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Designing Learning Trajectory of Curved 3D Shapes using RME with The Context of Sesaji Rewanda Semarang

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ABSTRACT

Curved 3D shapes are one of the essential materials in geometry, but students have difficulty learning the material. Thus, this study aimed to describe a learning trajectory to aid students in comprehending curved 3D shapes in the context of the Sesaji Rewanda tradition. The method used is design research with the RME learning approach as developed by McKenney and Akker. The subject in this research is the 9th grade of SMP Negeri 6 Semarang. The resulting learning trajectory comprised 5 sets of activities, namely: (1) identifying the types and characteristics of curved 3D shapes, (2) determining the beginning of the formulas for cylinder surface area and volume, (3) determining the beginning of the formulas for cone surface area and volume, (4) determining the beginning of the formulas for sphere surface area and volume, and (5) resolve contextual problems associated to curved shapes. The 5 activities produced in this study are hopefully to encourage students to learn and become an inspiration for teachers in implementing learning.
Keywords: *Curved 3D shapes, HLT, Sesaji Rewanda, Design Research, RME*

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INTRODUCTION

Geometry is a branch of mathematics that is the study of planes and 3D shapes that are often encountered in resolving real-life problems (Khoiri, 2014; Kurniasih, 2017). Geometry is an important subject in mathematics because the concept of geometry is intimately relevant to the context of everyday life (Rofii, Sunardi, & Irvan, 2018). In addition to being used in understanding the surrounding environment, geometry is also important in supporting the mastery of algebraic concepts, numbers, arithmetic further mathematical concepts (Tha National Mathematics Advisory Panel, 2008).

One of the branches of geometry that is considered quite difficult for students is the curved 3D shapes (Özerem, 2012). Students have difficulty in solving problems related to Curved 3D shapes material because they cannot understand the concept. Students' failure to understand mathematical concepts correctly, relate one concept to another, and are unable to apply previously learned concepts causes students to have difficulty solving the problems given (Farnika, Ikhsan, & Sofyan, 2015; Mulyani, Indah, & Satria, 2018; Yani, Maimunah, Roza, Murni, & Daim, 2019). In line with this, Rosyida, Riyadi, & Mardiyana (2016) stated that Student errors in understanding the material occur during the process of comprehending the problem, strategizing, applying the strategy, or re-examining the results of the work.

The difficulty faced by students in learning the material is induced by several factors such as learning that is done informatively (Nurainah, Maryanasari, & Nurfauziah, 2018). Geometry learning that requires a lot of imagination and the ability to analyze a problem makes students understand the material optimally (Afdila & Roza, 2018). In a lesson, a medium is needed that can visualize the material to make it facilitate students understand the 3D curved shape (Muna, Nizaruddin, & Murtianto, 2017). The visualization process will be formed through a context that can play a major role in the learning aspect (Fauzi & Arisetyawan, 2020). There are aspects of the major role, namely concept formation, model formation, and application (Febrian, Astuti, & Antika, 2019).

The RME approach solves students' difficulties in learning Curved 3D shapes because it provides usefulness in the context (Mariyana, Rosady, & Latifah, 2018). The RME is a lessons approach that focuses on student study activities and is based on contextual matters, namely connecting students from the contextual phase to mathematical problems (Sari, 2017). RME is a lesson theory that relates human activities with existing reality (Fadlila & Sagala, 2021). The findings of research carried out by Nursyahidah et al., (2023) state that the characteristics of RME are presented well in a medium, these characteristics include the use of context or using a context that is familiar to the students' environment so that it can bridge students' understanding of learning the content presented. One context that can be used is local wisdom. The use of RME context provides meaningful, fun learning and can develop students' concepts in understanding the material (Nursyahidah, Ilma, & Putri, 2014).

Some local wisdom that has been used in the implementation of RME include historical building traditions or customs (Fahrurozi, Maesaroh, Suwanto, & Nursyahidah, 2018), formal forms of mathematics (Puspasari, Zulkardi, & Somakim, 2015), social (Nursyahidah, Saputro, Albab, & Aisyah, 2020), and traditional food (Nursyahidah & Albab, 2021). In this research, the context used is the Rewanda Sesaji tradition, which is a typical tradition of the residents of Gunungpati, Semarang City. The series of traditional shapes in Rewanda Sesaji can represent Curved 3D shapes geometric materials that have never been used before in mathematics learning design, namely teak wood replicas represented as cylinders, *gunungan sego kethek* as cones, and *gunungan* fruits as spheres In addition, the utilization of this traditional context is also expected to give an occasion for students to recognize and expand local wisdom in Semarang.

Based on the background that has been explained, this research intends to design a learning trajectory of curved 3D shapes material using the context of the Rewanda Sesaji tradition to facilitate students in understanding concepts and creating more meaningful learning.

METHOD

This research used a design research method by developing a Hypothetical Learning Trajectory and cooperation between researchers and teachers. The research stages used in this design research study refer to the stages proposed by McKenney, which consist of 3 steps, namely: 1) preparing for the experiment, 2) design experiment, and 3) retrospective analysis. The subjects in this research were students in 9th grade of SMP N 6 Semarang.

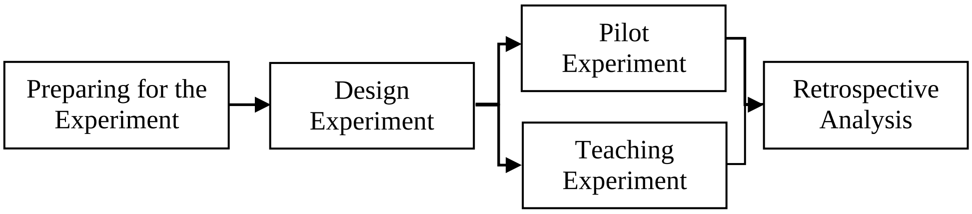


Figure 1. Stages of design research

RESULTS AND DISCUSSION

Results

Preparing for the Experiment

The first step of the design research method is preparing for the experiment, where the researcher makes preparations before the research, such as doing a literature review, checking students' skills, and preparing a Hypothetical Learning Trajectory. Understanding the concept of curved 3D shapes through the context of Sesaji Rewanda can assist students in understanding the material. The development of HLT in each lesson activity becomes an important passage of devising the next learning activity. There are 5 learning trajectories, namely: (1) identifying the types and characteristics of Curved 3D shapes, (2) determining the beginning of the formulas for cylinder surface area and volume, (3) determining the beginning of the formulas for cone surface area and volume, (4) determining the beginning of the formulas for sphere surface area and volume, and (5) resolve contextual problems associated to curved 3D shapes. The learning trajectory with 5 indicators aims to improve students' ability to learn the material and create meaningful learning.

Design Experiment

After the researcher has done all the preparations, the next step is the design experiment. This step consists of 5 activities carried out, namely:

Activity 1: Identify types and characteristics of curved 3D shapes

Activity 1 begins with the showing of an animated context video of the Sesaji Rewanda traditional tradition to identify the cylinder spaces contained in the tradition.

Figure 2. Students observe the animated video of *Sesaji Rewanda*

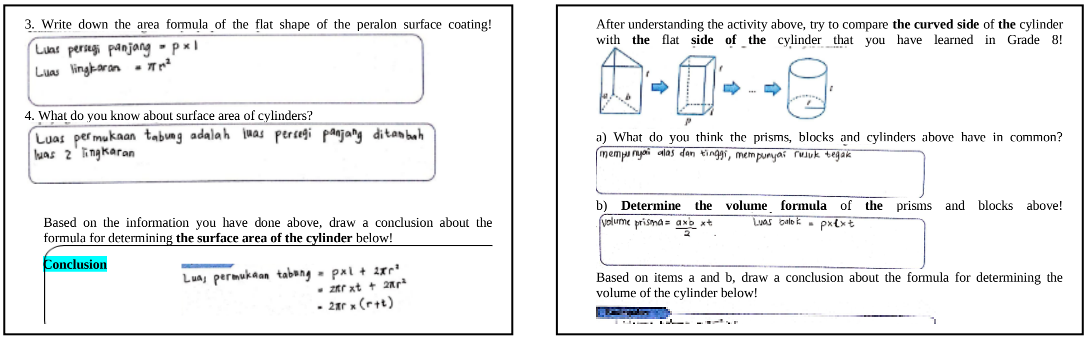
Students are asked to observe illustrations in the context of the Rewanda Offerings in the animated video to find various kinds of curved side shapes. After watching the video the teacher directs students to work on the activity sheet that has been given. Students are asked to sketch a series of Rewanda Offering activities starting from the performance of the Wanara dance by dancers to the procession carried out by residents bringing mountains of sego kethek, mountains of fruit and vegetable offerings to Goa Kreo which shows the connection between the shapes of the curved sided spaces as well. Identify types and characteristics. Students are allowed to conduct group discussions to solve the problems given. From this activity, students can identify the types and characteristics of curved-sided spatial structures implemented through the *Rewanda* Offering tradition.

Activity 2: Determine the initial formulas for the surface area and volume of a cylinder

The learning objective in Activity 2 is to determine the initial cylinder surface area and volume formula. In this activity, students are presented with the context of Sesaji Rewanda during the procession of teak wood replicas. Here students and their groups search for the origin of the surface area and volume formulas of the cylinders through their project.

Figure 3. Teak Wood Replica in the Context of Rewanda Offering Tradition

Based on the teacher's direction in discovering the surface area formula of the cylinder. In finding the cylinder surface area, students make a replica of teak wood using HVS paper while in determining the formula for the volume of a cylinder, students conduct a simple experiment using styrofoam which is inserted into a cylinder made of mica. In addition to using styrofoam, the determination of the volume of the cylinder can also be found through the volume approach of pyramids and prisms. In this case, students are expected not only to know the shape of the cylinder but also to know the formula for its surface area and volume. Here the teacher directs students according to the LAS guidelines to work on group projects. After students work on the group project, students are asked to reply to the questions posed. At the end of the activity, students conclude the formula for the surface area and volume of the cylinder and work on the exercise questions given.



3. Write down the area formula of the flat shape of the peralon surface coating!

Luas persegi panjang = p × l
Luas lingkaran = πr²

4. What do you know about surface area of cylinders?

Luas permukaan tabung adalah luas persegi panjang ditambah luas 2 lingkaran

Based on the information you have done above, draw a conclusion about the formula for determining **the surface area of the cylinder** below!

Conclusion

Luas permukaan tabung = p×l + 2πr²
= 2πr×t + 2πr²
= 2πr × (r+t)

After understanding the activity above, try to compare **the curved side** of **the** cylinder with **the** flat **side of the** cylinder that you have learned in Grade 8!

a) What do you think the prisms, blocks and cylinders above have in common?

mempunyai alas dan tinggi, mempunyai rusuk tegak

b) **Determine the volume formula** of **the** prisms and blocks above!

volume prisma = (a×b)/2 ×t   Luas balok = p×l×t

Based on items a and b, draw a conclusion about the formula for determining the volume of the cylinder below!

Figure 4. Results of student answers

Activity 3: Determine the initial formula for the surface area and volume of a cone

Activity 3 presents one part of the Rewanda Sesaji tradition, namely the *gunungan sego kethek*. Students are directed to observe the *gunungan sego kethek* which is shaped like a cone.

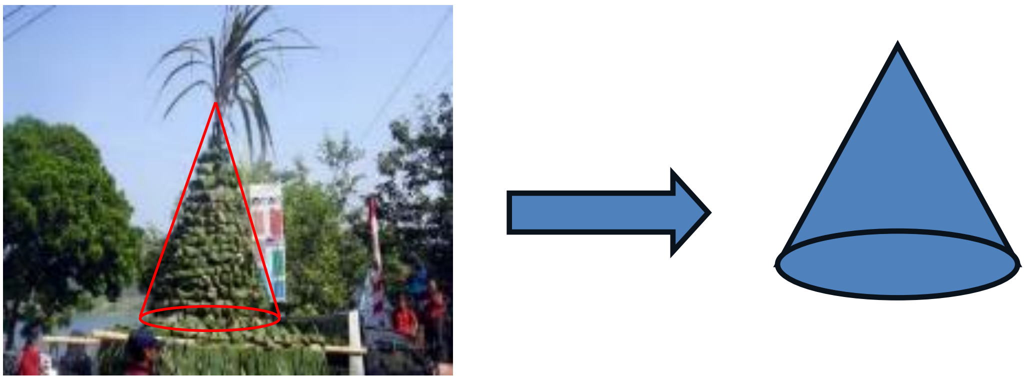
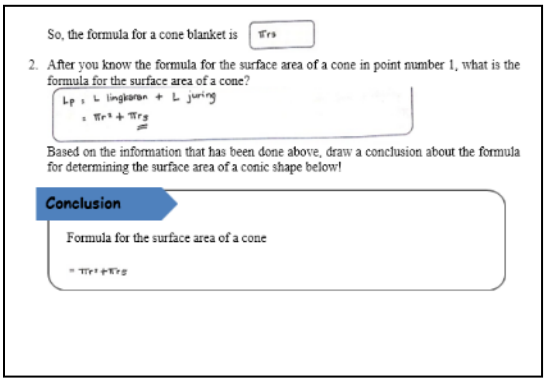


Figure 5. Replica *Gunungan Sego Kethek* in the Context of Rewanda Offering Tradition

This activity begins with students working on the activity sheet based on the teacher's direction. The activity sheet is planned to assist students in determining the formula for the surface area and volume of the cone. The initial determination of the cone surface area formula is done by making a replica of the *gunungan sego kethek*. Students with their groups made a cone-shaped replica using asturo paper. The resulting replica consists of a circle and a cone blanket in the form of a sector. From this, students were afford to find the beginning of the cone surface area formula. Then in determining the volume of the cone, students conduct a simple experiment using a cone and cylinder props made of asturo paper to find the concept of cone volume. In determining the formula of cone volume, students fill the cylinder using cones filled with rice until it is full. From this experiment, students know how many cones filled with rice can fill one cylinder. Through the experiments carried out in activity 3, students can define the formula for the surface area and volume of the cone.


So, the formula for a cone blanket is $\boxed{\pi rs}$

2. After you know the formula for the surface area of a cone in point number 1, what is the formula for the surface area of a cone?

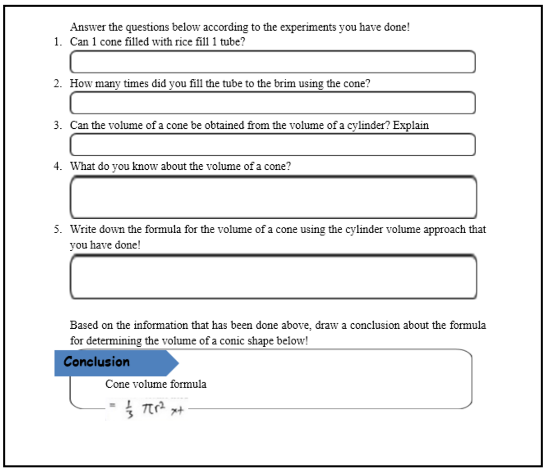
Lp = L lingkaran + L juring
= $\pi r^2 + \pi rs$

Based on the information that has been done above, draw a conclusion about the formula for determining the surface area of a conic shape below!

Conclusion

Formula for the surface area of a cone

= $\pi r^2 + \pi rs$


Answer the questions below according to the experiments you have done!

1. Can 1 cone filled with rice fill 1 tube?
2. How many times did you fill the tube to the brim using the cone?
3. Can the volume of a cone be obtained from the volume of a cylinder? Explain
4. What do you know about the volume of a cone?
5. Write down the formula for the volume of a cone using the cylinder volume approach that you have done!

Based on the information that has been done above, draw a conclusion about the formula for determining the volume of a conic shape below!

Conclusion

Cone volume formula

= $\frac{1}{3}\pi r^2 \times t$

Figure 6. Results of student answers

Reflection from activity 3 is that students still have adversity in recalling the formula for the area of the circular sector, therefore the teacher's role is required to stimulate students to review the material previously learned.

Activity 4: Determine the initial formula for the surface area and volume of a sphere

In the previous activity, the series in the Sesaji Rewanda tradition that was used was the *gunungan* replica of teak wood and *sego kethek* as a cylinder and cone. In activity 4 the context used is the gunungan of fruits. By utilizing the orange fruit on the *gunungan* as a spherical shape. By observing the illustration of oranges in the *Sesaji Rewanda* tradition, students are hopefully to be afford to determine the formula for the surface area and volume of a sphere.

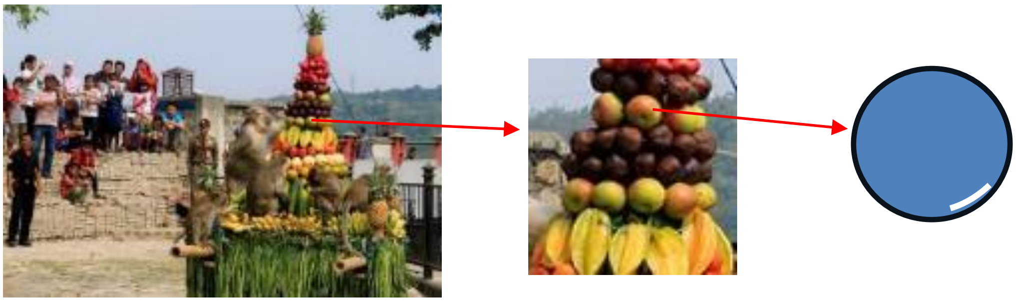
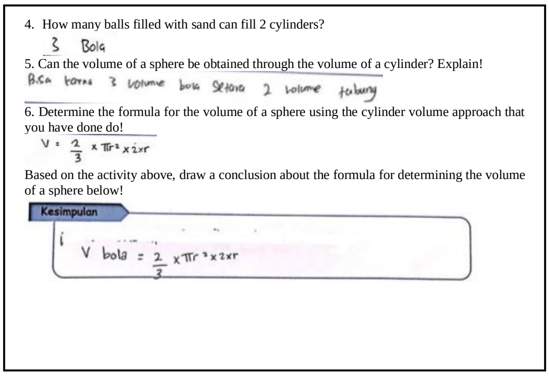


Figure 7. Replica Gunungan Buah in the Context of the *Rewanda* Offering Tradition

The teacher instructs the students to define the formulas for the surface area and volume of a sphere. Students with their groups determine the formula for the surface area of a sphere from the context provided. In this case, the researcher replaced the apples using plastic balls to facilitate the experiment process. Plastic balls are cut into small pieces and attached to a circle-shaped paper according to the diameter of the plastic ball circle. After all the pieces of plastic balls are attached to the paper, the students mention how many circles are formed from the experiment. The amount of circle area is used as a starting point in finding the surface area of the sphere. On the other hand, in determining the volume of the ball, students and their groups with the guidance of the teacher conducted a trial using 2 cylinders and a plastic ball with the height of the cylinder equal to the diameter of the ball. In this case, the volume formula of the ball is obtained through the cylinder volume approach. From the results of these trials, students were able to find the formula for surface area and volume of the sphere well.


4. How many balls filled with sand can fill 2 cylinders?

3 Bola

5. Can the volume of a sphere be obtained through the volume of a cylinder? Explain!

Bisa karna 3 volume bola setara 2 volume tabung

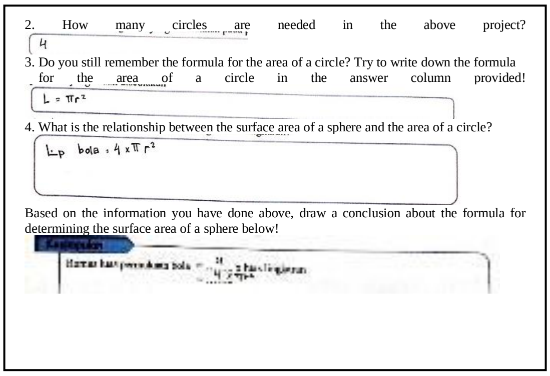
6. Determine the formula for the volume of a sphere using the cylinder volume approach that you have done do!

$V = \frac{2}{3} \times \pi r^2 \times 2 \times r$

Based on the activity above, draw a conclusion about the formula for determining the volume of a sphere below!

Kesimpulan

$V \text{ bola} = \frac{2}{3} \times \pi r^2 \times 2 \times r$


2. How many circles are needed in the above project?

4

3. Do you still remember the formula for the area of a circle? Try to write down the formula for the area of a circle in the answer column provided!

$L = \pi r^2$

4. What is the relationship between the surface area of a sphere and the area of a circle?

$Lp \text{ bola} = 4 \times \pi r^2$

Based on the information you have done above, draw a conclusion about the formula for determining the surface area of a sphere below!

Figure 8. Results of student answers

Activity 5: solving contextual problems related to curved 3D shapes.

Activity 5 contains some contextual problems related to curved-sided spaces, especially surface area and volume. The teacher allows one of the groups to present their work in front of the class.

Retrospective Analysis

The characteristics of RME can be reflected based on the five activities carried out including the use of context, the use of models, student involvement in learning, interaction, and intertwinement (Gravemeijer, 1994) have appeared as shown in activities 1-5.

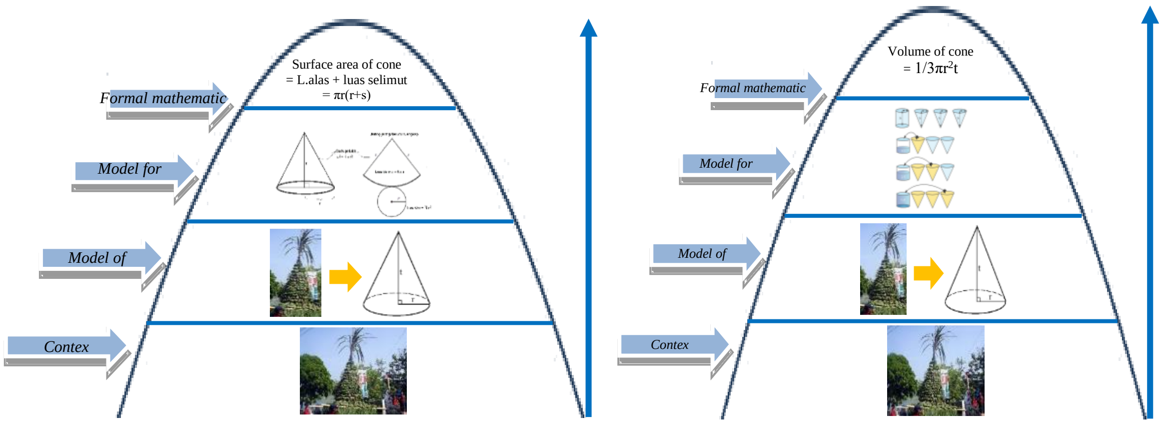


Figure 9. Iceberg surface area and volume of a cone

The first characteristic is the use of context in learning cone material starting from the contextual problem of the Rewanda offering tradition. The second characteristic is the use of models as progressive mathematization. The model used in this learning is making cones and cylinders using asturo paper. The third characteristic is the involvement of students in solving problems on each activity sheet given. The fourth characteristic is interactive where in the learning processes there is interaction between students and between students and teachers. The last characteristic is intertwinement. This characteristic can be seen when determining the formula for the surface area of the cone which is determined through the formula for the area of flat shapes that have been learned in the previous activity and determining the formula for the volume of the cone can be determined through the cylinder volume approach.

In this research, RME is a suitable approach to be applied (Nursyahidah et al., 2020). The use of the context of the traditional tradition of Sesaji Rewanda in the building material of cone space can assist students in understanding the material more easily. Context in mathematics learning plays a role in student understanding (Fahrurozi et al., 2018). In addition, the use of videos is effective in helping the learning process. The use of animated videos by teachers is very effective in visualizing the material presented (Agustien, Umamah, & Sumarno, 2018). The display of interesting and varied images from animated videos can enhance students' learning and comprehension of the material (Syahfitri, 2014).

Discussion

Students' understanding of Curved 3D shapes material can be supported by the design of learning trajectories using the context of the traditional tradition of Sesaji Rewanda which is divided into animated videos so that it can make it easier for students to understand the material. Students' understanding can be developed from the informal to the formal stage as shown from activities 1 to 5. This can be seen from the iceberg as shown in Figure 9 where 4 iceberg components can be used to help develop students' understanding from the informal stage to the formal stage. Contextual Learning and RME are two different approaches to education, although both emphasize the importance of context in the learning process. RME is more specific to mathematics learning and uses realistic contexts as the basis for building mathematical concepts. Meanwhile, Contextual Learning is more general and can be applied to various subjects to link learning to students' real lives.

The design of learning activities can change students' views that in learning mathematics which is considered difficult because it is far from the context of everyday life, it turns out that it exists and can be used in learning mathematics. The RME approach with the local wisdom of the *Rewanda* offering tradition can be used as a context for learning curved-sided space building material. Some previous studies that use local contexts in learning mathematics, such as puppet stories and uno stuck in learning number patterns (Risdiyanti & Indra Prahmana, 2020); traditional games in learning multiplication, addition, and social arithmetic (Nursyahidah et al., 2013; Risdiyanti & Indra Prahmana, 2020); and wicker in learning measurement and geometry (Harris & Ilma, 2011). Learning Curved 3D shapes in the context of the Rewanda offering tradition is also able to increase student enthusiasm and motivation in the learning process. This can be seen from the fulfillment of all RME characteristics. Students and groups are active in conducting discussions to solve the problems given. Students use contexts and models in learning curved-3D shapes material, linking previously obtained formulas to find new formulas and always actively discussing and asking questions to teachers and groups. Using the RME approach can facilitate students in mastering the concept learned and increase student interest and motivation in the mathematics learning process.

CONCLUSION

This research produces a learning trajectory of curved 3D shapes material assisted by animated videos using the context of the tradition of *Sesaji Rewanda* to assist students in understanding and mastering the material. The resulting learning trajectory consists of four activities as follows: (1) identifying the types and characteristics of curved 3D shapes, (2) determining the initial cylinder surface area and volume formula, (3) determining the initial formula for the surface area and volume of a cone, (4) determining the initial sphere surface area and volume formula, and (5) solving contextual problems related to curved 3D shapes. Research with this learning design is hopefully to be an inspiration for teachers to be able to further explore local wisdom to be used as a context in other mathematics learning to create meaningful learning.

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REFERENCE

Afdila, N. F., & Roza, Y. (2018). Analisis Kesalahan Siswa dalam menyelesaikan Masalah Kontekstual Materi Bangun Ruang Sisi Datar berdasarkan Tahapan Kastolan. *Letters of Mathematics Education*, 5(1), 65–72. Retrieved from https://doi.org/10.22202/jl.v5i1.3383

Agustien, R., Umamah, N., & Sumarno, S. (2018). Pengembangan Media

Pembelajaran Video Animasi Dua Dimensi Situs Pekauman di Bondowoso Dengan Model Addie Mata Pelajaran Sejarah Kelas X IPS. *Jurnal Edukasi*, 5(1), 19. Retrieved from https://doi.org/10.19184/jukasi.v5i1.8010

Bustang, Zulkardi, Darmawijoyo, Dolk, M., & van Eerde, D. (2013). Developing a local instruction theory for learning the concept of angle through visual field activities and spatial representations. *International Education Studies*, 6(8), 58–70. Retrieved from https://doi.org/10.5539/ies.v6n8p58

Fadlila, N. & Sagala, P. N. (2021). Development of Test Instrument Based Realistic Mathematics Education to Improve High Order Thinking Skills. *Journal of Physics: Conference Series*, *1819*(1). https://doi.org/10.1088/1742-6596/1819/1/012068

Fahrurozi, A., Maesaroh, S., Suwanto, I., & Nursyahidah, F. (2018). Developing Learning Trajectory Based Instruction of the Congruence for Ninth Grade Using Central Java Historical Building. *JRAMathEdu,* 3(2), 78–85. 10.23917/jramathedu.v3i2.6616

Farnika, N., Ikhsan, M., & Sofyan, H. (2015). Peningkatan Kemampuan Pemahaman dan Pemecahan Masalah Matematis Siswa Sekolah Menengah Atas dengan Model Pembelajaran Kooperatif Tipe Team Assisted Individualization. *Jurnal Elemen*, 1(2), 144. Retrieved from https://doi.org/10.29408/jel.v1i2.146

Febrian, F., Astuti, P., & Antika, R. (2019). Pelatihan pengembangan media videoscribe dengan konteks lokal dalam mengajarkan objek matematika bagi MGMP SMA Kabupaten Bintan. *J-ABDIPAMAS (Jurnal Pengabdian Kepada Masyarakat)*, *3*(2), 101-110.

Fauzi, I. & Arisetyawan, A. (2020). Analisis Kesulitan Belajar Siswa pada Materi Geometri Di Sekolah Dasar. *Kreano, Jurnal Matematika Kreatif-Inovatif*, *11*(1), 27–35. https://doi.org/10.15294/kreano.v11i1.20726

Gravemeijer, K. P. . (1994). *Developing realistic mathematics education*. ESoE.

Haris, D., & Ilma, R. (2011). The role of context in third graders' learning of area measurement. *Journal on Mathematics Education*, 2(1), 55–66. Retrieved from https://doi.org/10.22342/jme.2.1.778.55-66

Khoiri, M. (2014). Pemahaman Siswa pada Konsep Segiempat Berdasarkan Teori Van Hiele. *Pemahaman Siswa Pada Konsep Segiempat Berdasarkan Teori van Hiele*, 1 (1)(Universitas Jember), 262–267.

Kurniasih, R. (2017). Penerapan Strategi Pembelajaran Fase Belajar Model Van Hiele Pada Materi Bangun Ruang Sisi Datar di SMP Islam Al-Azhaar Tulungagung. *Jurnal Silogisme*, 2(2), 61–68. 10.24269/js.v2i2.626

Kusumaningsih, W., Hartono, & Nursyahidah, F. (2022). Designing hypothetical learning trajectory for lines and angles using Central Java traditional house context. *AIP Conference*

Proceedings, 2577(July). Retrieved from https://doi.org/10.1063/5.0096084

Mariyana, F. A., Rosady, I. A., & Latifah, N. (2018). Pemahaman Konsep Melalui Pendekatan Pendidikan Matematika Realistik Indonesia pada Materi Pengukuran Sudut di Kelas IV Sekolah Dasar. *Sekolah Dasar: Kajian Teori Dan Praktik Pendidikan*, 27(2), 98–107. Retrieved from https://doi.org/10.17977/um009v27i22018p098

Mulyani, A., Indah, E. kurnia N. I., & Satria, A. P. (2018). Analisis Kemampuan Pemahaman Matematis Siswa SMP pada Materi Bentuk Aljabar Mosharafa : Jurnal Pendidikan Matematika Mosharafa : Jurnal Pendidikan Matematika. *Mosharafa: Jurnal Pendidikan Matematika*, 7(2), 251–262. http://journal.institutpendidikan.ac.id/index.php/mosharafa

Muna, H., Nizaruddin, N., & Murtianto, Y. H. (2017). Pengembangan Video Pembelajaran Matematika Berbantuan Macromedia Flash 8 Dengan Pendekatan Kontekstual Pada Materi Program Linier Kelas Xi. *Aksioma*, 8(2), 9. Retrieved from https://doi.org/10.26877/aks.v8i2.1686

Najwa, W. A. (2018). Pendekatan PMRI sebagai Gerakan Literasi Sekolah dalam Pembelajaran Matematika. *Prisma, Prosicing Seminar Nasional Matematika*, 1, 575–581.

Nasrullah, & Zulkardi. (2011). Building counting by traditional game: A mathematics program for young children. *Journal on Mathematics Education*, 2(1), 41–54. Retrieved from https://doi.org/10.22342/jme.2.1.781.41-54

Nurainah, N., Maryanasari, R., & Nurfauziah, P. (2018). Analisis Kesulitan Kemampuan Koneksi Matematis Siwa Smp Kelas Viii Pada Materi Bangun Datar. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, 1(1), 61. Retrieved from https://doi.org/10.22460/jpmi.v1i1.p61-68

Nursyahidah, F., & Albab, I. U. (2021). Learning Design on Surface Area and Volume of Cylinder Using Indonesian Ethno-mathematics of Traditional Cookie maker Assisted by GeoGebra, 13(4).

Nursyahidah, F., Ilma, R., & Putri, I. (2014). 2014 Instructional Design of Subtraction Using PMRI Approach, (978), 132–141.

Nursyahidah, F., Putri, R. I. I., & Somakim. (2013). Supporting first grade students' understanding of addition up to 20 using traditional game. *Journal on Mathematics Education*, 4(2), 212–223. Retrieved from https://doi.org/10.22342/jme.4.2.557.212-223

Nursyahidah, F., Saputro, B. A., Albab, I. U., & Aisyah, F. (2020). Pengembangan Learning Trajectory Based Instruction Materi Kerucut Menggunakan Konteks Megono Gunungan. *Mosharafa: Jurnal Pendidikan Matematika*, 9(1), 47–58. Retrieved from https://doi.org/10.31980/mosharafa.v9i1.560

Nursyahidah, F., Saputro, B. A., & Rubowo, M. R. (2018). A Secondary Student's Problem Solving Ability in Learning Based on Realistic Mathematics with

Ethnomathematics. *JRAMathEdu (Journal of Research and Advances in Mathematics Education)*, 3(1), 13. Retrieved from https://doi.org/10.23917/jramathedu.v3i1.5607

Özerem, A. (2012). Misconceptions In Geometry And Suggested Solutions For Seventh Grade Students. *Procedia - Social and Behavioral Sciences*, 55, 720–729. Retrieved from https://doi.org/10.1016/j.sbspro.2012.09.557

Puspasari, L., Zulkardi, Z., & Somakim, S. (2015). Desain Pembelajaran Luas Segi Banyak Menggunakan Tangram Berpetak di Kelas IV. *JINoP (Jurnal Inovasi Pembelajaran)*, 1(2), 150. Retrieved from https://doi.org/10.22219/jinop.v1i2.2566

Risdiyanti, I., & Indra Prahmana, R. C. (2020). The learning trajectory of number pattern learning using barathayudha war stories and uno stacko. *Journal on Mathematics Education*, 11(1), 157–166. Retrieved from https://doi.org/10.22342/jme.11.1.10225.157-166

Rofii, A., Sunardi, S., & Irvan, M. (2018). Characteristics of Students' Metacognition Process At Informal Deduction Thinking Level in Geometry Problems. *International Journal on Emerging Mathematics Education*, 2(1), 89. Retrieved from https://doi.org/10.12928/ijeme.v2i1.7684

Rosyida, E. M., Riyadi, & Mardiyana. (2016). Analisis Kesalahan Siswa Dalam Pemecahan Masalah Berdasarkan Pendapat John W. Santrock Pada Pokok Bahasan Bangun Ruang Sisi Lengkung Ditinjau Dari Gaya Belajar Dan Gaya Berpikir Siswa. *Jurnal Elektronik Pembelajaran Matematika*, 4(10), 973–981.

Sari, P. (2017). Pemahaman Konsep Matematika Siswa pada Materi Besar Sudut Melalui Pendekatan PMRI. *Jurnal Gantang*, *II*(1), 41–51. https://doi.org/10.31629/jg.v2i1.60

Widiawati, Marzal, D., & Juwita, H. (2018). Desain Pembelajaran Garis Dan Sudut Dengan Konteks Pagar Buluh Di Kelas Vii. *Journal of Mathematics Science and Education*, 1(1), 118–130. Retrieved from https://doi.org/10.31540/jmse.v1i1.186

Yani, C. F., Maimunah, M., Roza, Y., Murni, A., & Daim, Z. (2019). Analisis Kemampuan Pemahaman Matematis Siswa pada Materi Bangun Ruang Sisi Lengkung. *Mosharafa: Jurnal Pendidikan Matematika*, 8(2), 203–214. Retrieved from https://doi.org/10.31980/mosharafa.v8i2.481.