MUST: ***Journal of Mathematics Education, Science and Technology***
Vol. 9, No. 2, Desember 2024 Hal 1-17
DOI: http://doi.org/10.30651/must.v5i1.

EFFECTIVENESS OF LEARNING TRAJECTORY BASED ON RME-ETHNOMATHEMATICS

Lely Kurnia[1], Eka Pasca Surya Bayu[2], Kurnia Rahmi Yuberta[3]
[1, 3] Universitas Islam Negeri Batusangkar, West Sumatera, Indonesia
[2] Universitas Muhammadiyah Sumatera Barat, Indonesia
lelykurnia@uinmybatusangkar.ac.id[1], ekapascha.suryabayu@gmail.com[2],
kurniarahmi.y@uinmybatusangkar.ac.id[3]

Received 20 April 2024; accepted 01 Mei 2024.

ABSTRAK

Hasil studi pendahuluan menunjukkan bahwa pada proses pembelajaran SPLDV di sekolah menengah pertama cenderung menggunakan model matematika secara langsung dan penyajian materi yang tidak berkaitan dengan pengalaman kehidupan sehari-hari sehingga menumbuhkan motivasi peserta didik terhadap matematika. Hal tersebut mendasari untuk mendesain alur belajar dalam bentuk aktivitas berdasarkan pengalaman peserta didik (experience-based activities). Penelitian ini merupakan design research dengan model Plomp. Pada tahap pertama dilakukan penelitian pendahuluan (preliminary research) yang terdiri dari dari analisis kebutuhan, analisis kurikulum, analisis konsep, analisis karakteristik dan literature review. Pada fase kedua dilakukan tahap pembuatan prototipe (prototyping phase) dengan serangkaian formative evaluation: self evaluation, expert validation, one-to-one evaluation dan small group. Uji coba dilakukan pada SMP swasta Al Islah kota Bukittinggi. Berdasarkan hasil implementasi desain pembelajaran materi SPLDV berbasis RME di kelas VIII SMP/MTs sudah efektif memberikan dampak terhadap hasil belajar. Hasil ini terlihat dari persentase ketuntasan yang diperoleh peserta didik menggunakan buku siswa dengan etnomatematika berbasis RME dimana 86,7% peserta didik dapat mengerjakan post test secara tuntas pada tahap field test. Hal ini berdasarkan acuan nilai KKM yang telah ditentukan satuan pendidikan yaitu 76.

Kata kunci: Learning Trajectory, Etnomathematics, RME.

ABSTRACT

The results of the preliminary study show that the System of Linear Equations in Two Variables learning process in junior high schools tends to use direct mathematical models and presents material that is not related to daily life experiences, thereby decreasing students' motivation towards mathematics. This is the basis for designing learning trajectory in the form of activities based on students' experiences. This research is design research with the Plomp model. In the first phase, preliminary research was carried out consisting of needs analysis, curriculum analysis,

concept analysis, characteristics analysis and literature review. In the second phase, the prototyping phase was carried out with a series of formative evaluations: self-evaluation, expert validation, one-to-one evaluation and small group. The trial was carried out at Al Islah private junior high school in Bukittinggi city. Based on the results of the implementation of RME-based etnomathematics learning design in class VIII SMP/MTs, it has effectively had an impact on learning outcomes. This result can be seen from the percentage of completeness obtained by students using student books with RME-based ethnomathematics where 86.7% of students were able to complete the post test at the field test stage.

Keywords: Learning Trajectory, Etnomathematics, RME.

INTRODUCTION

Globalization is currently unavoidable, because technology will continue to develop along with the development of science. Globalization leads people to become familiar with the many cultures of foreign countries. The presence of external cultural influences in a country can influence the fading of local cultural values in that country. Therefore, the Government issued Law number 5 of 2017 concerning the promotion of culture in order to protect, utilize and develop Indonesian culture. Normina, (2017) states that education has a very important role in growing and developing cultured humans. Education becomes an instrument of social power in society to develop a system for developing members of society that is relevant to the demands of changing times. Therefore, innovative learning is needed through a cultural approach so that it can foster a sense of love for Indonesian culture. Love for Indonesian culture can start by cultivating a feeling of love for local culture. This must be integrated in all subjects including mathematics.

The objectives of mathematics learning are explained in Minister of National Education Regulation Number 64 of 2013 (Kemendikbud, 2014), the scope of geometry has the following competencies: (1) having the ability to think critically, logically, analytically and creatively, the ability to solve problems, and the ability to communicate ideas and mathematical culture; (2) understand mathematical concepts, explain the relationship between concepts and apply concepts or algorithms, flexibly, accurately, efficiently and precisely, in solving problems; (3) use reasoning on patterns and properties, carry out mathematical manipulations in making generalizations, compiling evidence, or explaining mathematical ideas and statements; (4) develop an attitude of respect for the

usefulness of mathematics in life, namely having curiosity, attention and interest in studying mathematics, as well as a tenacious and confident attitude in solving problems in everyday life (the real world); (5) develop attitudes and behavior that are in accordance with values in mathematics and its learning.

To foster culture in students, the mathematical problems presented in learning have an ethnomathematics nuance. Ethnomathematics is an innovative learning that answers these challenges. With ethnomathematics-based learning, apart from being able to learn mathematics contextually, it can also foster a sense of love for local culture in students (Andriyani & E, 2017). Zahroh, (2020) also explained that the learning process using ethnomathematics can attract students' attention and increase their learning motivation. The ethnomathematics that will be explored in this research is Minangkabau culture, one example of which is traditional clothing.

Various mathematical concepts can be explored and found in culture so that it can make it clear that mathematics and culture are interrelated, mathematics can be born from culture, mathematics can be explored in culture so that it can be used as a concrete mathematics learning resource that is around students (Hardiarti, 2017). The material on Systems of Linear Equations in Two Variables allows questions in the form of narratives, but students don't understand them. This was revealed in research (Yusmin, 2016) concluding that students were wrong in solving problems of Systems of Linear Equations in Two Variables in the form of symbols due to: (1) not mastering the prerequisite material, (2) not being thorough enough, (3) rushing to do the questions, (4) not double check the answer. Students make mistakes in solving Systems of Linear Equations in Two Variables questions in the form of stories because: (1) reading the questions incompletely, (2) not understanding the problems in the form of narrative language.

The main focus of mathematics learning with the RME approach is how mathematics material is taught and how students learn mathematics in class. To realize this focus, it is necessary to develop a learning trajectory that will facilitate students in achieving learning goals with the help of teachers and learning resources. Initially, the learning trajectory took the form of a hypothesis about what would happen if students studied using the designed path (Hypothetical Learning

Trajectory/HLT). After the development process, HLT will become a theory about how to teach a mathematics topic (Local Institutional Theory /LIT) (Fauzan, Plomp, & Gravemeijer, 2013). Mathematics learning trajectory can support teachers in creating models of students' thinking and restructuring teachers' understanding of mathematics and reasoning (Rezky & Wijaya, 2018).

In general, research related to RME-based learning finds that the use of context can play an important role in developing students' abilities. Researchers also found that learning mathematics using the RME approach can increase students' creativity, allowing teachers and students to actively carry out learning activities and students' creativity to grow by itself. With an RME-based learning design, it can lead students to discover the concept of the material (Fauzan and Yerizon, 2013; Khusna, 2016; Revina, 2011; Yuberta, 2011; Huda, 2013; Afriansyah, 2017; Manurung, 2018; Budiyono, 2019, Eka, et al, 2022).

Ethnomathematics is a mathematics lesson that conceptually raises local cultural themes. Through the application of ethnomathematics in learning, it is hoped that students can better understand mathematics, as well as understand their culture, and it will be easier to instill these cultural values in their daily lives (Putri Reno Lenggo Geni & Isti Hidayah, 2017). Apart from that, Dosinaeng et al., (2020) in their research stated that by using ethnomathematics, mathematics learning in the classroom can become more interesting and meaningful. So, with ethnomathematics-based learning, students can learn mathematics in an interesting and meaningful way while also getting to know culture.

To facilitate students' understanding and bring students closer to the culture, we can combine RME based on the culture as a learning resource. One way that can connect the RME model with the culture is ethnomathematics. Ethnomathematics is a learning activity that connects the surrounding culture with mathematical concepts contained in that culture (Ardianingsih, Lusiyana, & Rahmatudin, 2019). Ethnomathematics learning is in line with the RME learning model which uses problems in students' real lives. Of course, by combining RME learning with ethnomathematics, the real problems presented can be packaged with the surrounding culture, so that students can simultaneously recognize and appreciate the existing culture.

RESEARCH METHOD

This research was carried out using the Plomp (2013) development model design. The resulting product is in the form of a Learning Trajectory and is implied in the form of a teacher's book and a student's book. The Gravemeijer & Cobb learning design model has the privilege of developing a learning flow, but has a weakness in product development, namely that the product produced is not validated. Apart from that, this design also does not consider implementation products, whereas in this research implementation products are needed in the form of teaching materials (teacher books and student books). These teaching materials require validity, practicality and effectiveness so that an appropriate development model is needed.

According to Plomp and Nieveen (2013: 19) the Plomp model consists of three stages, namely:

1. Preliminary research is a preparatory stage consisting of needs analysis, student analysis, curriculum analysis and concept analysis.
2. The development stage or prototyping phase, namely the process of designing and developing learning tools in stages through formative evaluation stages to evaluate and improve the prototype being developed.
3. The assessment phase is a semi-summative evaluation to test whether the final prototype or product meets the desired quality, especially the practicality and effectiveness criteria.

The stages of the Plomp model above are described by McKenney in Plomp & Nieven (2013:18) as in Figure 1 below:

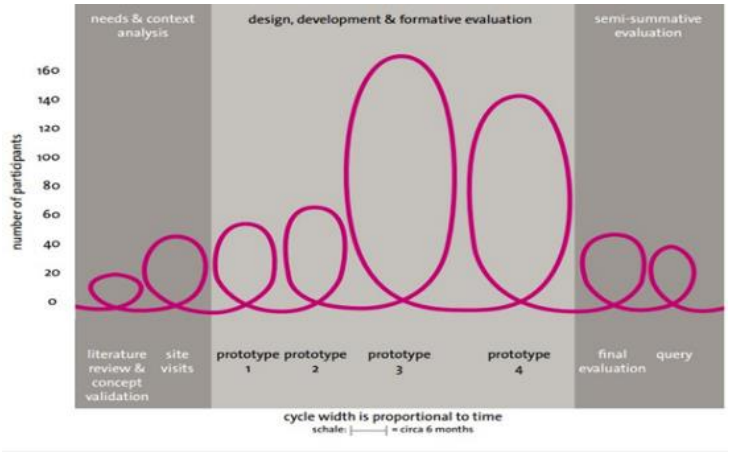

Figure 1. Development Phases Plomp and Nieveen (2013)

In this article we will discuss the third phase of development carried out, namely the effectiveness of the product being developed. The effectiveness test aims to determine the effectiveness or influence of the design. The instrument used is a student test in the form of an essay.

This effectiveness test was carried out at the field test stage. The effectiveness test for field tests carried out at the assessment stage (assessment phase) is carried out in two ways, namely by looking at the students' completeness in the test, which is said to be effective if ≥ 70% of students have achieved the minimal learning completion score and comparing the students' test results in the pretest and posttest.

RESEARCH RESULTS AND DISCUSSIONS

To see the achievements in using the product, students are given the opportunity to use student books that have been improved based on the results of the small group. Evaluation is carried out by field tests. Field tests are carried out by conducting pretests and posttests.

At this field test stage, the learning product was tested on class 8A in Al Islah Bukittinggi. At this stage, the researcher acts as an observer, facilitator and notes things that become obstacles for students. The implementation of the field test can be seen in Figure 2 below.

Figure 2. Implementation of field tests

Each student is asked to understand the context given at each meeting. Students are given the opportunity to solve and work on the problems given. Researchers observe, take notes and ask questions about parts that are difficult for

students to understand. Students provide responses about the content in the student book. The implementation of trials at the one-on-one evaluation stage will be described as follows:

Activity 1: Discover the concept of linear equations in two variables

Activity 1.1: Compile linear equations in two variables

In activity 1.1, students were given a problem in the form of determining the number of basiba clothes (traditional clothes of Minangkabau) needed in an allegorical parade which was attended by 24 students with each row consisting of 3 people with the same colored clothes not allowed to be close together. Testing for activity 1.1 went smoothly. For students' overall answers, they are based on their ability to directly solve the problem.

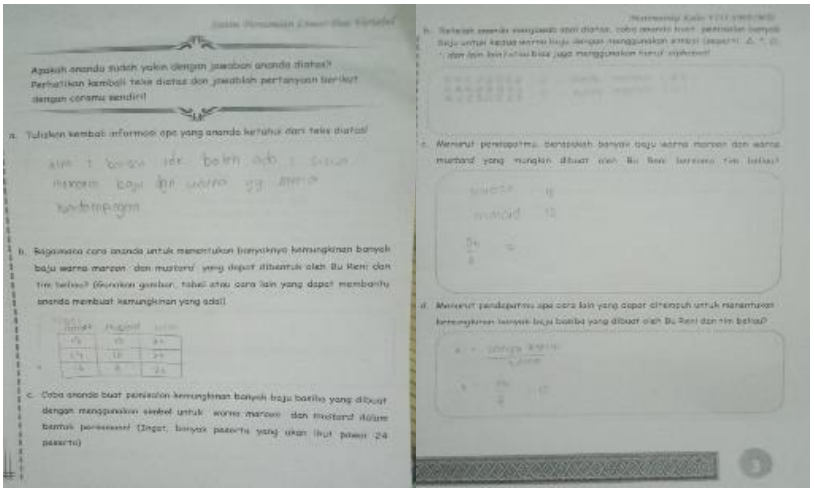

Figure 3. Student answers to Activity 1.1

Activity 1.2: Solving linear equations in two variables problems

In activity 1.2, students are given the problem to detemine the number of plain and embroidered basiba shirts that will be rented to customers. Students are able to describe every important thing in the problem and create it in symbols. Students then immediately try to find a solution by first constructing a mathematical model and trying out the right value according to the problem. Student’s answers to activity 1.2 is in figure 4.

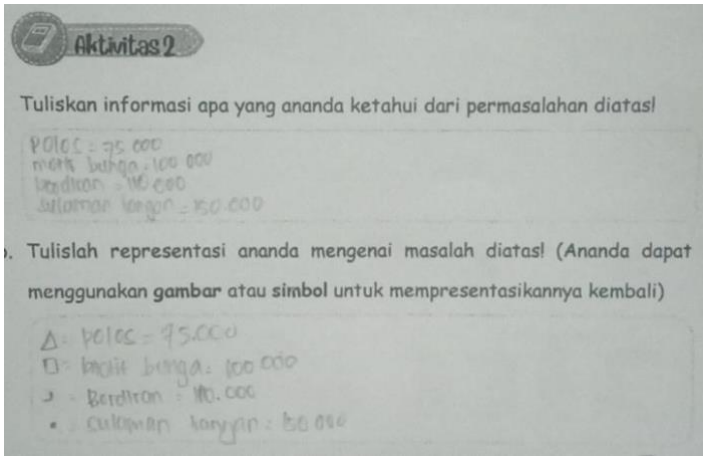

Figure 4. Student answers to Activity 1.2

Activity 2: Solve problems related to System of linear equations in two variables using graphic methods

Activity 2.1: Determine the System of linear equations in two variables solution using a graphic method using problems in the form of the price of 'Batabua clothes' in children's sizes and adult sizes

Students are given problems about prices of 'batabua clothes' for children's sizes and adult sizes. Students are given the problem to calculate the rental price for 'batabua clothes that will be used to celebrate Independence Day. In activity 2.1, students with high, moderate and low abilities were able to solve problems well. This can be seen from the students' solutions whose answers are almost uniform. Student's answers to activity 2.1 is in figure 5.

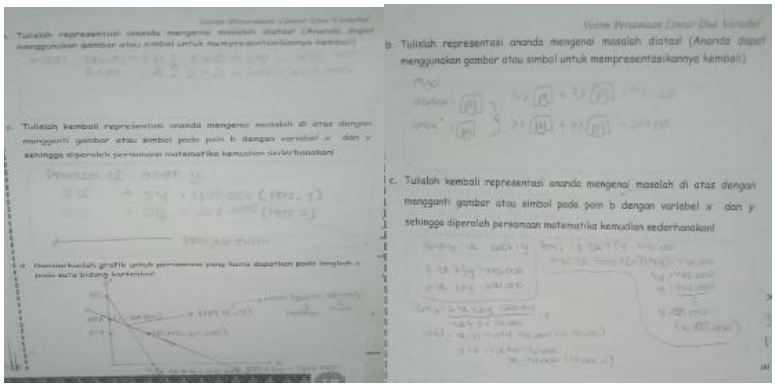

Figure 5. Student answers to Activity 2.1

Activity 2.2: Solve a system of linear equations in two variables using a graphical method using the problem of the time needed to make Kapalo Samek embroidery.

Students with high and moderate abilities can solve problems by first determining a mathematical model. In the representation section with pictures and symbols, students have directly used variables. students already understood the concept based on previous meetings. Meanwhile, low ability students still use symbols or pictures first. Figure 6 is one of the answers to activity 2.2.

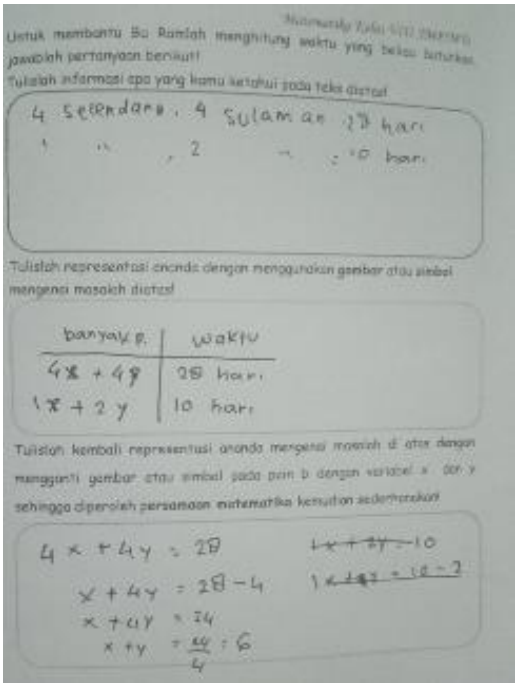

Figure 6. Student answers to Activity 2.2

Activitity 3: Solving systems of linear equations in two variables using the substitution method

Activity 3.1: In this activity, students are given the problem of determining the results of a system of linear equations in two variables using the method previously studied. Students are able to solve problems well.

Activity 3.2: solving system of linear equations in two variables using the substitution method through pricing activities for ‘tingkuluak tanduak’ and ‘tingkuluak balapak’. In general, the answers of students with high, moderate and low abilities can solve problems with substitution. Figure 7 is one of the answers to activity 3.2

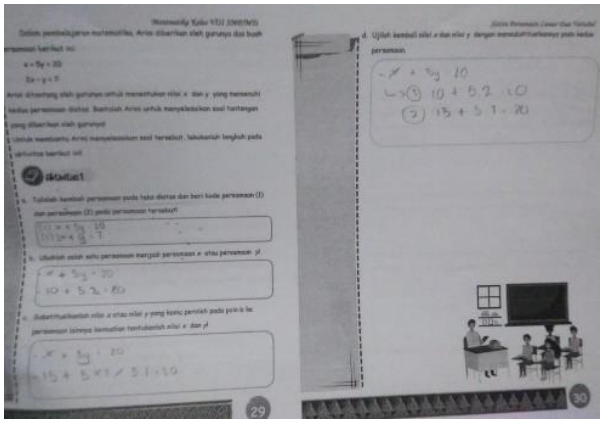

Figure 7. Student answers to Activity 3.2

Activity 4: Solve system of linear equations in two variables using the elimination method

Activity 4.1: Completing the system of linear equations in two variables using the elimination method through the activity of determining the price of sarawa galembong and dance clothes.

Students are given the problem of calculating the price of 'Sarawa galembong' and dance clothes that will be used at the 'Alek Nagari' event. In activity 4.1, each student can solve the problem well. Every student can find a solution to the problem given well using the elimination method. The use of other methods by combining elimination and substitution can also be done even though there are some students who experience errors in arithmetic operations. After being guided, the questions were finally answered correctly. Figure 8 is one of the answers to activity 4.1.

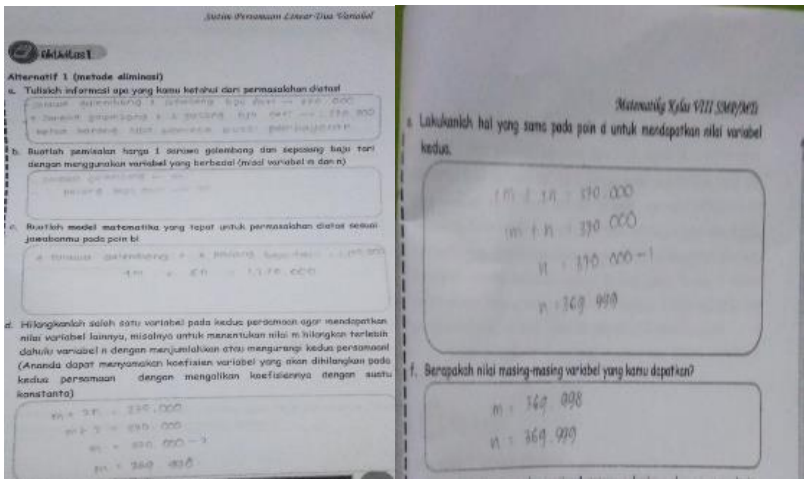

Figure 7. Student answers to Activity 4.1

Activity 4.2: Completing system of linear equations in two variables using the elimination method through the activity of determining the size of 'Batik Tanah' cloth. Students are given the problem of determining the size of batik tanah. In activity 4.2, each group can solve the problem well using the elimination method. Students start by eliminating one of the variables, the results obtained are then substituted into the previously formed equation to obtain the value of the other variable.

Effectiveness is carried out by looking at the differences of pre-test and post-test. After testing the t test prerequisites, data analysis was carried out using paired sample t-test. t value was 9.028 with a P-value (0.000) < 0.05, so it can be concluded that there is a difference in the average student scores on the pret test and posttest at a significance level of 5%.

The final test results based on the field test evaluation can be seen in Table 1.

Table 1 pretest and posttest

	Pretest		posttest	
	complete (≥76)	incomplete (<76)	complete (≥76)	incomplete (<76)
Number of students	8	22	26	4
Percentage (%)	26,7	73,3	86,7	13,3

From table, it can be seen that from the posttest results it is known that 26 students or 86.7% completed and 13.3% or 4 students did not complete.

The learning trajectory developed is a learning tarjectory for systems of linear equations in two variables. The resulting learning tarjectory has a learning sequence that begins with the concept of two-variable linear equations and two-variable linear equation systems, solving systems of two-variable linear equations using graphic methods, substitution and elimination methods. Several learning activities are placed in a concrete context and have been encountered by students related to ethnomathematics in the form of renting or purchasing 'Basiba' clothes, 'Tingkuluak Balapak, Kapalo Samek embroidery, 'Batik tanah', and others. The implementation of learning is aimed at improving the learning carried out by teachers towards students. Starting from the prototype design stage, learning

trajectories have been developed that are adapted to the level of development of students. Bring out the right characteristics and analyze their needs. so that the product being developed can meet the quality of a good product.

Based on the characteristics of the RME approach, it is known that there are several parts that must be considered in design development. The first characteristic is contextual, where the learning carried out must be easy understand for students and should even be in accordance with their life experiences. Based on the development and stages carried out, one example of the basiba shirt was obtained. In the students' minds, this clothing form was clearly understood because it had become mandatory clothing in the city of Bukittinggi, so that the concrete form in question could be clearly depicted. In the end, students can understand well without any significant difficulties. When related to students' understanding, it is still found that the introduction stage needs to be emphasized in a clear form so that it does not become the start of errors in understanding.

The second stage is modeling. Through a mature understanding of contextual matters, it is easier for students to translate the problems they face into mathematical language, such as symbols and others. This can be seen from the results made by students in solving the problems given, both in the student books and in the tests given. These findings emphasize that a mature introduction that students can accept as something new based on previous schemata will influence the next stage of thinking.

The third characteristic is the contribution of students. Learning carried out through the RME approach means that students must be able and brave to convey what is in their thoughts. The development of thinking skills through learning trajectory has of course entered the analysis stage where students try to develop the basic knowledge they have to try to find solutions to existing problems. Every student has their own thoughts and this is a valuable thing for teachers that needs to be nurtured and developed more deeply. So that in learning the teacher tries to respect the various opinions of students regardless of whether they are right or wrong while providing guidance.

The fourth characteristic is interactivity. Students in learning are stimulated to be able to actively participate in various activities developed by the teacher.

Starting from asking for a strengthening explanation, justification or approval for the ideas or thoughts conveyed, asking questions or reflections. This is a progress in mastering formal mathematics towards informal mathematics.

The final characteristic in the RME approach is intertwinement. Mature concepts that have been built through the previous stages and characteristics will help students develop and expand the application of the material studied regarding its use in various fields of science. For example, learning about the application of system of linear equations in two variables will provide a life context that its use exists and is encountered every day, for example in renting or buying clothes or embroidery.

The learning trajectory developed is based on HLT which has been tested for validity. The research results show that this learning trajectory meets the valid criteria. Based on the results of the validity test, it was found that the prototype complies with the validity criteria, although there are several parts that need to be improved. Things that need to be improved relate to a number of designed activities, conjecture of student's thinking processes, and anticipated answers to the HLT. For this reason, revisions are carried out, by looking again at the activities that will be created during the learning process. Apart from supporting the RME approach in highlighting its characteristics, this activity is also useful in strengthening the level of thinking that students will go through in system of linear equations in two variables.

In its implementation, this activity is able to help students master the material because they can directly manipulate real objects and express them in abstract form. Indirectly, a lot of knowledge is constructed through this activity. In learning that prioritizes RME as the basic foundation, each student is free to use their own strategy (utilizing the results of student contributions) in solving problems in each student handbook. In this research, it is very clear how each student has their own strategy/view that is different from the opinions of their friends, both in small groups and in class discussions. The development of system of linear equations in two variables learning design with RME-based ethnomathematics which is implemented in teacher books and student books has been effective.

The effectiveness of the teacher handbook and student handbook has also been achieved from the success of the students in completing the final test questions. At the field test stage, the average percentage of results was in the very good category, with 86.7% of students completing the final test. Because the product developed has reached the criteria of being valid, practical and effective, the development of system of linear equations in two variables learning design using Realistic Mathematics Education (RME) based ethnomathematics which has been implemented in teacher books and student books can be said to be successful.

CONCLUSIONS

Based on the results of the research, it can be concluded that the characteristics of the resulting learning tools have been adapted to the RME principles, namely guided reinvention, didactical phenomenology and self-development models (formation of models by students themselves). To make it easier for students to understand system of linear equations in two variables, researchers provide problems in the form of cultural contexts in life that are appropriate to the stages of experience they have had. To emphasize the real picture, pictures are added to describe the real form to students. Other characteristics include providing illustrations/pictures in teacher books and student books which can make it easier for students to understand the problems presented. The introduction to culture is also given a special explanation so that students can understand the use of the terms used.

Research results show 86.7% of students were able to complete the posttest at the field test stage. This condition shows that the development carried out has met effectiveness.

ACKNOWLEDGEMENTS

We would like to express our gratitude to the reviewers and the extended family of UIN Muhammad Yunus Batusangkar who provided the opportunity to participate in this research. Thank you for the financial support and regular evaluations so that we can produce useful research. \

REFFERENCES

Normina. (2017). Pendidikan dalam kebudayaan. *Ittihad Jurnal Kopertais Wilayah*

XI Kalimantan.

Andriyani, & E, K. (2017). Etnomatematika : Model Baru dalam Pembelajaran. *Jurnal Gantang*.

Zahroh, U. (2020). Pembelajaran Berbasis Etnomatematika dengan Memodelkan Motif Batik Gajah Mada. *Dinamika Penelitian: Media Komunikasi Penelitian Sosial Keagamaan*. https://doi.org/10.21274/dinamika.2020.20.1.1-17

Clements, D. H. (2003). Teaching and learning geometry. *A research companion to principles and standards for school mathematics*, 151-178.

Brodie, K. (2009). *Teaching mathematical reasoning in secondary school classrooms* (Vol. 775). Springer Science & Business Media.

NCTM. 2000. Principles and standards for school mathematics. Reston, VA: National Council of Teachers of Mathematics.

Harefa, A. O. (2013). Penerapan teori pembelajaran Ausebel dalam pembelajaran. *Jurnal Ilmiah IKIP Gunungsitoli*, *36*(36), 168547.

Sundawan, M. D. (2016). Perbedaan model pembelajaran konstruktivisme dan model pembelajaran langsung. *LOGIKA Jurnal Ilmiah Lemlit Unswagati Cirebon*, *16*(1).

Fauzan, A. (2002). *Applying realistic mathematics education in teaching geometry in Indonesian primary schools*. Doctoral dissertation. Enschede : University of Twente.

Risma, D. A., Putri, R. I. I., & Hartono, Y. (2013). On Developing Students' Spatial Visualisation Ability. *International Education Studies*, *6*(9), 1-12.

Soedjadi, R. (2020). Inti Dasar–Dasar Pendidikan Matematika Realistik Indonesia. *Jurnal Pendidikan Matematika Sriwijaya*, *1*(2), 121913.

Ningsih, S. (2014). *Realistic Mathematics Education*: model alternatif pembelajaran matematika sekolah. *Jurnal Pendidikan Matematika*, *1*(2), 73-94.

Fauzan, A., Plomp, T., & Gravemeijer, K. (2013). The development of an rme-based geometrycourse for Indonesian primary schools. *Educational design research–Part B: Illustrative cases*, 159-178.

Armanto, D. (2002). *Teaching multiplication and division realistically in Indonesian primary schools: A prototype of local instructional theory* (p. 309). University of Twente [Host].

Rezky, R., & Wijaya, A. (2018, September). *Designing hypothetical learning trajectory based on van hiele theory: a case of geometry*. In *Journal of Physics: Conference Series* (Vol. 1097, No. 1, p. 012129). IOP Publishing.

Revina, S. (2011). Design research on mathematics education: Spatial visualization supporting students' spatial structuring in learning volume measurement. *Unpublished Thesis. UniversitasSriwijaya*.

Manurung, M. M., Windria, H., & Arifin, S. (2018). Desain pembelajaran materi himpunan dengan pendekatan realistic mathematics education (RME) untuk kelas VII. *Jurnal Derivat: Jurnal Matematika Dan Pendidikan Matematika*, *5*(1), 19-29.

Khusna, A. H., Yuwono, I., & Muksar, M. (2016). Pengembangan Lembar Kerja Siswa (Lks)Berkarakteristik Rme Materi Barisan dan Deret untuk Kelas X. *Jurnal Pendidikan: Teori,Penelitian, dan Pengembangan*, *1*(4), 739-745.

Huda, M. A. (2013). Pembelajaran Kubus dan Balok dengan Pendekatan RME untuk Menumbuhkan Kreativitas Siswa MTs. *Jurnal Pendidikan Sains, 1*(4), 390-396.

Fauzan, A., & Yerizon, Y. (2013). Pengaruh Pendekatan RME dan Kemandirian Belajar Terhadap Kemamampuan Matematis Siswa. *Prosiding SEMIRATA 2013, 1*(1).

Afriansyah, E. A. (2017). Desain Lintasan Pembelajaran Pecahan melalui Pendekatan Realistic Mathematics Education. *Mosharafa: Jurnal Pendidikan Matematika*, *6*(3), 463-474.

Abdullah, D. I., Mastur, Z., & Sutarto, H. (2015). Keefektifan Model Pembelajaran Problem Based Learning Bernuansa Etnomatematika Terhadap Kemampuan Pemecahan Masalah Siswa Kelas VIII. *Unnes Journal of Mathematics Education Research*, *4*(3).

Dine Van, D. W. (2014). *Development and Evaluation of a Revised Developmental Progression of a Learning Trajectory for Volume Measurement in the Early Years* (Doctoral dissertation, Faculty of the Graduate School of The University at Buffalo, State University of New York).

Dahlan, J. A. (2011). Analisis Kurikulum Matematika. Jakarta: Universitas Terbuka

D'Ambrosio, U. (2020). In My Opinion: What Is Ethnomathematics, and How Can It Help Children in Schools? *Teaching Children Mathematics*. https://doi.org/10.5951/tcm.7.6.0308

Rahmawati Z, Y. R., & Muchlian, M. (2019). Eksplorasi etnomatematika rumah gadang Minangkabau Sumatera Barat. *Jurnal Analisa*. https://doi.org/10.15575/ja.v5i2.5942

Dosinaeng, W. B. N., Lakapu, M., Jagom, Y. O., Uskono, I. V., Leton, S. I., & Djong, K. D. (2020). Etnomatematika untuk Siswa Sekolah Menengah: Eksplorasi Konsep-konsep Geometri pada Budaya Suku Boti. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*. https://doi.org/10.24127/ajpm.v9i3.2900

Yani, R., & Desriyeni. (2019). Paket Informasi Arsitektur Rumah gadang Tiga Kabupaten di Sumatera Barat. *Jurnal Ilmu Informasi Perpustakaan Dan Kearsipan*, *8*(1)

Gravemeijer, K. (1994). *Developing Realistic Mathematics Education*. Ultrecht: Freudenthal Institute.

----------2004. "Local Instruction Theories as Means of Support for Teachers in Reform Mathematics Education". Jurnal Lawrence Elbaum Associates. Page 105-128.

Gravemeijer, K., & Van Eerde, D. 2009. Design Reseach as a Means for Building Knowledge Base for Teaching in Mathematics Education. The elementary School Journal, Volume 109 Number 5.

Gravemeijer, Koeno. 2013. Design Research from the Learning Design Prespective. In T.Plomp & N. Nieveen (Eds.), Educational Design Research-Part A: Introduction. Enschede, the Netherlands: SLO.

Nieveen, Nienke. 1999. Design Approaches and Tools in Education and Training. Netherlands: Kluwer Academic Publishers.

Ploom, T dan Nieveen, N.2013. Educational Design Research Part B: Illustrative Cases. Netherlands Institute for Curriculum Development: SLO.

Freudenthal, H. (1991) Revisiting Mathematics Education: China Lectures (Dordrecht, The Netherlands: Kluwer). Freudenthal, H. (2002). *Didactical Phenomenology of MathematicalStructures*. New York, Boston, Dordrecht, London, Moscow: Kluwer AcademicPublisher.

Kemendikbud. 2016. Permendikbud No 22 Tahun 2016 Tentang Standar Proses Pendidikan Dasar dan Menengah.Jakarta: Kementerian Pendidikan dan Kebudayaan Republik Indonesia.

Tessmer, M. (1993). *Planning and conducting formative evaluations: Improving the quality of education and training*. Psychology Press.

Yusmin, E. (2016). Matematika (Rangkuman Dengan Pendekatan Meta-. Jurnal Visi Ilmu Pendidikan, 2119–2136.

Hardiarti, S. (2017). Etnomatematika : Aplikasi Bangun Datar. Aksioma, 8(2), 99–110. https://doi.org/10.26877/aks.v8i2.1707

Sukardi, M. (2012). *Evaluasi Pendidikan: Prinsip dan Operasionalnya*. Bumi Aksara.

Rochmad. (2012). Desain Model Pengembangan Perangkat Pembelajaran Matematika. *JURNAL KREANO*, *3*(1).

Purwanto, dkk. 2007. Pengembangan Modul. Pusat Teknologi dan Informasi Kominukasi, depdiknas. Jakarta.