Pengembangan Perangkat Pembelajaran Matematika SMP menggunakan Pendekatan Realistic Mathematics Education pada Materi Relasi dan Fungsi

by Noviani Student

Submission date: 05-Oct-2020 11:39AM (UTC+0900)
Submission ID: 1405343456
File name: CT_2New_Template_Jurnal_MaPan_-_English_-_Copy_-_Copy.docx (425.58K)
Word count: 3100
Character count: 16816

MaPan : Jurnal Matematika dan Pembelajaran
p-ISSN: 2354-6883 ; e-ISSN: 2581-172X
Volume 8, No 2, Dec 2020 (1-6)
DOI: https://doi.org/10.24252/mapan.2020v8n2a1

THE DEVELOPMENT OF MATHEMATICS LEARNING TOOLS USING REALISTIC MATHEMATICS EDUCATION APPROACH TO RELATIONS AND FUNCTIONS

Julia Noviani[1)], Firmansyah[2)]
[1,2] Program Studi Tadris Matematika, Institut Agama Islam Negeri Takengon
[1,2] Jln. Yos Sudarso, Takengon, Aceh Tengah
Email: juliaanoviani@gmail.com[1)], fmanb88@gmail.com[2)]

Abstract:

This study aims to produce learning tools using the Realistic Mathematics Education approach on relation and function material. This type of research uses the Plomp development model which consists of three phases, namely the initial investigation phase, the development or prototyping phase and the assessment phase. The research subjects were grade VIII students of SMPN 2 Takengon with instruments in the form of expert validation sheets, practicality assessment sheets and effectiveness assessment sheets. The resulting tools include lesson plans, student books, teacher books, and worksheets. The average assessment on the four aspects of the RPP is 3.89 with valid criteria. The average assessment of the three aspects of the teacher's book is 3.98 with valid criteria. The average assessment of three aspects of the student book is 3.97 with valid criteria. The average assessment of two aspects on the LKS was 3.75 with valid criteria. Learning implementation 96.86% and carried out well. The teacher's response shows that on average 82% of the aspects of the RPP assessment are responded positively by the teacher. The response of students to student books was obtained by 83.2% of students who gave positive responses to student books and 82.6% of students who gave positive responses to student worksheets. The learning outcomes of students obtained a classical average value of 74.2. The results of validation and testing of learning tools show that the tools meet the criteria of learning tools developed referring to valid, practical, and effective.

Keywords: Development, Learning Tools, Realistic Mathematics Education (RME) Approach

PENGEMBANGAN PERANGKAT PEMBELAJARAN MATEMATIKA MENGGUNAKAN PENDEKATAN *REALISTIC MATHEMATICS EDUCATION* PADA MATERI RELASI DAN FUNGSI

Abstrak:

Penelitian ini bertujuan untuk menghasilkan perangkat pembelajaran menggunakan pendekatan *Realistic Mathematics Education* pada materi relasi dan fungsi. Jenis penelitian ini menggunakan model pengembangan Plomp yang terdiri dari tiga fase yaitu fase investigasi awal, fase pengembangan atau pembuatan protipe dan fase penilaian. Subjek penelitian adalah siswa kelas VIII SMPN 2 Takengon dengan instrumen berupa lembar validasi para ahli, lembar penilaian kepraktisan dan lembar penilaian keefektifan. Perangkat yang dihasilkan meliputi RPP, buku siswa, buku guru,

dan LKS. Rata-rata penilaian pada empat aspek pada RPP adalah 3,89 dengan kriteria valid. Rata-rata penilaian tiga aspek pada buku guru adalah 3,98 dengan kriteria valid. Rata-rata penilaian tiga aspek pada buku siswa adalah 3,97 dengan kriteria valid. Rata-rata penilaian dua aspek pada LKS adalah 3,75 dengan kriteria valid. Keterlaksanaan pembelajaran 96,86% dan terlaksana dengan baik. Respons guru diperoleh bahwa rata-rata 82% aspek penilaian RPP direspons positif oleh guru. Respons peserta didik pada buku siswa diperoleh 83,2% peserta didik yang memberikan respons positif terhadap buku siswa dan 82,6% peserta didik yang memberikan respons positif terhadap LKS. Hasil belajar peserta didik diperoleh nilai rata-rata klasikal 74,2. Hasil validasi dan uji coba perangkat pembelajaran menunjukkan perangkat memenuhi kriteria perangkat pembelajaran yang dikembangkan mengacu yaitu valid, praktis, dan efektif.

Kata kunci: Pengembangan, Perangkat Pembelajaran, Pendekatan *Realistic Mathematics Education (RME)*

How to Cite: Noviani, J., & Firmansyah. (2020). The Development of Mathematics Learning Tools using Realistic Mathematics Education Approach to Relation and Functions. *MaPan: Jurnal Matematika dan Pembelajaran*, *8*(2), xx-xx. https://doi.org/10.24252/mapan.2020v8n2a1.

INTRODUCTION

Mathematics is one of the subjects that must be taken by students at the SD, SMP, and SMA education levels. Mathematics is recognized as a very useful field of study because it is applied to other subjects (Inglis & Attridge, 2016). Learning mathematics can develop and hone general skills, such as logical thinking, the ability to analyze problems based on assumptions, and an awareness of how underlying assumptions can influence analytical conclusions or think (Inglis & Attridge, 2016). However, many students consider mathematics to be a difficult subject to understand. Common stereotypes about math are difficult and boring (Hall & Suurtamm, 2020). Students who find it difficult to understand mathematics consider mathematics to be a worrying specter.

One research study states that teachers must have a meaningful learning concept, meaningful assignments that are relevant to students' lives so that mathematics is not boring for students (Khoshaim, 2020). The role of the mathematics teacher is to provide meaningful mathematics teaching, not only teaching mathematics based on rules of concepts and procedures (Aytekin & Şahiner, 2020). The teaching of mathematics is not only oriented to basic principles and techniques, but also to its application in certain contexts (Gil-Doménech & Berbegal-Mirabent, 2020). Because of this, meaningful

mathematics teaching is an important virtue that mathematics teachers must apply.

Based on the observations of researchers at SMPN 2 Takengon, mathematics learning at the school is still teacher-centered. Teachers still use the lecture method in the learning process and students only listen to and record explanations from the teacher. Then when the teacher asked a question, only one and two students answered, the other students just kept quiet. From the results of these observations, the researcher observed that student activities became passive during the learning process. Passive students will position themselves as objects that only wait and receive information from educators or teachers (Wibowo, 2020). In addition, researchers also found mismatches in the application of learning methods to lesson plans and conditions in the field. The method to be used in the learning process as outlined in the lesson plan is the discussion and question and answer method, but the fact is that the teacher does not apply this method, the teacher only uses the lecture method.

Learning approach that focuses on meaningful learning is Realistic Mathematics Education (RME). RME was developed by a group of mathematicians since 1971 at Utrecht University in the Netherlands. Indonesia has adopted RME since 1994 which was originally chaired by Professor Sembiring from the Bandung Institute of Technology (Zulkardi et al., 2020). In Indonesia, RME is better known as Indonesian Realistic Mathematics Education (PMRI). The main objective of the RME approach is to apply real-world problems in the mathematics learning process so that learning activities are inspiring and meaningful for all students (Zulkardi et al., 2020). RME principle emphasizes that the students actively in the learning process, students dominating the learning activities and student learning activities close to the students real-life problems (Ndiung, 2020). Learning mathematics that is inspiring and meaningful for students will help students deal with problems found in everyday life.

The RME approach applied in schools is recognized as one of the means providing the best and most detailed elaboration of a problem-based approach (Hadi, 2002). RME also focuses on the process of skills when doing mathematics that leads students to solve their own problems by utilizing informal knowledge from student life (Gee et al., 2018). The RME approach emphasizes that teachers are actively involved in designing and developing learning materials or tools, implementing strategies that allow students to be more active thinkers in the class, and developing context and teaching materials that are closely related to

the school environment and student interests (Sembiring et al., 2008). Because of this, the development of learning tools using the RME approach is expected to motivate and develop students' interest in learning mathematics. The results of the study stated that the learning materials for mathematics using the RME approach met, the effective criteria so as to improve students' problem solving abilities (Putri et al., 2019). The results of other studies also suggested that learning tools were developed using RME approach valid criteria, practical and effective so that increase students' independence and problem solving skills of students (Hasibuan et al., 2018). The development of learning tools that are arranged must be in accordance with the curriculum, using realistic and contextual problems to help and motivate students. Good learning tools are expected to accommodate the students' mathematics learning process which has been considered difficult by students. In addition, structured and systematic learning tools will facilitate mathematics teachers in the learning process (Amin, 2014)

The development of quality learning device can produce a good learning model development (Fauzi & Waluya, 2018). In addition to creating good learning and helping students, good learning tools help teachers in the process of delivering indicators that must be understood by students in an interesting way so that it is more effective and efficient (Destino & Bharata, 2019). Based on the description above, it is necessary to develop a learning device using RME approach. Learning tools that will be developed include lesson plans, worksheets, student books and teacher books. The purpose of this study is to develop a learning device using an RME approach to the material relations and functions and to describe the quality of the learning device from the aspect of validity, practicality and effectiveness.

METHODS

This research is a development research using the Plomp development model. The Plomp model is seen as more flexible than other models, for example the Four-D model because each step contains development activities that can be adjusted according to the characteristics of the research (Rochmad, 2012). The Plomp development model consists of an initial investigation phase, a development or prototyping phase, and an assessment phase (Plomp & Nieveen, 2013). This research was conducted at SMPN 2 Takengon, Aceh Tengah. Quality learning tools must include criteria that refer to validity, practicality, effectiveness (Nieveen, 1999). The quantitative data from the

validation results were analyzed by determining the average score of the validator's assessment (*Ii*) on each indicator and then determining the validity score (*Vs*) by calculating the average *Ii* on all assessment indicators.

The validity criteria used are based on the following validity score criteria.

Table 1. Criteria for the validity score

Interval *Vs*	Criteria
$4 < Vs \leq 5$	Highly Valid
$3 < Vs \leq 4$	Valid
$2 < Vs \leq 3$	Less Valid
$1 \leq Vs \leq 2$	Invalid

(Mauliana et al., 2018)

Learning tools are declared valid if at least be in a valid category.

RESULTS AND DISCUSSION

Based on the stages of the Plomp development model, the first phase is the initial investigation. In this phase, conducted a needs analysis to assess the needs in the development of learning tools. The analysis at this stage includes the curriculum, concepts, and characteristics of students.

In the development or prototyping phase, the Realistic Mathematics Education (RME) based learning device prototype is designed. Learning tools developed include lesson plans, worksheets, student books and teacher books. At this stage also tests the validity of the learning tools are developed.

Phase assessment performed limited testing on 25 students of class VIII SMPN 2 Takengon. At this stage the practicality test and effectiveness test were carried out.

1. Validity of Learning Tools

Analysis of the validity of the learning device aims to determine the extent to which the learning device developed lesson plan and worksheets valid criteria based on expert judgment using the validation sheet (Marlinda & Wijaya, 2018). In the development phase of evaluation by the two (2) experts and practitioners in each of the learning tools. The quantitative assessments of the two experts were averaged to determine the validity score (*Vs*). The *Vs* score is categorized according to Table 1., and several revisions were made based on the qualitative assessment of the validator for each of the learning tools described next.

The Validity of Lesson Plan

Aspects that are assessed in validating the lesson plan are curriculum, material, language, and time allocation. The average assessment of four aspects of the RPP is 3.89 with valid criteria. Although the RPP assessment criteria are valid, the validator provides suggestions for improvement. The validator's suggestion is that because learning uses the Realistic Mathematics Education (RME) learning approach, the RPP needs to bring up an activity level design based on the RME principle. The activity levels referred to include: 1) situation; 2) model of; 3) model for; 4) formal knowledge.

Table 2. Results of the revision of lesson plan

Revision	Validators' Suggestions
The RME stage is emphasized in phase 2: the presentation of the material (STAD model) in the RPP includes 1. *Situation;* 2. *Model of;* 3. *Model for;* 4. *Formal knowledge*.	It is necessary to emphasize each stage of the RME approach in the learning phase planned in the lesson plan.

Based on the validator's suggestion, the following are examples of improvements to the first meeting lesson plan.

Table 3. The lesson plan for first meeting

Phase 2: Presenting the Material		
Learning Objectives	**Mental Activity**	**Time Allocation**
Through this activity, students connect members to the two sets (real context) given and construct sentences about the relationships formed. (*Situation*)	Connect the members on the left with the members on the right with arrows (→). Write down the name of the relationship you made in sentence form (*Tuliskan apa nama hubungan yang kalian buat dalam bentuk kalimat*)	15

Figure 1. Diagram 1

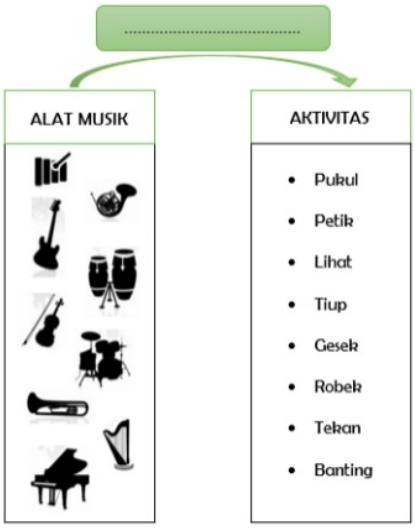
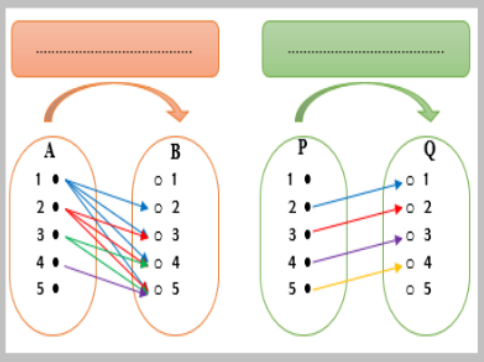
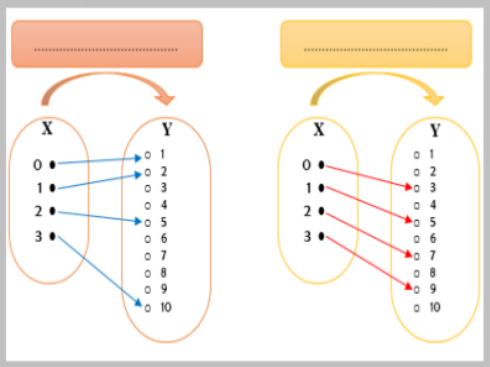


Figure 2. Diagram 2

Through this activity, students are able to develop knowledge about relations in a mathematical context, in this case involving a set of numbers (*Model of*)	Define the relationship what you observe on the sets of the following numbers (*Rumuskan hubungan apa yang kalian amati pada himpunan-himpunan bilangan berikut ini:*)  Figure 3. Diagram 3  Figure 4. Diagram 4	15
Through this activity, the student is able to determine the Y members corresponding to the members of X based on a predetermined relationship (*Model for*)	Find the member of set Y (y) which is the equivalent of the member of set X (x) based on the relation X→Y that is determined as follows: (X and Y are sets of real numbers) (*Tentukan anggota himpunan **Y** (y) yang merupakan padanan dari anggota himpunan **X** (x) berdasarkan relasi **X→Y** yang ditentukan berikut:*) (***X** dan **Y** adalah himpunan pada bilangan Real*) 1. Relation: y one is less than three times x (*Relasi: y satu lebih kecil dari tiga kali x*) [$y = 3x - 1$] a) x = -4 → y = ... b) x = -2 → y = ...	15

	c) x = 3 → y = ... d) x = 5 → y = ... e) x = 9 → y = ... 2. Relation: y is the square of x minus 1 (*Relasi: y merupakan kuadrat dari x dikurang 1*) [$y = (x - 1)^2$] a) x = -2 → y = ... b) x = -1 → y = ... c) x = 0 → y = ... d) x = 2 → y = ... e) x = 7 → y = ...	
Through this activity, students are able to formulate set relations in the form of formal mathematics (*Formal knowledge*)	If (x, y) expresses the equivalent of the member of the set X (x) to the member of the set Y (y) by a relation, express the relation X→Y in terms of the equation (*Jika (x, y) menyatakan padanan anggota himpunan **X** (x) dengan anggota himpunan **Y** (y) oleh suatu relasi, nyatakan relasi X→Y dalam bentuk persamaan:*) 1. X→Y : {(-3, 3), (-2, 2), (-1, 1), (0, 0), (1, -1), (2, -2), (3, -3)} *y* = ... 2. X→Y : {(0, -4), (1, 1), (2, 6), (3, 11), (4, 16), (5,21)} *y* = ... 3. X→Y : {(-2, 8), (-1, 5), (0, 2), (1, -1), (2, -4)} *y* = ... 4. X→Y : {(0, -1), (1, 0), (2, 3), (3, 8), (4, 15), (5, 24)} *y* = ...	15

The Validity of Teacher Books, Student Books, and Worksheets

The aspects that are assessed in validating the teacher's and student's books are structure, material, and language. The average rating for three aspects of the Teacher's Book is 3.98 with valid criteria. The average assessment of three aspects of the Student Book is 3.97 with valid criteria. The aspects assessed on the worksheets are content and language. The average assessment of two aspects on the worksheets is 3.75 with valid criteria. So overall acquired learning device with a valid category and can be used after minor revisions. Qualitative assessments and revisions of teacher books, student books, and student worksheets include adjustments with revisions to the lesson plans. The adjustment in question is to present teaching materials with the RME activity level: 1) situation; 2) model of; 3) model for; 4) formal knowledge. Based on the validation results above, improvements were made and continued with the trial phase. The testing of the device was carried out in class VIII4 for four meetings.

2. Practical Learning Tools

The practicality of the device is seen from the feasibility of learning, teacher responses, and students at the trial stage. Learning implementation is obtained from observing, learning activities at four meetings. The learning used uses the RME approach using the STAD type cooperative learning model. The observations obtained at the first meeting of learning 91.65% accomplished. The second meeting 100% done learning, learning third meeting 100% successful, and the fourth meeting of the learning 95.82% accomplished. Overall adherence to the learning gained 96.86% and is considered to have learned by using learning tools developed performing well.

Teacher's response to the lesson plan shows that on average 82% positive response assessment aspects of lesson plan by two teachers. As for the response to the teacher's book, it was found that 81% of the assessment aspects were responded positively by two teachers. The response of students to student books was obtained 83.2% of students who gave positive responses to student books and 82.6% of students who gave positive responses to student worksheets. From the response data, it can be concluded that in general the responses of teachers and students to learning tools are positive. Because learning activities are carried out well and get a positive response, the learning device is considered to meet the criteria of practicality.

3. Effectiveness of Learning Tools

The effectiveness of the device is seen from the learning outcomes achieved by students after participating in learning with the tools developed. The learning outcomes of students obtained a classical average value of 74.2. There are 12% of students who do not meet the minimum learning completeness and the remaining 88% meet the minimum learning completeness. From these results, the learning device is considered effective. The effectiveness of learning tools is also influenced by the success of teachers in teaching mathematics. The ability of mathematics teachers in managing learning activities, having knowledge and skills about mathematics and RME and applying them in the learning process can make mathematics learning meaningful for students (Fauzi & Waluya, 2018).

CONCLUSION

This research produces mathematics learning tools for junior high school on relation and function materials using the Realistic Mathematics Education (RME) approach. The resulting tools include lesson plans, student books,

teacher books, and worksheets. The results of validation and testing of learning tools show that the tools meet the criteria of learning tools developed referring to valid, practical, and effective.

Pengembangan Perangkat Pembelajaran Matematika SMP menggunakan Pendekatan Realistic Mathematics Education pada Materi Relasi dan Fungsi

ORIGINALITY REPORT

18%	%	%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Universitas Islam Negeri Sumatera Utara Student Paper	2%
2	Mauliana, M Ikhsan, M Subianto. "Development of Learning Tool with Contextual Teaching and Learning (CTL) Approach to Improve Student Mathematical Connection Ability", Journal of Physics: Conference Series, 2018 Publication	1%
3	D. J. Collier, I. L. Beales. "Drinking among medical students: a questionnaire survey.", BMJ, 1989 Publication	1%
4	K Aini, Hobri, A C Prihandoko, D Yuniar, A K A Faozi, Asmoni. "The students' mathematical communication skill on caring community-based learning cycle 5E", Journal of Physics: Conference Series, 2020 Publication	1%

5	digilib.uinsby.ac.id Internet Source	1%
6	Nesfitri Legahati, Armiati. "Preliminary research development of professional competency-based mathematics learning devices in the culinary expertise program", Journal of Physics: Conference Series, 2019 Publication	1%
7	A Husaini, H Syarifuddin. "The Validity Of Learning Devices Of Cooperative Models Based On Blended Learning To Improve Learning Outcomes", Journal of Physics: Conference Series, 2020 Publication	1%
8	Advanced mathematics 1, 1980. Publication	1%
9	Shulha Kynanda Putri, Hasratuddin Hasratuddin, Edi Syahputra. "Development of Learning Devices Based on Realistic Mathematics Education to Improve Students' Spatial Ability and Motivation", International Electronic Journal of Mathematics Education, 2019 Publication	1%
10	Yerizon Yerizon, Yulia Utami Putri, Edwin Musdi, Dony Permana. "EFEKTIVITAS PERANGKAT PEMBELAJARAN MATEMATIKA	1%

BERBASIS PENDEKATAN CONTEXTUAL TEACHING AND LEARNING TERHADAP KEMAMPUAN KOMUNIKASI MATEMATIS", AKSIOMA: Jurnal Program Studi Pendidikan Matematika, 2020
Publication

---

11 E Afriani, A Asmar. "The development of device learning based on contextual teaching and learning improve mathematical communication skills class VII", Journal of Physics: Conference Series, 2020 — 1%
Publication

---

12 W Doli, A Armiati. "Development of Mathematics Learning Tools Based on Realistic Mathematics Education for Vocational High School Students", Journal of Physics: Conference Series, 2020 — 1%
Publication

---

13 media.neliti.com — 1%
Internet Source

---

14 Elsa Farapatana, Yunita Septriana Anwar, Abdillah Abdillah. "Pengembangan Komik Matematika dengan Metode Preview, Question, Read, Reflect, Recite, & Review (PQ4R) Pada Materi Lingkaran Kelas VIII SMP", JTAM | Jurnal Teori dan Aplikasi Matematika, 2019 — 1%
Publication

---

15 E Gradini, F Bahri. "Developing mathematics

	teaching tool using ELPSA", Journal of Physics: Conference Series, 2018 Publication	1%
16	M. Rusdi T, Hamsiah Djafar, Nur Khalisah Latuconsina, Idah Suaidah, Megita Dwi Pamungkas, Andi Kusumayanti. "The Learning Tools development of Rectangular and Square Material Oriented toward the Learning Cooperative Setting and included Bruner Theory on Students", Journal of Physics: Conference Series, 2020 Publication	<1%
17	Sudarmiani, A Trilaksana. "Implementation of the scientific approach on social studies learning based on local wisdom through advanced organizer learning models of the students of junior high schools", Journal of Physics: Conference Series, 2020 Publication	<1%
18	Khairina, M Ikhsan, Suhartati. " The validity of vector analysis module using ", Journal of Physics: Conference Series, 2018 Publication	<1%
19	anzdoc.com Internet Source	<1%
20	Submitted to Universitas Negeri Surabaya The State University of Surabaya	<1%

Student Paper

21	darululumjember.blogspot.com Internet Source	<1%
22	Welly Rahmawati, Irwan. "Validation of learning devices guided inquiry-based to increase problem solving ability mathematic participants in class VII SMP", Journal of Physics: Conference Series, 2019 Publication	<1%
23	jurnal.unej.ac.id Internet Source	<1%
24	Novi Indriani, Hongki Julie. "Developing learning trajectory on the circumference of a cycle with realistic mathematics education (RME)", AIP Publishing, 2017 Publication	<1%
25	m.everythingmaths.co.za Internet Source	<1%
26	worldwidescience.org Internet Source	<1%
27	Zulazhari, D Djamas, Yulkifli, Festiyed. "Preliminary study of the use of games interactive multimedia module to increase critical thinking of students in senior high school", Journal of Physics: Conference Series, 2019	<1%

	Publication	
28	research-report.umm.ac.id Internet Source	<1%
29	digilib.unimed.ac.id Internet Source	<1%
30	journal.uny.ac.id Internet Source	<1%
31	S N Ramadhani, I Irwan. "Preliminary analysis on development of mathematics learning tools based on indicators of mathematical communication skills", Journal of Physics: Conference Series, 2020 Publication	<1%
32	D Yuniar, Hobri, A C Prihandoko, K Aini, A K A Faozi. "The analyze of students' creative thinking skills on Lesson Study for Learning Community (LSLC) based on Science, Technology, Engineering, and Mathematics (STEM) approach", Journal of Physics: Conference Series, 2020 Publication	<1%
33	S A Aziz, I Irwan. "Validity Of Mathematical Learning Material Based On Model Eliciting Activities (MEAS) Approach To Improve Mathematical Creative Thinking Skill Of Students", Journal of Physics: Conference	<1%

Series, 2020
Publication

34	A Asmar, A Arnellis, R Sriningsih. "Implementation of the 21st Century Skills to High Order Thinking Students' Mathematical in Senior High School Padang", Journal of Physics: Conference Series, 2020 Publication	<1%

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	Off		