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Research Article

The Guided Inquiry to Improve Students Mathematical Critical Thinking Skills Using Student's Worksheet

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Abstract

In this study, research using guided inquiry was conducted to improve students' ability to think critically. By improving and making the worksheets the students of this research are expected to make it easier to understand a lesson. The development step in this study is to conduct a preliminary study as the first stage, then pre-product planning and development, after which the pretest, product pre-revision and field test are carried out. Data collected in this study was carried out by observation, documentation, interviews, questionnaires and tests. In addition, student worksheets are validated based on media and material, which will be given revisions based on suggestions from the media, matrices, and experts. The participants of this study were students Junior High School of SMP Negeri 30 Bandar Lampung, Indonesia. The final results in this study, showed that the development of guided inquiry based worksheets was able to improve students' critical thinking power, which was obtained from the results of good category values, namely 71.07% on average students in mathematical critical thinking.

Keywords

student's worksheet, guided inquiry, mathematics critical thinking

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Introduction

Mathematics is a basic science that has an important role in the process of human life. In our daily lives we will not be separated from mathematics, from small things to technological developments (Rahman, Abdurrahman, Kadaryanto, & Rusminto, 2015). Mathematics as a universal science underlies the development of modern technology (Prastowo et al., 2019), has an important role in various disciplines and advances human thinking power (Sriyakul et al., 2019). Mathematics is used throughout the world as an important tool in several fields (Kasayanond, Umam, & Jermsittiparsert, 2019), including natural sciences (Abdurrahman Abdurrahman et al., 2019), engineering, medicine, medical, and social sciences (Abdurrahman, Saregar, & Umam, 2018).

Mathematics subjects need to be given to all students to equip students with the ability to think logically(Rahmi Ramadhani, Huda, & Umam, 2019), analytically, systematically, critically, and creatively as well as the ability to work together (Nurulsari, Abdurrahman, & Suyatna, 2017). The ability to think logically, analysis, systematic, critical (Huda et al., 2019), and creative and able to work together will be realized when learning in the classroom goes well(Rahmi Ramadhani, Umam, Abdurrahman, & Syazali, 2019).

Based on the results of preliminary observations that have been made with the seventh grade mathematics teacher in Junior High School of SMP Negeri 30 Bandar Lampung, it is known that there is a problem in the Student Activity Sheet (LKPD) of mathematics students used in learning activities at the school. LKPD used in mathematics learning has not been student-centered(A Abdurrahman, Nurulsari, Maulina, & Ariyani, 2019).

Figure 1.
The Relationship Between Critical and Creative Thinking in Education

Efforts that need to be done so that the ability of students can be better, namely by honing high-level mathematical skills. One of the mathematical abilities included in higher-order thinking skills is critical thinking. There are four reasons raised by(Anwar et al., 2019), regarding the need to be accustomed to developing critical thinking skills, namely: (1) the demands of the times that require citizens to be able to search for, choose, and use information for community and state life; (2) every citizen always faces various problems and choices so that they are required to be able to think critically and creatively(Diani, Herliantari, Irwandani, Saregar, & Umam, 2019); (3) the ability to see things in ways that are different in solving problems(Diani, Irwandani, et al., 2019); and (4) critical thinking is an aspect in solving problems creatively so that students can compete fairly(Sagala, Umam, Thahir, Saregar, & Wardani, 2019) and be able to cooperate with other nations(Saregar et al., 2018).

Critical thinking ability is part of the mathematical thinking skills that every student needs to have in dealing with various problems. One of the causes of students' low critical ability is the assumption of students about mathematics is a difficult lesson(Lestari et al., 2019). The notion that mathematics is a difficult lesson allows students make a mistake in solving the problem. The fact is supported by the many results of research conducted to analyze errors in solving mathematical problems(Habibi et al., 2019). In order for the learning process to be more effective, efficient and attractive, it is by designing and developing learning that is an important part of learning media(Hartinah et al., 2019).

Inquiry has the meaning of participating, or being involved, in asking questions, seeking information, and conducting investigations(Diani, Irwandani, et al., 2019). He added that inquiry learning aims to provide a way for students to build intellectual skills (thinking skills) related to reflective thinking processes. If thinking is the main goal of education, ways must be found to help individuals build that ability(Syazali et al., 2019).

In the inquiry method students are designed to be involved in conducting inquiry(Ratnasari, Tadjudin, Syazali, Mujib, & Andriani, 2018). The model of inquiry teaching is student-centered teaching where the teacher leads in the inquiry learning process(Hartinah et al., 2020). In the learning process through inquiry methods, students are faced with contextual problems that can be seen in their daily lives(Syahrir et al., 2019). In the process of resolving these problems, students are trained to interpret their ideas into mathematical symbols. In the learning process, students work together to discuss to find a solution to the problem presented. After that one group presented the results of the discussion in front of the class and the other groups responded or did the question and answer activities(Syazali, 2015).

The inquiry method that is applied to the mastery of mathematical competencies. From the understanding that must be met to develop the inquiry method, the inquiry method, must be fun and must be able to improve the mastery of mathematical competencies(Nugroho, Putra, Putra, & Syazali, 2017).

Problem of Research

The purpose of this research is to improve students' critical thinking skills by developing guided inquiry-based mathematics LKPD. Other objectives in this study are:

- Knowing how to develop a math LKPD through inquiry methods to improve critical thinking skills.
- Knowing the quality of the LKPD developed to improve the ability to think critically.
- Knowing critical thinking of students by developing LKPD using guided inquiry methods.

Method

Students who have the ability to think critically will always ask themselves in facing all problems to determine the best for themselves. Likewise if students who have critical thinking skills will be imprinted in their character and personality and implemented in all aspects of their lives. Critical thinking ability is nothing but the ability of students to gather various information and then make an evaluative conclusion from various information. So, In this study we are following the steps of collecting data with steps, namely (1) Research and information collecting data (2) Planning, (3) Develop preliminary form of product, (4) Preliminary field testing, (5) Main product revision, (6) Main field testing, (7) Operational product revision, (8) Operational field testing, (9) Final product revision, (10) Dissemination and implementation.This result of study produced a development product in the form of LPKD based on guided inquiry on quadrilateral triangle material to develop students' mathematical critical thinking abilities(Bersin, 2004).

The stages in this development research are analyzing problems, designing products or developing products. Then the validator is qualified and competent in his field, namely material experts and design experts. In this study, the LKPD and Handout were developed. The LKPD and Handout are validated by the validator and teacher. After passing the validation, the LKPD is used in learning activities at Junior High School of SMP Negeri 30 Bandar Lampung. In this research, the researcher aims to produce or develop a product, namely the LKPD in accordance with the guided inquiry method.

The steps or paths in this research and development are limited, that is, only to the revision of the product trial product (step 7), considering the time in developing the LKPD used. In this study, design or product validation was carried

out by a team of experts, educators in the field of study and only a few students. Usage testing is limited, that is, the product trial (initial trial) is only done in one school.

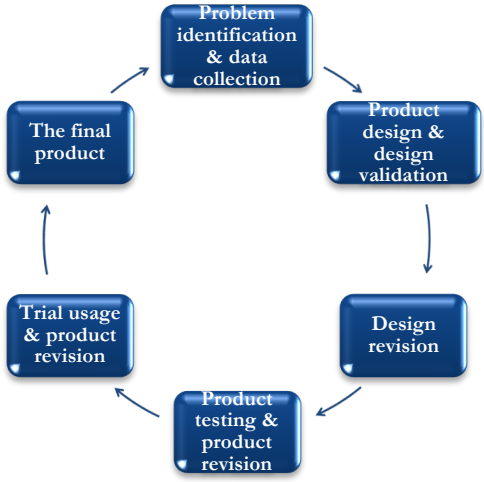

Figure 2
Steps for Research and Development Methods

Participants

This research was conducted in Bandar Lampung Middle School 30 in the even semester of the school year 2017/2018. The subject of the preliminary study and information gathering were teachers who taught mathematics in class VIII, namely Mr. Sayfudin, S.Pd and 7th grade students. Subject validation of LKPD Inquiry in this study were 2 experts consisting of material experts and media experts. Material experts were Dr. Asmiatiwho is a post-graduate lecturer at the University of Lampung, and a media expert, Dr. Herpratiwi, M.Pd who is a postgraduate lecturer at Lampung University.

In addition, the limited trial subjects were 7th grade students who had not yet studied quadrilateral triangles. While for the field test subjects were all (VII.A) grade students as many as 32 students with heterogeneous mathematical abilities.

Data Collection

The procedure for developing research according previous research can be carried out according to the research needs to be carried out(A Abdurrahman et al., 2019). The initial step in conducting a preliminary study and data collection is to analyze the 2017 curriculum manual obtained from one of the teachers who has received training (MGMP) through the math and by accessing it from the internet. In addition, the researchers also reviewed the LKPD that was already available in accordance with the 2013 curriculum, namely the seventh grade publisher LKPD as one of the references for the preparation of LKPD based on guided inquiry

methods, as well as the learning practices of teachers in the classroom. Data collection is done by collecting data on students, classes, and grades of students during class VII SMP which will later be used as the basis for determining research classes at the time of field testing. Literature studies are also carried out to obtain analysis of learning material and review relevant research.

Data Analysis

Data analysis techniques obtained when giving instruments tested in the field there are two, namely data mathematical critical thinking skills and effective learning outcomes. Both are explained as follows:

a. Mathematical Critical Thinking Ability

The post-test results of the students' mathematical critical thinking skills that refer to the indicators that have been made are given a score according to the scoring guidelines. After the critical thinking test we are given the next score that "learning completeness is ideal for each indicator with an ideal minimum criteria of 75%". This means that ideal learning completeness occurs when 75% of all students are said to be complete or get a score above KKM, which is 70. To calculate the percentage of learning completeness(R. Ramadhani & Narpila, 2018), the following formula is used:

$$P = \frac{\text{the number of students who complete } study}{total \quad students} x100\%$$

b. Effectiveness Test Analysis

Effectiveness can be seen from students' post-test scores compared to KKM. The posttest results referred to in this study are scores obtained by students working on test questions given after the end of the learning process. Learning using guided inquiry-based LKPD is said to be effective if at least 75% of the total number of test participants succeed in achieving the KKM that has been set at SMP Negeri 30 Bandar Lampung, which is equal to 75. Determination of the percentage of learning achievement is shown in the following formula(Syazali et al., 2019):

$$P = \frac{f}{F} \times 100\%$$

Information :

P = Percentage of learning completeness
f = Complete number of students
F = Number of students participating in the Post-test

Results and Discussion

Validation by experts is carried out by two people. One of them as a material expert and the other as a media expert. Validation of material experts is carried out by competent parties. LKPD that has been prepared is submitted to the material experts by including the grid and LKPD assessment sheet. The material experts in

this study were Unila postgraduate lecturers, namely Dr. Asmiati, M.Sc. Based on the processing of data from the validation results by material experts, the assessment categories for each component were obtained on a given scale. The assessment categories are shown in **Table 1**.

Table 1.
Assessment Category Components of Material Validation Results

No	Component	Total	Number of Ideal Scores	Rating Category
1	Feasibility of content	28	36	Good
2	Feasibility of presentation	29	36	Very good
3	Guided Inquiry Learning Strategy	19	24	Very good

Based on **Table 1**, this feasibility component gets a maximum score of 28 or 77.78% in four quarters and has good criteria, the feasibility component of presentation gets a maximum score of 29 or 80.56% on a scale of four and has good criteria, while for a guided inquiry learning strategy is 19 or 79.17 on a scale of four with very good criteria. Based on the acquisition of the scores of these three components, LKPD can be used in the field without any revisions.

Table 2.
Assessment Category Components of Media Expert Validation Results

No	Component	Total	Number of Ideal Scores	Rating Category
1	Feasibility of graphics	49	64	Good
2	Language feasibility	27	36	Good

Media expert validation is carried out by competent parties in the graphic field. The LKPD that has been prepared is submitted to media experts by including a grid and LKPD assessment sheet. Media experts in this study are lecturers at Lampung University, namely Dr. Herpratiwi, M.Pd. The results of the assessment conducted by media experts show that it has not shown satisfactory results, especially in the design section. The assessment categories by media experts are shown in **Table 2**.

Based on **Table 2**, the component of graphic feasibility obtained a score of 49 or 76.56% on a scale of four with good criteria. While the score for language feasibility is 27 or 83.33% on a four scale with very good criteria.

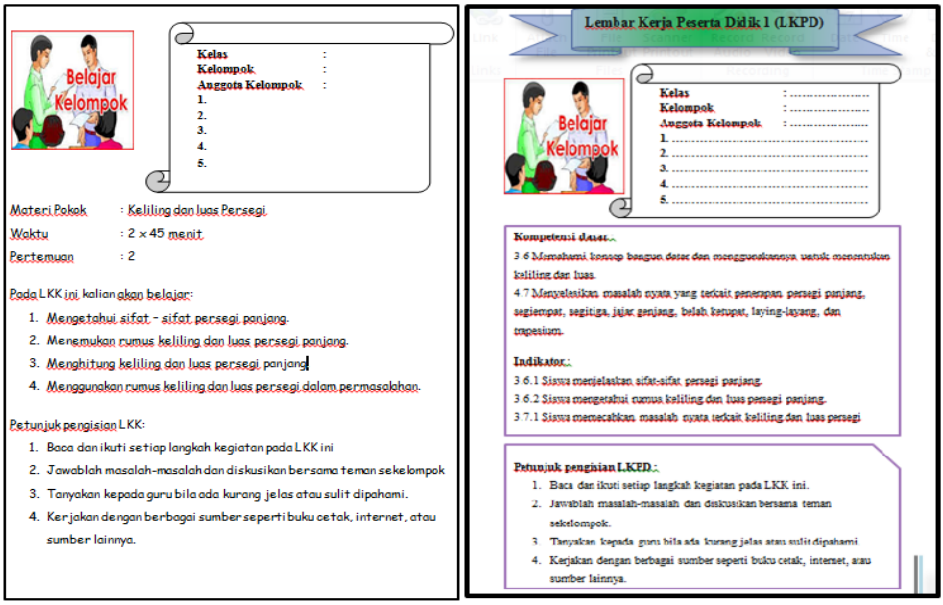

Figure 3
The LKPD 1 Page Used Before Revision and After Revision

In **Figure 3** (before revise) shows that the LKPD that is used has not yet been dispatched about basic competencies and indicators as well as designs that seem sober. In **Figure 3** (after revised) it shows changes in LKPD 1 which have displayed basic competencies and indicators, with a more neat design.

Initial Field Trial

After getting advice from material and media experts, the revised LKPD was then piloted to students. The initial field trial in this study was to provide LKPD to five students with heterogeneous abilities. Two high-ability students, one moderate ability student, and two low ability students. This trial aims to determine the level of readability, understanding, and interest of students towards the LKPD. The implementation of field trials was conducted during six meetings. Each meeting conducted a learning simulation as will be done in the classroom in the field test with the LKPD which is used as the main source of learning.

The instrument used was in the form of a response scale. The components assessed in this stage were the display criteria for the LKPD for presentation of the material, and the benefits of using LKPD for students. Recapitulation of the acquisition of scale scores of students for the initial field trials is explained in **Table 3**.

Table 3.
Recapitulation of Initial Field Scale Test Scores

No	Component	Total	Number of Ideal Scores	Rating Category
1	Display of LKPD	97	300	Good
2	Material presentation	103	200	Good
3	Benefits of LKPD	189	260	Good

Based on **Table 3**, the display component of the LKPD obtained a score of 97 or 69.28% on a scale of four with good criteria. The material presentation component obtained a score of 103 or 71.5% on a four scale with good criteria. While the score for the benefits component of using LKPD is 189 or 72.69% on a four scale with good criteria.

Mathematical Critical Thinking Ability

Test data on critical thinking skills in triangular and rectangular material is obtained through posttest after carrying out learning on the material. Analysis of achievement of indicators of mathematical critical thinking ability of students. The purpose of this analysis is to find out what percentage of indicators of critical thinking skills students achieve after using guided inquiry-based LKPD. **Table 4** presents data on achievement of indicators of students' mathematical critical thinking abilities.

Table 4.
Achievement of Indicators of Mathematical Critical Thinking Ability

No	Indicator	Achievement	Maximum	Percentage
1	Explore	84	144	58,33
2	Identify and establish the truth of the concept	116	144	80,56
3	Generalize	115	144	79,86
4	Classification and resolution	215	288	74,65
	Average			73,35

Table 4 shows the achievement of indicators of students' mathematical critical thinking after using mathematics LKPD based on Guided Inquiry. The percentage of achievement of each indicator of critical thinking has a balanced proportion with an average of 73.35%.

Discussion

Based on calculations in **Table 2**, generally the components of graphics and language already have good criteria, but LKPDs should be revised before being

used in the field. Some suggestions and input given by media experts are as follows:

- Use design drawings related to the material using photos that fit everyday life.
- Improve the form of writing that is by using letter shapes that don't have to be the same.

Use language that is easy for students to understand and relevant to the problem presented.

Phase 2 of the LKPD revision is based on the results of the trial and advice from five selected students. The revision includes the display components of the LKPD and presentation of the material. After testing there are several parts that need to be revised, namely:

- Submission of analyzing the square of the "Square Area" section before revision by moving the square shape to the LKDP page section so that it does not hang to the next page and makes it easier for students to conclude.
- Submission of part-time practice section and in the space to answer is not wide enough so that the researcher changes the form of the question and expands the answer sheet section so that the students' answers are sufficiently wide.

The effectiveness of learning using LKPD is measured through the level of completeness of the results of student posttest at the field test stage compared to the KKM value determined by the school, which is equal to 70. Learning using guided inquiry-based LKPD is said to be effective(Saregar, Latifah, & Sari, 2016) if at least 75% of the students take the KKM(Kusumawati & Nayazik, 2018). This is reinforced by the opinion of (A Abdurrahman et al., 2019)that ideal learning completeness occurs when at least 75% of all students get a score above the KKM(Putra, Nur Kholifah, Subali, & Rusilowati, 2018). Based on the results of the student posttest at the field trial stage, data was obtained that as many as 77.78% succeeded in achieving KKM. This shows that the developed LKPD has met the criteria of effective and feasible as one of the LKPD that can be used in learning in the classroom(Andini & Yunianta, 2018).

Guided inquiry-based Student Worksheets are said to be effective because the learning objectives in the LKPD have been achieved. And the goals that have been achieved, namely students can (1) find the circumference and area of the triangle and solve real problems related to triangles, (2) find formulas around and square area and solve real problems related to square, (3) find the formula around and area rectangle and solve real problems related to rectangles, (4) find the formula around and the parallelogram area and solve real problems(Yuniasti & Wulandari, 2018),

(5) find formulas around and rhombus area and solve real problems related to rhombus, (6) find the circumference formula and kite area and solve real problems related to kites, (7) find formulas around and area of trapezoid and solve real problems related to trapezoid.

In the learning process, students are given an LKPD that is expected to facilitate students' mathematical critical thinking skills(Agus Slamet Susanto, Haninda Bharata, 2018). In this LKPD students are required to work together with their group members, because they have to make several flat-build models then conduct experiments and measurements to answer the hypothetical results(Meriyati, Rizkia Shaulita, 2018). Then the group discusses to find the right answers from the results of their data analysis. From various activities, opinions or discussions and work on students towards the LKPD in the learning process, this LKPD is able to facilitate students' critical thinking skills.

Conclusion

The following are the research conclusions that are based on the results of the research and discussion so it can be concluded

- The steps of developing guided inquiry-based LKPD on a third and square material are carried out by adapting the development research model of Borg and gall, which is limited to the eighth stage. The developed LKPD is the integration of LKPDs with stages of inquiry learning that are systematically designed to facilitate and facilitate students in learning triangular and square material.
- The material and questions have gone through the material expert test process with an assessment reaching 79.17%, thus the LKPD is categorized as very good and suitable to be used for field testing.
- The appearance of the LKPD has also gone through the process of testing design experts with an assessment of 76% in the "Good" category.
- Achievement of indicators of mathematical critical thinking learners have a balanced proportion with an average of 73.35%
- The guided inquiry-based LKPD developed was declared effective. This is based on the completeness of the post-test results of class (VII.A)at SMP Junior High School of SMP Negeri 30 Bandar Lampung of 36 students who have reached KKM as many as 28 students with a percentage of 77.78%.

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References

Abdurrahman, A., Nurulsari, N., Maulina, H., & Ariyani, F. (2019). Design and Validation of Inquiry-based STEM Learning Strategy as a Powerful Alternative Solution to Facilitate Gifted Students Facing 21st Century Challenging To cite this article : *Journal for the Education of Gifted Young*, *7*(March), 33–56. https://doi.org/10.17478/jegys.513308

Abdurrahman, A., Nurulsari, N., Maulina, H., Rahman, B., Umam, R., & Jermsittiparsert, K. (2019). Multi-level Scaffolding : A Novel Approach of Physics Teacher Development Program for Promoting Content Knowledge Mastery. *International Journal of Innovation, Creativity and Change*, *7*(8), 71–89.

Abdurrahman, Saregar, A., & Umam, R. (2018). Assessment Toward The Quantum Physics Concept Mastery Of The Prospective Physics Teachers. *Jurnal Pendidikan IPA Indonesia*, *7*(1), 34–40. https://doi.org/10.15294/jpii.v6i2.7239

Agus Slamet Susanto, Haninda Bharata, S. D. (2018). The effect of Cooperative Learning Model Think-Talk-Write (TTW) Type on Mathematical Problem-Solving Abilities In Terms of Learning Habits. *Al-Jabar : Jurnal Pendidikan Matematika*, *9*(1), 33–40. https://doi.org/https://doi.org/10.24042/ajpm.v9i1.2235

Andini, M., & Yunianta, T. N. H. (2018). The Development of Borad game "The Adventure Of Algebra" in The Senior High School Mathematics Learning. *Al-Jabar : Jurnal Pendidikan Matematika*, *9*(2), 95–109. https://doi.org/10.24042/ajpm.v9i2.3424

Anwar, C., Saregar, A., Yuberti, Zellia, N., Widayanti, Diani, R., & Wekke, I. S. (2019). Effect Size Test of Learning Model ARIAS and PBL : Concept Mastery of Temperature

and Heat on Senior High School Students. *EURASIA Journal of Mathematics, Science and Technology Education*, *15*(3), 1–9. https://doi.org/https://doi.org/10.29333/ejmste/103032

Bersin, J. (2004). *The Blended Learning Book: Best Practices, Proven Methodologies, and Lessons Learned*. New York: Wiley.

Diani, R., Herliantari, H., Irwandani, I., Saregar, A., & Umam, R. (2019). The Effectiviness of SSCS Learning Model: Its Impact on the Students' Creative Problem-Solving Ability on the Concept of Substance Pressure. *Jurnal Penelitian Fisika Dan Aplikasinya (JPFA)*, *9*(1). https://doi.org/http://dx.doi.org/10.26740/jpfa.v9n1.p%25p

Diani, R., Irwandani, I., Al-Hijrah, A.-H., Yetri, Y., Fujiani, D., Hartati, N. S., & Umam, R. (2019). Physics Learning through Active Learning Based Interactive Conceptual Instructions (ALBICI) to Improve Critical Thinking Ability. *Jurnal Penelitian Dan Pembelajaran IPA*, *5*(1), 48. https://doi.org/10.30870/jppi.v5i1.3469

Habibi, B., Hartinah, S., Umam, R., Syazali, M., Lestari, F., Abdurrahman, A., & Jauhariyah, D. (2019). Factor Determinants of Teacher Professionalism as Development of Student Learning Education at School of SMK PGRI in Tegal City, Indonesia. *Journal of Gifted Education and Creativity*, *6*(2), 125–134.

Hartinah, S., Sholikhakh, R. A., Umam, R., Syazali, M., Andriani, S., Mujib, … Lestari, F. (2019). Application Auto-play Media Studio (AMS) 8 for Learning Me-dia of Logaritm Function. *International Journal of Engineering & Technology*, *8*(2), In Press. https://doi.org/10.14419/ijet.v7i4.27914

Hartinah, S., Suharso, P., Umam, R., Syazali, M., Lestari, B. D., Roslina, R., & Jermsittiparsert, K. (2020). Teacher's performance management: The role of principal's leadership, work environment and motivation in Tegal City, Indonesia. *Management Science Letters*, *9*(14), 1–12. https://doi.org/10.5267/j.msl.2019.7.038

Huda, S., Anggraini, L., Saputri, R., Syazali, M., Umam, R., Islam, U., & Radenintan, N. (2019). Learning Model to Improve The Ability to Understand Mathematical Concepts. *PRISMA*, *8*(2), 173–181.

Kasayanond, A., Umam, R., & Jermsittiparsert, K. (2019). Environmental Sustainability and its Growth in Malaysia by Elaborating the Green Economy and Environmental Efficiency. *International Journal of Energy Economics and Policy*, *9*(5), 465–473. https://doi.org/https://doi.org/10.32479/ijeep.8310

Kusumawati, R., & Nayazik, A. (2018). Developing Mathematics Learning Strategy Module Based on Journal Review. *Al-Jabar : Jurnal Pendidikan Matematika*, *9*(2), 111–120. https://doi.org/https://doi.org/10.24042/ajpm.v9i2.3110

Lestari, F., Saryantono, B., Syazali, M., Saregar, A., Jauhariyah, D., & Umam, R. (2019). Cooperative Learning Application with the Method of Network Tree Concept Map : Based on Japanese Learning System Approach. *Journal for the Education of Gifted Young Scientists*, *7*(1), 15–32. https://doi.org/10.17478/jegys.471466

Meriyati, Rizkia Shaulita, L. N. T. (2018). Problem Based Learning Strategy: the Impact on Mathematical Learning Outcomes viewed from Anxiety Levels. *Al-Jabar : Jurnal Pendidikan Matematika*, *9*(2), 199–208. https://doi.org/https://doi.org/10.24042/ajpm.v9i2.3719

Nugroho, A. A., Putra, R. W. Y., Putra, F. G., & Syazali, M. (2017). Pengembangan Blog sebagai Media Pembelajaran Matematika. *Al-Jabar : Jurnal Pendidikan Matematika*, *8*(2), 197–204.

Nurulsari, N., Abdurrahman, & Suyatna, A. (2017). Development of soft scaffolding strategy to improve student's creative thinking ability in physics. *Journal of Physics: Conference Series*, *909*(1). https://doi.org/10.1088/1742-6596/909/1/012053

Prastowo, R., Huda, S., Umam, R., Jermsittiparsert, K., Prasetiyo, A. E., Tortop, H. S., &

Syazali, M. (2019). The Effectiveness Of Environmental Geophysical Learning In Developing Academic Achievement And Conceptual Understanding Of Electrodynamics: Applications Geoelectric Using Cooperative Learning Model. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, *8*(2), 165–175. https://doi.org/10.24042/jipfalbiruni.v0i0.4614

Putra, F., Nur Kholifah, I. Y., Subali, B., & Rusilowati, A. (2018). 5E-Learning Cycle Strategy: Increasing Conceptual Understanding and Learning Motivation. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, *7*(2), 171. https://doi.org/10.24042/jipfalbiruni.v7i2.2898

Rahman, B., Abdurrahman, A., Kadaryanto, B., & Rusminto, N. E. (2015). Teacher-based scaffolding as a teacher professional development program in Indonesia. *Australian Journal of Teacher Education*, *40*(11), 66–78. https://doi.org/10.14221/ajte.2015v40n11.4

Ramadhani, R., Huda, S., & Umam, R. (2019). Problem-Based Learning , Its Usability and Critical View as Educational Learning Tools. *Journal of Gifted Education and Creativity*, *6*(3), 219–231.

Ramadhani, R., & Narpila, S. D. (2018). Problem based learning method with geogebra in mathematical learning. *International Journal of Engineering and Technology(UAE)*, *7*(3.2 Special Issue 2).

Ramadhani, R., Umam, R., Abdurrahman, A., & Syazali, M. (2019). The Effect Of Flipped-Problem Based Learning Model Integrated With LMS-Google Classroom For Senior High School Students. *Journal for the Education of Gifted Young*, *7*(2), 137–158. https://doi.org/https://doi.org/10.17478/jegys.548350

Ratnasari, N., Tadjudin, N., Syazali, M., Mujib, M., & Andriani, S. (2018). Project Based Learning (PjBL) Model on the Mathematical Representation Ability. *Tadris: Jurnal Keguruan Dan Ilmu Tarbiyah*, *3*(1), 47. https://doi.org/10.24042/tadris.v3i1.2535

Sagala, R., Umam, R., Thahir, A., Saregar, A., & Wardani, I. (2019). The Effectiveness of STEM-Based on GenderDifferences: The Impact of PhysicsConcept Understanding. *European Journal of Educational Research*, *8*(3), 753–763. https://doi.org/http://doi.org/10.12973/eu-jer.8.3.753

Saregar, A., Irwandani, I., Abdurrahman, A., Parmin, P., Septiana, S., Diani, R., & Sagala, R. (2018). Temperature and Heat Learning Through SSCS Model with Scaffolding : Impact on Students ' Critical Thinking Ability. *Journal for the Education of Gifted Young Scientists*, *6*(3), 39–54.

Saregar, A., Latifah, S., & Sari, M. (2016). Efektivitas Model Pembelajaran CUPs: Dampak terhadap Kemampuan Berpikir Tingkat Tinggi Peserta Didik Madrasah Aliyah Mathla'ul Anwar Gisting Lampung. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, *05*(2), 233–243. https://doi.org/10.24042/jpifalbiruni.v5i2.123

Sriyakul, T., Umam, R., Jermsittiparsert, K., Development, T., Chi, H., City, M., … City, M. (2019). Internal Supply Chain Integration And Operational Performance Of Indonesian Fashion Industry Firms : A Supplier to Buyer Approach. *Humanities & Social Sciences Reviews*, *7*(2), 479–486. https://doi.org/10.18510/hssr.2019.7256

Syahrir, S., Syazali, M., Maskur, R., Amrulloh, M. A., Sada, H. J., & Listiani, B. (2019). Calculus Module for Derivative Application Materials with an Islamic Contextual Teaching and Learning Approach. *Journal of Physics: Conference Series*, *1155*(1). https://doi.org/10.1088/1742-6596/1155/1/012079

Syazali, M. (2015). Pengaruh Model Pembelajaran Creative Problem Solving Berbantuan Maple II Terhadap Kemampuan Pemecahan Masalah Matematis. *Al-Jabar : Jurnal Pendidikan Matematika*, *6*(1), 91–98. https://doi.org/https://doi.org/10.24042/ajpm.v6i1.58

Syazali, M., Putra, F. G., Rinaldi, A., Utami, L. F., Widayanti, Umam, R., & Jermsittiparsert, K. (2019). Partial correlation analysis using multiple linear regression: Impact on

business environment of digital marketing interest in the era of industrial revolution 4.0. *Management Science Letters*, *9*, 1875–1886. https://doi.org/10.5267/j.msl.2019.6.005

Yuniasti, A., & Wulandari, R. (2018). The Relationship Between Verbal Ability and Critical Thinking Skill: The Implementation of Susan Loucks Horsley Model. *Jurnal Ilmiah Pendidikan Fisika Al-BiRuNi*, *7*(1), 89–97.