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Learning Design of Pythagorean Theorem Contextualized Salt House with Interactive Videos

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a b s t r a c t

The Pythagorean theorem is one of the materials in geometry and has a close relationship with everyday life. However, many students still have difficulty understanding the concepts and solving problems related to the material. This study aims to develop a learning trajectory that assists students in improving their ability to understand the concept of the Pythagorean theorem using the context of an interactive video-assisted Salt House in class VII SMP Negeri 2 Pegandon. This learning trajectory consists of four activities, namely: (1) finding the concept and formula of the Pythagorean theorem with the help of a video context; (2) finding concepts related to the length of one side of a triangle if two sides are known; (3) determining the type of triangle based on the length of its side; (4) finding and checking related Pythagorean triple number patterns. This study uses design research method which consists of three stages, namely preparing for the experiment, design experiment, and retrospective analysis. The learning approach used is PMRI. The results of the research conducted show that the learning trajectory obtained can improve students' mathematical problem solvings skills on the Pythagorean theorem material.

K e y w o r d s:
Pythagorean Theorem, Design Research, Learning Trajectory, PMRI, Salt House

INTRODUCTION

Mathematics is one of the most important subjects to be studied at all levels of education. Mathematics in the school curriculum serves as a means to foster critical and creative thinking skills among students (Kwan, Y., & Wong, 2014; Tandiseru, 2015), logical, analytical, systematic and collaborative thinking (Lince, 2016). Mathematics as a main subject (Sukmawati & Amelia, 2020), includes many branches, such as calculus, geometry, algebra, statistics, and others. One of the important fields of mathematics to learn is geometry, because it is useful in everyday life (Nursyahidah et al., 2020).

However, in reality geometry is one of the difficult materials for students and the results obtained by students are also still relatively low (Sahara & Nurfauziah, 2021; Sholihah & Afriansyah, 2017). This is caused by several factors such as geometry material including material that is difficult for students to understand (Waskitoningtyas, 2016), lack of student understanding of geometry material and difficulties in the use of concepts and principles (Soleha et al., 2019), and basic concepts that must be mastered are more abstract than other areas of mathematics (Adelabu et al., 2019). In addition, difficulties in understanding this geometry material can affect other materials, because geometry is a prerequisite material needed in other interconnected materials (Hidayah & Fitriani, 2021; Sholihah & Afriansyah, 2017).

One of the geometry materials that are still considered difficult for students is the Pythagorean theorem material (Saputri et al., 2019). The difficulty of students in learning Pythagorean theorem material is that students have difficulty interpreting the problem and do not illustrate the problem in the picture and incorrectly use the Pythagorean formula (Priyanto et al., 2015). This is in accordance with the opinion As'ari et al., (2017); Sura et al., (2021); Warih et al., (2016) which states that students have difficulty understanding the concept of the Pythagorean theorem and have difficulty solving story problems related to the Pythagorean theorem. Supported by research (Widodo, 2013) which said that operation errors were found where students were less precise in writing the steps in solving the problem and were unable to manipulate the solution steps. In addition, in research of Rahmania & Rahmawati, (2016) it was found that students were mistaken in using the formula used to solve the problem.

The many problems or difficulties experienced by students from the explanation above are caused by the inappropriate methods used by teachers when teaching, where teachers only use existing formulas, but do not know the underlying concepts (Lisnani & Asmaruddin, 2018). Due to the basic concepts that are not well mastered by students, it causes difficulties in learning and the learning objectives will be difficult to achieve properly (Rahmiati et al., 2017). Therefore, learning design is very important for teachers as a guide in teaching. In addition, according to Maisyarah & Prahmana, (2020) said that starting mathematics learning by using contextual problems will further increase the meaningfulness of what is learned. Therefore, learning will become more meaningful if students are given contextual problems and directed to abstract problems (Nursyahidah et al., 2021a).

In the context of these problems, teachers can create the right approach by combining media and integrating with context in designing Pythagorean theorem learning to make it more meaningful. One approach that can make learning more meaningful is the

Indonesian Realistic Mathematics Education (PMRI) approach (Nursyahidah et al., 2020, 2021b; Zulkardi, Z., & Putri, 2010). PMRI is a learning method that prioritizes the rediscovery and introduction of concepts through contextual problems or real situations in the student's environment by constructing their own concepts (Lisnani & Asmaruddin, 2018; Marlinda & Wijaya, 2018). Supported by the opinion of Nursyahidah & Albab, (2021) which states that the PMRI learning process starts with a real context or situation experienced and recognized by students which allows students to connect informal mathematics to formal mathematics. The use of context is one of the characteristics of PMRI, with the use of context it is expected that students will more easily understand contextual problems.

The context used in this study is the Salt House which is one of the traditional Javanese houses, especially the coastal area. The Salt House can be represented in the Pythagorean theorem material. In addition, the use of the context of the Salt House is also intended to provide opportunities for students to get to know and explore local wisdom in the form of useful buildings around and be more motivated in a meaningful learning process. The context of the Salt House used in this study is packaged in the form of an interactive video. By using the right media, learning will be imaginative and innovative. Dengan menggunakan media yang tepat pembelajaran akan menjadi imajinatif dan inovatif. This is in accordance with research Nursyahidah et al., (2021a) which says that learning will become more meaningful by using interactive video assistance and students will become more active and enthusiastic in learning.

Based on the background presented, the researcher will describe the preparing for the experiment step to provide an explanation of the preparation before the HLT trial at the design experiment stage. This article is written as part of a research that aims to produce student learning trajectories in understanding Pythagorean theorem material with the context of the Salt House. The design of HLT is important for students to know how students think so that it is expected to help students in overcoming the difficulties experienced by students in the Pythagorean theorem material.

METHODS

The research method used was design research. Design research is a research method conducted with the aim of developing Local Instructions Theory (LIT) through collaboration between researchers and teachers to improve the quality of education (Gravemeijer, K., & van Eerde, 2009). According to (Akker et al., 2006), design research has 3 stages, namely: preparing for the experiment, design experiment, and retrospective analysis. This research was implemented in March-April 2023 with the subjects in this study were seventh grade students of SMP Negeri 2 Pegandon, Kendal, Central Java.

In the first step, preparing for the experiment, researchers conducted a literature review related to research from relevant journals, books, and articles. The literature review was used as the basis for developing a Hypothetical Learning Trajectory (HLT) or temporary learning trajectory consisting of learning objectives, learning activities, and hypotheses.

The second step is the design experiment, there are 2 cycles, namely the pilot experiment cycle and the teaching experiment cycle. In the pilot experiment session (first cycle), the HLT was tested on a small group of 6 students from class VIII C with different ability indications, namely 2 high ability students, 2 medium ability students, and 2 low ability

students. In the pilot experiment session, the researcher acted as the teacher. After the implementation of the pilot experiment cycle, the HLT will be revised based on the results of the student trials and then tested on large classes in the teaching experiment session. In the teaching experiment session (second cycle), the HLT was tested on a large group of 32 students from class VIII B, and the mathematics teacher acted as the model teacher.

The third step is retrospective analysis, the researcher analyzes the results of student work and produces a learning trajectory that is in accordance with the understanding of basic concepts in real learning. The results obtained at the retrospective analysis step were used to answer the problem formulation. Thus, it can be concluded that the purpose of retrospective analysis is to develop Learning Instruction Theory (LIT).

Data collection in this study was through observation, documentation of activities, video recording of activities, and interviews. After conducting learning activities, researchers and model teachers held discussions to analyze data from the results of pilot experiments and teaching experiments. Student data collection in data analysis includes LAS results, pre-test, post-test, photos, and video recordings. This was done to determine the progress of students in learning the material provided. In this article, the researcher focuses on explaining the first stage of design research, namely the preparing for the experiment stage. The main discussion in this study is the description of the Hypothetical Learning Trajectory (HLT) using the context of the Salt House assisted by interactive videos on the Pythagorean theorem material.

RESULT AND DISCUSSION

The first step in design research is preparing for the experiment. This step is the preparation step where the researcher prepares all the instruments that will be used to be tested in learning. The preparations made included: a) examining the basic competencies that students already had before learning the Pythagorean theorem material based on the 2013 curriculum, b) examining the basic competencies needed by students to learn the Pythagorean theorem material based on the 2013 curriculum, and c) developing the Pythagorean theorem HLT based on the PMRI approach using the context of the Salt House with interactive video assistance.

The first step in developing the HLT (Hypothetical Learning Trajectory) is to determine the indicators of the Pythagorean theorem material, namely: a) identify the various components of the Pythagorean theorem, b) determine the concept and formula of the Pythagorean theorem, c) determine the length of one side of a triangle, and d) solve contextual problems related to the Pythagorean theorem.

Furthermore, the researcher can design HLT on Pythagorean theorem material that includes 5 characteristics of PMRI (Akker et al., 2006), namely: (1) the use of context, the researcher used the context of the Salt House, (2) the use of models, students apply their understanding from real situations to the formal stage of mathematics, (3) the existence of student contributions, students are given the freedom to find concepts and solve problems based on their knowledge through discussions and other sources, (4) interactivity, there is interaction between students with groups and also teachers, (5) linkage, there is a connection between the Pythagorean theorem material and other

materials. The HLT of the Pythagorean theorem based on the PMRI approach using the context of the Salt House with interactive video assistance will be explained as follows.

Steps and Rules for Learning

The teacher applies the learning according to the PMRI steps, namely understanding the context, explaining the context problem, explaining the context problem, comparing and discussing the results of students' answers, and concluding them. After implementing learning based on PMRI steps, teachers and students make an agreement on the rules in learning, including: a) after finishing working on the activities given, group representatives can make presentations in front of the class, b) if the results of the group's answers are different, group representatives can argue by raising their hands first, c) when a group is presenting, all students must listen well and students will be given time to ask questions and have opinions, d) the teacher gives several questions after the students present to check students' understanding of the material learned.

Aktivitas 1

The explanation of activity 1 in the HLT is as below:

- Learning objective

  Students are able to identify the types, elements and sketches of combined two-dimentional figures through the context of the Salt House with the use of an interactive video.

- Learning activities

  Students are asked to observe the interactive video of the Salt House as a context situation. After observing the video, students are directed to recognize and identify the various two-dimentional figures that make up the Salt House section represented in the Pythagorean theorem material. Furthermore, students are asked to identify the elements of the two-dimentional figures that have been found. After that, students are asked to sketch a combination of several two-dimentional figures that have been found that can be represented in the Pythagorean theorem.

  The activities carried out in completing LAS 1 include: (1) students are given a context in the form of a picture of a Salt House then students can observe parts of the Salt House that can be represented in the Pythagorean theorem by completing the picture. After finding various two-dimentional figure based on the observed context, students can identify their elements by completing the table provided, (b) before giving problems for students to solve, the teacher first provides a stimulus to students by reminding them of the material to be learned, and the teacher provides guidance and direction to students in following the activities provided, (c) students are given the opportunity to discuss with their groups to find and solve problems according to their abilities.

- Class discussion

After the students completed the LAS 1 given, the teacher then gave the opportunity to the group representatives to present the answers they had discussed. Most likely students have been able to identify parts of the Salt House that are in accordance with the Pythagorean theorem, then students can identify the elements of the building that make up the sketch. Thus, it can be said that students have been able to determine the kinds of two-dimentional figure that make up the part. The next possibility is that students have not been able to identify parts of the Salt House that are in accordance with the Pythagorean theorem, so that in identifying the elements of the building is also incomplete. Thus, teachers are needed in providing guidance and direction, especially for students who are still having difficulty in completing the activities given. In order for all students to understand the problems given in LAS 1 well, the groups that did not make presentations were asked to pay attention and reveal the results of the findings of their different groups. At the end of the lesson, the teacher provides conclusions related to the subject matter regarding the types and elements of flat shapes and sketches of combined two-dimentional figure..

Aktivitas 2

The explanation of activity 2 in the HLT is as below:

- Learning objective

Students are able to determine the concepts and formulas of the Pythagorean theorem and solve contextual problems related to the Pythagorean theorem.

- Learning activities

In activity 2 students are presented with the context of the Salt House, from this context students are directed to observe the combined parts of the house that represent the Pythagorean theorem. Students are also given props in the form of a cardboard house that resembles the Salt House as in Figure 1 below. Students are asked to sketch a combination of several parts of the context to complete the missing part in the form of a two-dimentional figure to complete the two missing parts of the roof from the part that is the size of the front wall then complete the constituent components to help determine the concept and formula of the Pythagorean theorem..

Figure 1
Context of the Salt House

Next, students are asked to complete the missing part of the context by first sketching a combination of several parts of the context in the form of a flat shape with a size of 1 unit area. After the students have made the sketch, they can make it with the help of printed origami paper. Then each group can cut out origami paper that is the size of the front wall and put the origami paper on the missing part so that the part can be covered. This method can help students to determine the concept and formula of the

Pythagorean theorem. Finally, students can solve contextual problems related to the Pythagorean theorem..

- Class discussion

The teacher gives the opportunity to group representatives to present the answers they have discussed. Groups that are not presenting are asked to pay attention and express the results of their different group findings. It is possible that students can already determine the concept and formula of the Pythagorean theorem, as well as solve contextual problems related to the Pythagorean theorem according to the instructions on the designed activity. It is also possible that students are only able to determine the concept of the Pythagorean theorem and students still have difficulty in determining the Pythagorean theorem formula based on the concepts they already understand and vice versa. Another possibility is that students still have difficulty in determining the concept and formula of the Pythagorean theorem, as well as solving contextual problems. Thus, teachers are needed in providing guidance and direction to students so that they do not have the wrong concept in doing the activities given. At the end of the lesson, the teacher provides conclusions related to the subject matter regarding concepts, formulas, and solving problems related to the Pythagorean theorem.

Aktivitas 3

The explanation of activity 3 in the HLT is as below:

- Learning objective

Students are able to determine the length of one side of a triangle if both sides are known and solve contextual problems related to the length of one side of a triangle.

- Learning activities

In activity 3, the context of the Salt House is presented, from this context students are directed to observe the triangular parts of the house represented by the Pythagorean theorem. In the first activity, students are asked to make several right triangles of various sizes with only 2 known sides using origami paper with a pattern. From the triangles that have been drawn, students can then determine the known components in the triangles that have been made. Then students can determine the length of the unknown side based on the length of the known side and the concept of the Pythagorean theorem that they already understand. In addition, students can also determine the derived formula obtained from the Pythagorean theorem formula to calculate each unknown side. Finally, students can solve contextual problems related to the side length of a triangle.

- Class discussion

The teacher gives the opportunity to group representatives to present the answers they have discussed. Groups that are not presenting are asked to pay attention and express the results of their different group findings. It is possible that students can already determine the length of one side of a triangle whose two sides are known and can determine the formula to calculate the length of each side correctly. It is also possible that students can only determine the length of one side of a triangle whose two sides are known but cannot determine the formula to calculate the length of each side

correctly. Another possibility is that students can already determine the length of one side of the triangle and determine the formula but students have difficulty in solving the contextual problem. Thus, teachers are needed in providing guidance and direction to students who are still having difficulty in following the instructions of the activities provided. At the end of the lesson, the teacher provides conclusions related to the length of the side of a triangle and the formula for calculating it, as well as solving problems related to the length of the side of a triangle.

Aktivitas 4

The explanation of activity 4 in the HLT is as below:

- Learning objective

Students are able to solve contextual problems related to the Pythagorean theorem.

- Learning activities

In activity 4, students are given LAS 4 which contains several contextual problems related to the Pythagorean theorem. In addition, the contextual problems given are also related to the length of the side of the triangle as well as the area and perimeter of triangles and quadrilaterals previously learned by students.

- Class discussion

The teacher gives the opportunity to group representatives to present the results of their group discussions by writing them on the blackboard and then explaining them in front of the class. Groups that are not presenting are asked to pay attention and express opinions related to different findings.

Based on the results that have been described, there are several activities that must be carried out at the preparing for the experiment stage, including: conducting a literature review related to the research conducted, examining student abilities, and designing HLT with 4 activities, namely: (1) identifying types, elements, and sketches of flat shapes through interactive video observation, (2) determining the concept and formula of the Pythagorean theorem, (3) determining the length of one side of a triangle, (4) solving contextual problems related to the Pythagorean theorem. The series of activities that have been designed are expected to help students understand the Pythagorean theorem material. Learning activities using interactive videos with the context of the Salt House are expected to help students to find the concept of the Pythagorean theorem and side lengths in triangles. This is in accordance with the research of Nursyahidah (2014), Fahrurozi et al., (2018) which states that learning with the right context can improve concept understanding ability and create more meaningful learning.

CONCLUSION

This study has the objective to develop a Hypothetical Learning Trajectory (HLT) of the Pythagorean theorem material for grade VIII using the context of Rumah Garam in the form of an interactive video consisting of 4 activities, namely: (1) identifying types, elements and sketches of combined flat shapes through the Salt House video, (2) determining concepts and formulas, and solving contextual problems related to the

Pythagorean theorem, (3) determining the length of one side of a triangle if both sides are known and solving contextual problems related to the length of one side of a triangle, (4) solving contextual problems related to the Pythagorean theorem. The results of this study show that using the context of the Salt House can help students improve their understanding of concepts related to the Pythagorean theorem material. Research with this learning design is expected to be an inspiration for teachers to be able to further explore local wisdom to be used as a context in other mathematics learning so that it can create more meaningful learning.

REFERENCES

Adelabu, F. M., Makgato, M., & Ramaligela, M. S. (2019). The importance of Dynamic Geometry Computer Software on learners' performance in geometry. *The Electronic Journal of E-Learning*, *17*(1), 52–63. Retrieved from https://academic-publishing.org/index.php/ejel/article/view/1870

Akker, V. den J., Gravemeijer, K., McKenny, S., & Nieveen, N. (2006). *Educational Design Research* (1st ed.). Routledge. https://doi.org/https://doi.org/10.4324/9780203088364

As'ari, A. R., Tohir, M., Valentino, R., Imron, Z., & Taufiq, I. (2017). *Matematika* (2nd ed.). Kemendikbud.

Gravemeijer, K., & van Eerde, D. (2009). Design research as a means for building a knowledge base for teachers and teaching in mathematics education. *The Elementary School Journal*, *109*(5), 510–524.Retrieved from https://www.journals.uchicago.edu/doi/abs/10.1086/596999

Hidayah, I. S., & Fitriani, N. (2021). Analisis Kesulitan Siswa SMP Kelas VII dalam Memahami Materi Segiempat dan Segitiga dalam Pembelejaran Daring. *Jurnal Pembelajaran Matematika Inovatif*, *4*(3), 631–642. https://doi.org/10.22460/jpmi.v4i3.631-642

Kwan, Y., & Wong, A. (2014). The Constructivist Classroom Learning Environment and Its Associations with Critical Thinking Ability of Secondary School Students in Liberal Studies. *Learning Environment Research*, *17*(2), 191–207. https://doi.org/https://doi.org/10.1007/s10984-014-9158-x

Lince, R. (2016). Creative Thinking Ability to Increase Student Mathematical of Junior High School by Applying Models Numbered Heads Together. *Journal of Education and Practice*, *7*(6), 206–212.Retrieved from https://eric.ed.gov/?id=EJ1092494.

Lisnani, & Asmaruddin, S. N. (2018). Desain Buku Ajar Matematika Bilingual Materi Bangun Datar Menggunakan Pendekatan PMRI Berkonteks Kebudayaan Lokal. *Mosharafa: Jurnal Pendidikan Matematika*, *7*(3), 345–356. https://doi.org/https://doi.org/10.31980/mosharafa.v7i3.134

Maisyarah, S., & Prahmana, R. C. I. (2020). Pembelajaran Luas Permukaan Bangun Ruang Sisi Datar Menggunakan Pendekatan Pendidikan Matematika Realistik Indonesia. *Jurnal Elemen*, *6*(1), 68–88. https://doi.org/10.29408/jel.v6i1.1713

Marlinda, I., & Wijaya, A. (2018). Pengembangan perangkat pembelajaran dengan pendekatan pendidikan matematika realistik berorientasi pada minat dan prestasi Developing a learning set with realistic mathematics education approach oriented to the interest and achievement. *Phytagoras: Jurnal Pendidikan Matematika*, *13*(1), 76–87. https://doi.org/http://dx.doi.org/10.21831/pg.v13i1.21171

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. *Mathematics Teaching Research Journal*, *13*(4), 79–98. Retrieved from https://eric.ed.gov/?id=EJ1332350

Nursyahidah, F., Saputro, B. A., & Albab, I. U. (2021a). Desain Pembelajaran Kerucut Berkonteks Tradisi Megono Gunungan. *Jurnal Elemen*, *7*(1), 19–28. https://doi.org/10.29408/jel.v7i1.2655

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. https://doi.org/10.31980/mosharafa.v9i1.560

Nursyahidah, F., Saputro, B. A., & Albab, U. A. (2021b). The Learning Trajectory of Sphere Using Megono Gunungan Tradition Context. *International Journal of Engineering Science and Computing*, *5*(2), 69–76. https://doi.org/https://dx/doi.org/10.12928/ijeme.v5i2.18313

Priyanto, A., Suharto, & Trapsilasiwi, D. (2015). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Cerita Matematika Pokok Bahasan Teorema Phytagoras Berdasarkan Kategori Kesalahan Newman di Kelas VIII A SMP Negeri 10 Jember. In *Artikel Ilmiah Mahasiswa* (Vol. 1, Issue 1).

Rahmania, L., & Rahmawati, A. (2016). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Cerita Persamaan Linier Satu Variabel. *JMPM: Jurnal Matematika Dan Pendidikan Matematika*, *1*(2), 165. https://doi.org/https://doi.org/10.26594/jmpm.v1i2.639

Rahmiati, Musdi, E., & Fauzi, A. (2017). Pengembangan Perangkat Pembelajaran Matematika Berbasis Discovery Learning Untuk Meningkatkan Kemampuan Pemecahan Masalah Siswa Kelas VIII SMP. *Mosharafa: Jurnal Pendidikan Matematika*, *6*(2), 267–272.

Sahara, R. I. A., & Nurfauziah, P. (2021). Analisis Kesulitan Siswa Materi Bangun Ruang Sisi Datar Berdasarkan Tahap Berpikir Van Hiele. *Jurnal Pembelajaran Matematika Inovatif*, *4*(4), 911–920. https://doi.org/https://doi.org/10.22460/jpmi.v4i4.911-920

Saputri, M. A., Darmawan, P., & Prayekti, N. (2019). Analisis Kesulitan Siswa SMP Kelas VIII dalam Pemecahan Masalah Teorema Pythagoras. In *Prosiding Seminar Nasional MIPA UNIBA 2019*.

Sholihah, S. Z., & Afriansyah, E. A. (2017). Analisis kesulitan siswa dalam proses pemecahan masalah geometri berdasarkan tahapan berpikir van hiele. *Mosharafa: Jurnal Pendidikan Matematika*, *6*(2), 287–298. https://doi.org/10.31980/mosharafa.v6i2.317

Soleha, Rasiman, & Purwosetiyono, F. D. (2019). Analisis Kesulitan Siswa dalam Menyelesaikan Masalah Matematika Ditinjau dari Gaya Belajar Siswa SMK. *Imajiner: Jurnal Matematika Dan Pendidikan Matematika*, *1*(5), 138–147.

Sukmawati, S., & Amelia, R. (2020). Analisis Kesalahan Siswa SMP dalam Menyelesaikan Soal Materi Segiempat Berdasarkan Teori Nolting. *Jurnal Pembelajaran Matematika Inovatif*, *3*(2), 223. https://doi.org/https://doi.org/10.22460/jpmi.v3i5.423-432

Sura, G. L., Tahmir, S., & Dassa, A. (2021). Analisis Kesalahan Siswa Dalam Menyelesaikan Soal pada Materi Persamaan Kuadrat. *Mathematics Education (IMED)*, *5*(1), 73–81. https://doi.org/https://doi.org/10.35580/imed19914

Tandiseru, S. R. (2015). The effectiveness of local culture-based mathematical heuristic-KR learning towards enhancing students' creative thinking skill. *Journal of Education and Practice*, *6*(15), 74–81. https://eric.ed.gov/?id=EJ1080709.

Warih, P. D., Parta, I. N., & Rahardjo, S. (2016). Analisis Kemampuan Koneksi Matematis Siswa Kelas VIII Pada Materi Teorema Pythagoras. *Prosiding Konferensi Nasional Penelitian Matematika Dan Pembelajarannya [KNPMP I] Universitas Muhammadiyah Surakarta, 12 Maret 2016*, *Knpmp I*, 377–384 https://proceedings.ums.ac.id/index.php/knpmp/article/view/2523.

Waskitoningtyas, R. S. (2016). Analisis kesulitan belajar matematika siswa kelas V Sekolah Dasar Kota Balikpapan pada materi satuan waktu tahun ajaran 2015/2016. *Jurnal Ilmiah Pendidikan Matematika*, *5*(1), 24–32. http://doi.org/10.25273/jipm.v5i1.852

Widodo, S. A. (2013). Analisis Kesalahan dalam Pemecahan Masalah Divergen Tipe Membuktikan pada Mahasiswa Matematika. *Jurnal Pendidikan Dan Pengajaran*, *46*(2), 106–113. https://doi.org/10.23887/jppundiksha.v46i2%20Juli.2663

Zulkardi, Z., & Putri, R. I. I. (2010). Pengembangan Blog Support Untuk Membantu Siswa dan Guru Matematika Indonesia Belajar Pendidikan Matematika Realistic Indonesia (PMRI). *Jurnal Inovasi Perekayasa Pendidiakan (JIPP)*, *2*(1), 1–24.