INOVASIA (1) (2022), E-2963-2617, P-2964-9420

INOVASIA

Journal INOVAISA

https://jurnal.institutsunandoe.ac.id/index.php/inovasia

THE DEVELOPMENT OF STUDENT WORKSHEETS (LKS) WITH A CONTEXTUAL APPROACH TO ARRITHMETIC AND GEOMETRY SEQUENCES

Anny Zuliyana*[1], and Muhammad Aminuddin[2]

[1,2]Science Education Program Studies, Institut Studi Islam Sunan Doe

Accepted: 14 September 2022. Approved: 21 September 2022. Published: 28 September 2022

ABSTRACT

This research is development research that aims to produce Student Worksheets (LKS) with a valid and practical contextual approach so that it is suitable for use in the learning process on arithmetic and geometric sequences. The development design used in this study is the ADDIE development model, which consists of five stages, namely 1) the analysis stage, 2) the planning stage, 3) the development stage, 4) the implementation stage, and 5) the evaluation stage. Based on the data analysis results, the following results were obtained (1) the level of validity got a score of 3.3 with very valid validity criteria, (2) the level of practicality got a score of 3.9, with efficient criteria of practicality. Therefore, it can be concluded that the developed worksheets meet the good criteria so that they are suitable to be used as one of the teaching materials that can be used in Arithmetic and Geometry Sequences.

Keywords: Student worksheets (LKS), Contextual, Arithmetic and Geometry sequences.

INTRODUCTION

Mathematics is one of the sciences that has an essential role in various fields of life (Safford et al., 2016, p. 2). This is because mathematics is a science that can be applied in everyday life. Based on the NCTM (2000:29), the standard process in learning mathematics is that students can solve mathematical problems, mathematical reasoning, mathematical communication, mathematical connections, and mathematical representations. Therefore, students are expected to be able to understand mathematical concepts and be able to use the knowledge they have to solve everyday problems. According to Permendikbud, number 103 (Mendikbud, 2014), learning can be said to be ideal when in the learning process, students can find out for themselves and learn not only based on one source. The learning process is not just the teacher explaining and students receiving explanations from the teacher.

Teachers are not the only source of learning for students, but there are still many learning resources that can be used as a reference in learning. Based on the results of initial observations made by researchers at the Laboratory High School, State University of Malang, student's mathematics learning outcomes are deficient; it can be seen from the results of their classical mastery on daily tests, which are very low, where their classical mastery only reaches 25%. Based on this, in order to improve student learning outcomes, effective learning is needed.

Effective learning is one of the crucial factors in improving student achievement in

* **Correspondence Address**
E-mail: zuliyanaanny7@gmail.com

school, especially in mathematics, so many studies have been conducted to find ways to improve the quality of learning (Ying et al., 2017). One effort that can be made to improve student learning outcomes is to apply learning with a contextual approach. Contextual learning is a good combination of many learning practices and several educational reforms that aim to enrich the relevance of education for all students (Lamapha, 2017). Johnson (2009) stated that "CTL is an educational process that aims to help students see meaning in the academic material they are studying by connecting academic subjects with the context of their daily lives, that is, with the context of their personal, social, and cultural circumstances". In this definition, he stated that CTL is a learning process that aims to help students to interpret the learning material being taught by connecting the learning with the contests in their daily lives, namely in the context of their personal, social and cultural conditions. Several research results regarding contextual learning state that learning with CTL effectively increases students' motivation and learning outcomes (Laili, 2016). Fauzan (2013) states that learning by applying a contextual approach has a better effect on students than conventional approaches. This is because contextual questions close to students are used as a starting point in learning; it can motivate students to learn and improve student learning outcomes. According to Yuwono (2012), giving problems given to students who come from screeching around students is intended so that students feel that from the beginning, learning mathematics is easy and exciting for students.

Contextual learning has been introduced for a long time to assist in the learning process and improve the quality of learning. Sears (2003:9) suggests that by applying CTL (contextual teaching and learning) learning in the learning process, teachers will be helped because learning that has been designed is based on real situations so that it can encourage students to apply it in their lives. In addition, one of the characteristics of contextual learning is Learning to ask, inquiry, to work together, where learning is carried out actively, creatively, and productively, and prioritizes collaboration between students so that students can find their concepts from learning by solving contextual problems. Lavasani and Kandhan (2011) state that learning that occurs in the classroom by actively interacting between students can foster self-confidence so that students will not be afraid to learn mathematics. One thing that needs to be considered in learning activities is the teaching materials used in learning.

The observations made by researchers at the SMA laboratory of the State University of Malang revealed that the teaching materials used in the learning process were the 2013 curriculum package books. Students can not use the package as reference material for learning. Therefore, the researcher wants to provide complementary teaching materials that can be used together with the concentrated book.

Arithmetic and Geometry Sequence material is one of the materials studied by students in high school (SMA). In the 2013 curriculum, this material is taught in class XI. Students must achieve two essential competencies in this lesson: (3.8) Analyzing sequences based on interactive and recursive patterns, especially those that include Arithmetic and Geometric Sequences. (4.8) Using Arithmetic or Geometric Sequence patterns to present and solve contextual problems. Based on the discussion above, the researcher intends to develop teaching materials in the form of Student Worksheets (LKS) with a contextual approach to Arithmetic and Geometric Sequences for students in class XI, which is expected to improve student learning outcomes.

LITERATURE RIVIEW

According to Budisetyawan in Putri (2013: 103), "LKS is a learning tool that can be used in experimental activities, demonstrations, discussions, and can also be used as guidance in curricular assignments". This means that LKS plays a vital role in learning because it can be used in all activities. Arsyad in Isnaningsih (2013: 137) suggests, "LKS as a learning resource can be used as an alternative learning media and includes print media resulting from the development of printing technology in the form of books and

containing visual material". Students because the material is visual.

Contextual, according to Sanjaya (Udin Syaefudin Sa'ud, 2013: 162), is a learning approach that emphasizes the process of full student involvement to find material and relate it to real life to encourage students to apply it in life. This means that an approach that emphasizes the process of total involvement of students in finding material and connecting with their lives so that students can apply them in real life. According to The Washington State Consortium for contextual teaching and learning (in Kunandar, 2007: 295), contextual learning is teaching that allows students to strengthen, expand, and apply their knowledge and academic skills in various school settings and outside of school to solve all problems that exist in the real world. . This means that this opinion says that contextual learning is that every problem at school or outside of school can solve all problems that exist in the real world. Based on the description above, it can be concluded that contextual-based worksheets are learning tools for students given by their educators that contain information, instructions and also a learning approach that emphasizes the process of full student involvement to find material and relate it to real-life to encourage students to apply it, in life.

METHODS

Research conducted by researchers in research and development. Borg and Gall (1989) say that development research aims to develop and validate the products used in a study. Meanwhile, according to Syadih (2015), development research is a process carried out to develop a new product or improve a product that already exists and can be accounted for.

The method used to develop worksheets with this contextual approach is the ADDIE development model. According to Tegh et al. (2014: 42-44), the ADDIE development model consists of five steps, namely (1) the analysis phase, (2) the planning phase, (3) the development phase, (4) the implementation phase, (5) the evaluation phase. The following describes each stage in the development of LKS.

The first stage carried out by the researcher was the analysis stage, where the analysis stage carried out by the researcher was divided into two, namely (1) a needs analysis was carried out by giving a questionnaire to students consisting of 15 questions related to teaching materials, including worksheets and interviews with eye teachers—mathematics lessons for class XI students of SMA Laboratories State University of Malang. (2) material analysis begins by asking for data on the annual and even semester programs for the teacher in mathematics class XI at SMA Laboratorium Negeri Malang State University.

The second stage is the design of the LKS to be developed; the design of the LKS is carried out based on the things obtained from the analysis stage. The activities carried out at the design stage include determining the title of the LKS and the preparation of the LKS. The preparation of LKS is carried out with the following steps (1) formulating essential competencies that must be mastered, (2) designing evaluation tools, and (3) compiling materials.

The third stage is the development stage; at this stage, LKS has developed with a contextual approach where the structure or components in the LKS are (1) LKS title, (2) LKS content instructions, (3) core competencies, (4) essential competencies, (5) learning objectives, (6) supporting information in the form of problems and pictures, (7) activities to work on questions that help students understand the material, (8) conclusion of activities, (9) practice questions.

The fourth stage is the implementation stage. At this stage, the LKS development was carried out by testing the LKS on students who were used as test subjects. The trial conducted was a field trial at the school that was the subject of the research. The last stage is the evaluation stage; in the ADDIE development model, two evaluations are carried out: formative and summative. However, in this study, only a formative evaluation was carried out due to limited time and funds. The evaluation was conducted to determine the quality of the LKS in terms of the validity of the LKS and the results of student responses to the LKS.

In addition to developing worksheets, researchers also develop research instruments. The research instruments developed in this study were validation sheets and student response questionnaires. The validation sheet consists of a worksheet validation sheet and a student response questionnaire validation sheet. Nieveen (1999) states that product development must meet three criteria: valid, practical and effective. However, in this development research, it is only at the stage of measuring the level of validity and practicality of the LKS. To measure the LKS and research instruments' validity, validation sheets were given to two expert validators, namely mathematics education lecturers and mathematics teachers at SMA Laboratory, State University of Malang. Meanwhile, a student response questionnaire was used to measure the practicality of the developed LKS.

After the preparation of the LKS to be developed is completed. The LKS is continued with the validation stage, which aims to determine the level of validity of the LKS developed so that it is suitable for use in learning. At this stage, the validator provides several suggestions to improve the developed LKS. The trial phase was carried out at the Laboratory High School, the State University of Malang, with as many as 3 test subjects. In contrast, the practicality test was carried out after the learning was completed by providing a student response questionnaire to the test subject.

The data analysis technique used to calculate the results of the validity and practicality test of the LKS developed was adapted from the average analysis technique in Hobri (2010: 53). The average value is determined based on all aspects contained in the validation sheet and student response questionnaires using the formula:

$$I_i = \frac{\sum_{j=1}^{n} V_{ji}}{n} \quad (1)$$

Information:

Ii = average result of LKS validation/student response questionnaire and all subjects for all indicators

Vji = jth validator/student value data against the i-th indicator

n = number of validators/students

Revisions are made if the validation scores/student responses are lacking and the worksheets developed need to be revised. The revision of the LKS was carried out on the parts that experienced deficiencies by taking into account the suggestions from the validator and the test subjects after the trials.

RESULTS AND DISCUSSION

The following presents the results of data analysis of the results of the validity test conducted by the validator and the practicality test conducted by the students.

Table 1. Results of LKS Validity Test by Validator

No	Apect	Level	Criteria	Description
1	Relevance	3,3	Valid	No Revision Needed
2	Accuracy	3,7	Valid	No Revision Needed
3	Contextual learning	3,1	Valid	No Revision Needed
4	Evaluation	3	Valid	No Revision Needed

In Table 1, it can be seen that overall, every aspect of the validity criteria for the LKS is valid and does not need to be revised, with an average score of 3.3. Therefore, the worksheets developed by researchers can be used as teaching materials in learning Arithmetic and Geometric Sequences. Nevertheless, the researcher still made a few revisions based on the suggestions given by the validator. At the time of the trial run, the answers given by students were almost close to the answers expected because they had passed the validation test. The results of the practicality test of the LKS developed from the results of filling out the questionnaire given to the test subject. Questionnaires were given to the test subjects after the learning process with the developed LKS was completed.

Table 2. Practicality Test Results of LKS After Trial

No	Apek	Level	Criteria	Descriptions
1	This arithmetic and geometric sequence worksheet helps me understand the material for arithmetic and geometric sequences	3,3	Practical	No Revision Needed
2	This arithmetic and geometry worksheets motivates me to study arithmetic and geometric sequences	3,2	Practical	No Revision Needed
3	The physical appearance of this arithmetic and geometric sequence worksheet is interesting	3,2	Practical	No Revision Needed
4	The material and illustrations of this arithmetic and geometric sequence worksheet are quite clear and easy to understand	3,	Practical	No Revision Needed
5	The material and activities of students in this arithmetic and geometry worksheet are related to everyday life	3	Practical	No Revision Needed
6	The pictures contained in this arithmetic and geometric sequence worksheet are interesting and provide new knowledge	3,1	Practical	No Revision Needed
7	The learning activities contained in the arithmetic and geometric sequence worksheets help to master the learning material	3,1	Practical	No Revision Needed
8	The steps in this arithmetic and geometric sequence worksheet are clear and easy to understand	3	Practical	No Revision Needed
9	The questions contained in the LKS for arithmetic and geometric sequences are easy to understand and help understand concepts	3,2	Practical	No Revision Needed
10	Student activities and practice questions contained in this arithmetic and geometry worksheet help to improve understanding of the material being studied	3	Practical	No Revision Needed
11	Learning by using LKS arithmetic and geometric sequences is fun	2,8	Not Practical	No Revision Needed
12	The language used in this arithmetic and geometric sequence worksheet is simple and easy to understand	3	Practical	No Revision Needed
13	Learning by using this arithmetic and geometric sequence worksheet helps me to study independently or in groups	3,2	Practical	No Revision Needed

Overall, the LKS teaching materials developed have reached the criteria to be considered practical because they get an average score of 3. However, one point from the student response questionnaire scores less than 3, so it still needs to be revised from these points. This means that the developed worksheets are suitable for learning Arithmetic and Geometric Sequences material, but some revisions still need to be made. After the learning process using the developed LKS, the researchers tested the effectiveness of the developed LKS by giving evaluation tests to students to find out how far the success of the LKS is in improving student learning outcomes.

Overall, the developed worksheets have met the effectiveness criteria, and this can be seen

from the students' initial classical completeness criteria, which only reached 25%; table 3 shows the results of student evaluation tests after learning using LKS. the data above shows an increase in student learning outcomes which reached 77%.

Table 3. Student Evaluation Test Results

Trial Subject	Students' Score	Completeness Criteria
M1	70	Complete
M2	53	Not finished
M3	70	Complete
M4	90	Complete
M5	50	Not finished
M6	70	Complete
M7	85	Complete
M8	95	Complete
M9	80	Complete
M10	40	Not finished
M11	80	Complete
M12	90	Complete
M13	70	Complete
M14	90	Complete
M15	55	Not finished
M16	85	Complete
M17	65	Not finished
M18	75	Complete
M19	75	Complete
M20	90	Complete
M21	70	Complete
M22	90	Complete
M23	85	Complete
M24	70	Complete
M25	80	Complete
M25	85	Complete
M27	55	Not finished
M28	70	Complete
M29	70	Complete
M30	55	Not finished
M31	-	-
M32	43	Not finished
M33	70	Complete
M34	75	Complete
M35	80	Complete
M36	95	Complete

Student Worksheet (LKS) is a teaching material in the form of sheets containing tasks in the form of questions that can guide students to gain new knowledge that refers to an essential competency that students must achieve. Several types of worksheet development are based on the purpose of making it (Prastowo, 2014). The purpose of developing LKS with a contextual approach to the material of arithmetic and geometric sequences is to help students and guide students to find a concept of arithmetic and geometric sequences.

The worksheet developed by the researcher refers to Basic Competencies 3.8 Analyzing sequences based on interactive and recursive patterns, especially those that include arithmetic and geometric sequences and 4.8 Using arithmetic or geometric sequence patterns to present and solve contextual problems. The

researcher has set ten indicators, as presented in Figure 1 below.

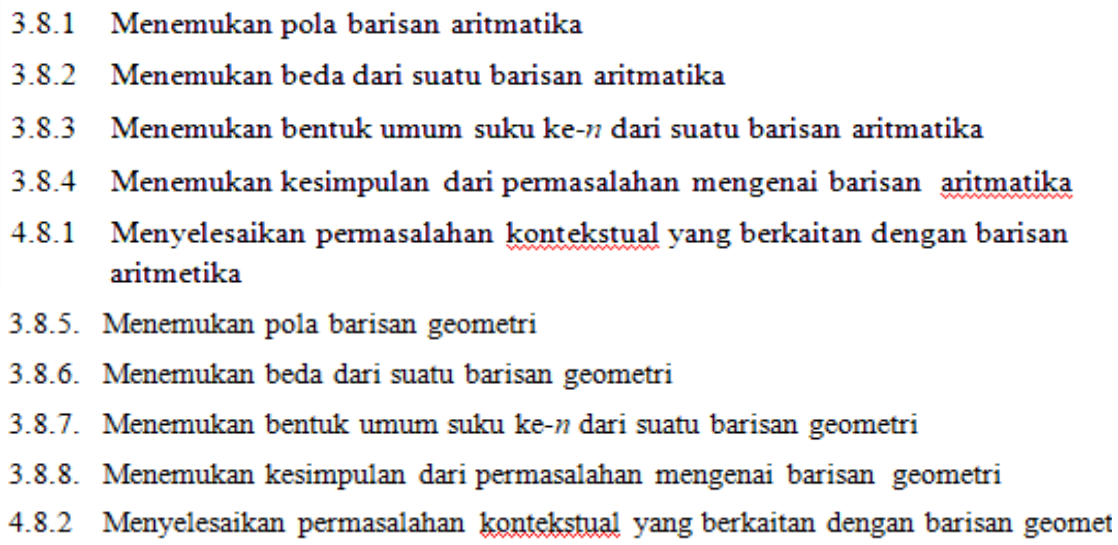


Figure 1 Learning Indicators in LKS

There are four problems given in the developed LKS. Two problems refer to arithmetic sequence indicators: 3.8.1, 3.8.2, 3.8.3, 3.8.4, and 4.8.1. The following two problems relate to geometric sequence indicators: 3.8.5, 3.8.6, 3.8.7, 3.8.8, and 4.8.2. The problems in the LKS carried out by students are related to the characteristics of contextual learning itself. There are seven learning characteristics with a contextual approach applied in the developed worksheets. Learning in real-life settings where the learning process is carried out in an environment related to the real world, where students are taught to build their knowledge with things that occurs in real life or the daily life of the students themselves, meaningful learning is where learning that occurs is carried out by providing knowledge, tasks and treatments that have benefits for the students themselves, learning in groups where learning is done in groups, exchange of ideas and discussion between students and other students, learning by doing where students learn from the experience gained in the learning process, they are learning to know each other deeply, where the learning process provides opportunities for students to understand the knowledge gained internally.

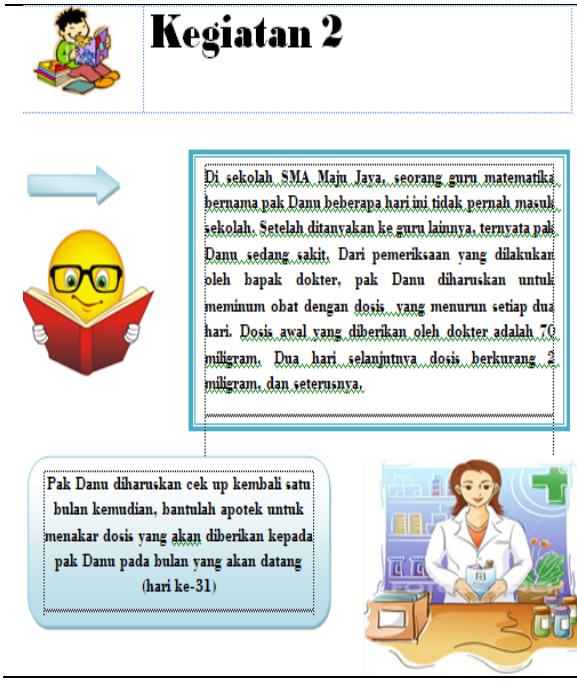
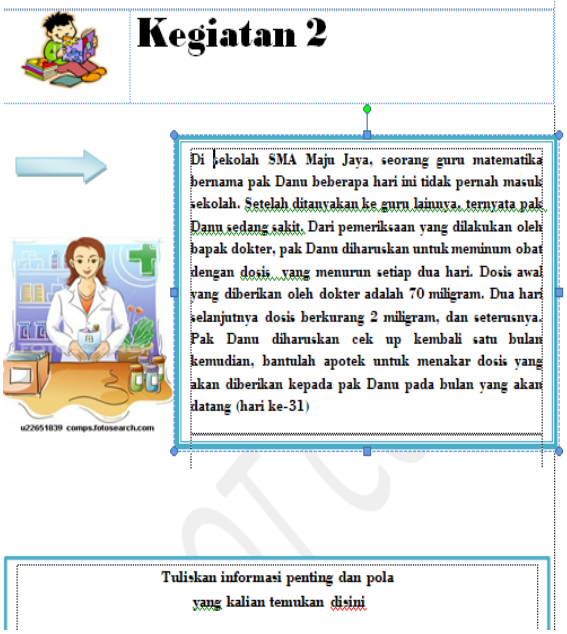
Deeper, (6) Learning to ask, to inquiry, to work together where contextual learning is carried out actively, creatively, productively, and prioritizes collaboration between students so that students can find their concepts from learning, (7) Learning as an enjoyable activity where learning is carried out in situations and conditions that are pleasant for students. The researchers conducted three trials after preparing the LKS with a contextual approach to the Arithmetic and Geometric Sequences material was completed. The trials carried out tested the practicality test's validity and effectiveness of the developed LKS. The validity test was carried out with two validators: a mathematics education lecturer and a high school mathematics teacher with two years of teaching experience.

The results of the LKS validity test showed that the developed LKS had met the validity criteria with a validity level of 3.3. Therefore, it can be said that the LKS developed can be used as one of the teaching materials used in the learning process on Arithmetic and Geometric Sequences and can improve student learning outcomes. Nevertheless, the researcher continued to make revisions based on the suggestions given by the validator. In the following, several revisions were made based on suggestions from the validator. The test subject completed the practicality test by filling out a student response questionnaire. Students filled out student response questionnaires after learning using the developed LKS was completed. The results of the practicality test show that the worksheets developed are included in the practical category with a practicality level of 3.1.

Therefore, the LKS developed can be used as teaching material in the learning process of Arithmetic and Geometry Sequence Materials. The effectiveness test is carried out by giving an

evaluation test to the test subject after learning using the developed LKS. The effectiveness test results show that the developed worksheets - have met the effectiveness criteria because they have reached the classical completeness criteria, which is 77%.

Table 3 Revision Results Based on Suggestions from the Validator

Before Revision	After Revision
	

CONCLUSION

LKS that has been fully developed has a structure based on creative guidelines for making innovative teaching materials (Prastowo, 2008), namely making LKS titles, instructions for using LKS, essential competencies or basic materials, supporting information, tasks or work steps. The LKS developed also fulfils seven criteria for contextual learning, namely Learning in real life, Meaningful learning, learning by doing, namely, in grub, to know each other deeply, as an enjoyable, to ask, to inquiry, and to work together. Based on the validation data analysis results by two validators, the LKS developed can be said to be valid with a validity level of 3.3. This means that the worksheets' suitability with the seven contextual learning criteria is suitable. After the validation test was carried out, the worksheets were tested on 36 class XI SMA Laboratories State University of Malang students. The test results said that the developed worksheets received a positive response from students and were practically used in direct learning with a practicality level of 3. Overall, it can be concluded that the LKS developed is a valid and practical LKS so that it is suitable to be used as an alternative teaching material that can be used in arithmetic and geometric sequences, both in classroom learning and as independent teaching materials for students. In addition to the practicality test, the LKS is also tested for its effectiveness by giving evaluation tests to the test subjects after learning the developed LKS. From the results of the trial, it was found that student learning outcomes increased from 25% to 77%.

REFERENCES

Borg, W & Gall, M. (1989). Education research. New York: Longman.

Fauzan, Ahmad. 2013. Pengaruh Pendekatan RME dan Kemandirian Belajar Terhadap Kemampuan Matematis Siswa. Prosiding Seminarata FMIPA Universitas Lampung, 2013. Email: ahmad_fz@yahoo.com.

Johnson, E. B. (2009). Contextual teaching and learning: What it is and why it's here to stay (Terjemahan Ibnu Setiawan). Bandung: MLC

Lamapaha, F, Y. (2017). *Pengembangan Lembar Kerja Siswa Berbasis Kontekstual Berorientasi Penalaran Saintifik*. Permalink/DOI: DOI:

http://dx.doi.org/10.21831/jpms. v5i1. 13541

Lavasani, M. G. and Khandan, F. (2011) ' The Effet of Cooperative Learning on Mathematics Anxiety and Help Seeking Behavior'. Procedia- Social and Behavioral Sciences, 15, pp. 271-276. Doi:10.1016/j.sbspro.2011. 03.085

Laili, H. (2016). Keefektifan pembelajaran dengan pendekatan CTL dan PBL ditinjau dari motivasi dan prestasi belajar matematika. PYTHAGORAS: Jurnal Pendidikan Matematika, 11 (1), 25 – 34. doi:http://dx.doi.org/10.21831/pg.v11i1. 967

Mendikbud. (2014). Peraturan Menteri Pendidikan dan Kebudayaan Nomor 103, Tahun 2014, tentang pembelajaran pada pendidikan dasar dan pendidikan menengah: Pedoman pelaksanaan pembelajaran.

NCTM. 2000. Principles and Standars for School Mathematics. United State of America. The National Council of Teacher of Mathematics.

NCTM. 2000. A Teacher's Guide to Reasoning and Sense Making. United State of America. The National Council of Teacher of Mathematics.

Nieveen, Nienke. 1999. Design Approaches And Tools In Education And Training. ICO: Netherlands

Prastowo, Andi. 2012, Panduan Kreatif Membuat Bahan Ajar Inovatif. Yogyakarta: Diva Press.

Safford-Ramus, K., Misra, P. K., & Maguire, T. (2016). *The Troika of Adult Learners, Lifelong Learning, and Mathematics*. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-32808-9

Sears, S. 2003. Introduction *to Contextual Teaching and Learning*. Indianan : Phi Delta Kappa Educational Foundation Bloomington

Syaodih, N. (2015). Metode penelitian pendidikan. PT Remaja Rosdakarya Offset.

Tegeh, I. M, dkk. 2014. *Model Penelitian Pengembangan.* Yogyakarta : Graha Ilmu

Ying. B. et al. (2017). ' Classroom Quality and Chinese Preschool Children's Approaches to Learning ', *Learning and Individual Differences*, 54, pp. 51-59. Doi: 10.1016/j. lindif.2017.01.007

Yuwono, Ipung. 2012. *Peran Pendidikan Matematika Dalam Membentuk Karakter Bangsa*. Makalah Seminar Nasional Pendidikan Matematika.