized by the students' demands to be able to connect two or more concepts or procedures. Questions at this level can include the following: the relationship between concepts and problem solving. In addition, questions at this level often require the use of a variety of different strategies in solving them (Figure 1).

High-level questions contain complex demands such as mathematical reasoning, communication skills, critical and creative attitudes, interpretation, reflection, generalization, and math. A key component of this level is the student's ability to construct the demands of the desired task in the question on their own. The limousin question (Figure 2) is an example of a high-level question.

Table 2. Limousin Cattle Problems

	Limousin cows weigh 600 kg

How many calves weigh the same as a Limousin cow?

Mathematics is an important subject in the modern education system. There is not a single country in the world that does not include mathematics as a compulsory subject in schools. These subjects occupy an important position in the school curriculum. Mathematics is seen as a universal science that underlies the development of science and technology. Therefore, in order for a nation to keep up with the development of science, it is necessary to provide mathematics lessons to every generation.

The rapid development of information and communication technology today cannot be separated from the development of mathematics in the fields of number theory, algebra, analysis, probability theory, and discrete mathematics. To master and create the technology of the future, a strong mastery of mathematics is needed from an early age. The goal of mathematics education is to help students become mathematically literate individuals. This means that individuals are able to understand and utilize mathematics in various life situations related to nature, society, and culture. Mathematical literacy is needed for the life of individuals now and in the future, both as citizens, as well as in the world of work or further study. Individuals who are mathematically literate understand and appreciate mathematics as a science.

Mathematical literacy is the ability of an individual to identify, understand, assess with careful consideration the role of mathematics in life, and the ability of that individual to act in accordance with the role of mathematics in life. Such understanding and action are not only necessary for the current and future needs of individuals as individuals, but also as citizens to make a constructive, caring, and reflective contribution (OECD, 2009). The term mathematical literacy emphasizes mathematical knowledge that is used functionally at different levels of situations in a diverse, reflective, and thoughtful way. Mathematical literacy cannot be reduced to knowledge of mathematical terms, facts, and procedures, or the skills to complete certain operations and use certain methods. Math literacy involves a creative combination of these elements to respond to the needs demanded by external situations.

CONCLUSIONS

Mathematics competencies follow the mathematical literacy framework as described above. These competencies include competence in mathematical thinking, mathematical argumentation, in modeling, proposing and solving problems, in representation, the use of symbols and formal language, and in communication. Successful learning must be supported by an appropriate assessment system, which provides opportunities for teachers and students to achieve learning objectives optimally. Assessments in RME provide many opportunities for children to develop. Assessment in PMR is a didactic assessment. This means that assessments are closely related to teaching and are part of the daily educational practice in the classroom. The purpose of assessment is didactic, meaning that assessment seeks to gather convincing data about students and their learning process to make specific educational decisions. The content of the assessment is also didactic, meaning that the content of the assessment is not only specialized (limited) to skills that are easy to assess, but several objectives (competencies) contained in the curriculum and in-depth. The assessment procedure is also didactic, meaning that the procedures applied are an integration of teaching and assessment and are a phase in the teaching and learning process. The assessment tool must also be didactic, meaning that it must be able to describe students completely and thoroughly, so that the tools used vary according to the information needed.

REFERENCES

de Lange, J. (1987). *Doctoral Dissertation "Mathematics, Insight and Meaning"* , Freudenthal Institute.

de Lange, J. (1994). "Curriculum change: an American-Dutch perspective" In D.F. Robitaille, D.H. Wheeler, & C. Kieran (Eds.), *Selected lectures of the 7th International Congress on Mathematics Education* , Sainte-Foy, Quebec: Le Presses De L'Universite Laval.

de Lange, J. (1995). Rating: No change without problems. In T. Romberg (ed.) *Reform in school mathematics and authentic assessment* . Albany, NY: State Univeristy of New York Press.

de Lange, J. (1996). "Using and applying mathematics in education" In A.J. Bishop, et al. (Eds.), *International Handbook of Mathematics Education* . Kluwer, 49 – 97.

de Lange (1999). *Framework for classroom assessment in mathematics* . Utrecht: Freudenthal Institute & National Center for Improving Student Learning and achievement in Mathematics and Science.

Gravemeijer, KPE (1994). "Developing a realistic mathematics education" *Doctoral Dissertation*, Freudenthal Institute.