



DEVELOPMENT OF FLIP PDF E-MODULE BASED ON A SCIENTIFIC APPROACH TO IMPROVE PROBLEM SOLVING AND SPATIAL ABILITY FOR STUDENTS MIN 2 SERDANG BEDAGAI

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Abstract

This study aims to: 1) Analyze the validity of the e-module flip pdf based on a scientific approach in improving the spatial ability of students at MIN 2 Serdang Bedagai. 2) Finding a pdf flip e-module based on a scientific approach that is practical in improving the spatial ability of the students of MIN 2 Serdang Bedagai. 3) Finding a flip pdf e-module based on an effective approach in improving the spatial ability of students at MIN 2 Serdang Bedagai. This research is a development research. The development model used in this study is the 4-D Thiagarajan model. The results showed that: 1) E-module flip pdf based on scientific approach that was developed meets the criteria of validity, practicality and effectiveness; 2) The increase in spatial ability using the e-module flip pdf based on a scientific approach increased in terms of the Ngain trial I by 0.30 with low criteria and in the second trial by 0.37 with moderate criteria.

Keywords: *e-module, Scientific, Spatial Ability, Problem Solving*

A. Introduction

Learning mathematics in elementary schools is a stand-alone learning. Mathematics learning in elementary schools is not only oriented to the mastery of mathematical material, but mathematics is positioned as a tool and a means for students to achieve a competency. (Wiryanto, 2020). Mathematics learning basically has abstract characteristics, as well as tiered concepts and principles. This causes many students to find it difficult to learn mathematics. The success of learning mathematics in elementary schools is shown by the mastery of the material by students. One of the success factors in the learning process so that students are able to master math material well, namely the teacher's ability to plan and implement learning.

Mathematics learning is still experiencing challenges where students' mathematical learning outcomes are still very low, especially in Indonesia. Reality shows that learning outcomes in mathematics have not been satisfactory. This can be seen from the results of the Program for International Student Assessment (PISA) which focuses on math, reading, and science skills. The fluctuations in the results obtained by Indonesia on PISA still illustrate that mathematical abilities are still low, especially because the results above are still below the OECD average of 489 and still places Indonesia in the 73rd position, below Malaysia and Thailand which are in the 48th and 58th positions, meanwhile Singapore is in 2nd place out of 79 Countries (Hewi & Salih, 2020).

Geometry is one of the materials that is considered quite difficult. Students' failure to understand concepts, reasoning, and problem solving geometry becomes a benchmark for the difficulty of geometric material (Saha, 2010; Dogan-Dunlap, 2010, Imdad Ali, 2014). The results of the 2012 PISA survey show that Indonesian students' space and shape

content is weak in geometry content, namely Space and Shape content. Of the 6 levels of questions according to the level of difficulty tested, Indonesian students were only able to answer 69.2% (OECD average 25.8%) at level one, 19.8% (OECD average 22.3%) at level two, 7.8% (OECD average 22.2%) at level three, and nearly 0% (average 29.7%) at high. (National Center for Education Statistics USA, 2014). From these facts, it can be concluded that the ability of students in Indonesia, especially junior high school students, is still lacking in understanding geometric or spatial material.

Ferguson AM (2015) released the results of his research in the Journal of Learning and Individual Differences that there is a close relationship between spatial ability and geometric mathematics learning outcomes and poor spatial ability greatly affects students' math anxiety. Problem solving in geometry is highly dependent on students' ability to develop spatial abilities (National Research Council, 2006).

The fact shows that spatial ability has not received serious attention by most teachers (National Research Council, 2006). When teaching geometry, especially about geometric shapes such as cubes, blocks, pyramids or prisms, most teachers emphasize providing information on the number of edges, planes, areas, and other information that is rote. what he saw was in the form of a parallelogram or a rhombus, and even miscalculated the angle of the cube which should be 900 (Ozerem, 2012).

Besides that, The Covid-19 pandemic is also a learning challenge at this time, Coronavirus Diseases 2019 (Covid-19) has an impact on various sectors of people's lives. Starting from the social sector, the economy, tourism, and even the education sector experiencing a significant impact because of this virus. Putri and Dewi (2020) stated that along with the

times, one can easily obtain information through new technology that continues to develop. The development of this technology is beneficial in the field of education for both teachers and students.

A teacher ideally should not only use the media regardless of the conditions and learning situations. The development of learning media needs to be done by teachers to overcome the shortcomings and limitations of existing media. In addition, learning media developed by the teacher themselves can avoid mismatches because they are designed according to the needs, potential resources, and environmental conditions of each. In fact, an educator who is proficient in developing learning media is an educator who is innovative, creative, and professional (Ashyar R, 2012).

Relevant research that utilizes e-modules is research (Syahrial et al., 2019) which states that the ethnoconstructivism electronic module based on the 3D Page flip Professional software developed can be used as teaching material in the learning process. By using this ethnoconstructivism e-module, it makes students more interested in learning, therefore it is highly recommended for teachers to use this ethnoconstructivism e-module in their learning. The same thing can also be seen through the results of other relevant research (Yanindah & Ratu, 2021) states that learning using e-modules is quite effective in being used in the medium category.

Regarding the students' mathematical spatial ability, the results of the diagnostic test conducted by researchers to 24 students and the observations of the sixth-grade teacher at MIN 2 Serdang Bedagai which gave a general description of the low spatial ability of students' mathematics. From the diagnostic results, it shows that the spatial ability of 24 students of class V MIN 2 Serdang Bedagai is still low, especially the

limited learning effect that is currently being implemented due to a pandemic that causes students not to get a complete explanation from the teacher, as a result it is feared that there will be a decline in learning abilities, especially learning mathematics with geometric concepts.

The results of observations made by researchers as homeroom teachers for class V MIN 2 Serdang Bedagai also found that there was a shortage of student learning materials, especially textbooks that were still incomplete for all students, resulting in a lack of student learning references. This resulted in a decrease in student enthusiasm for learning which resulted in lower student learning outcomes when compared to the results of previous classes. Thus, it is necessary to develop electronic modules that can be accessed by students to study at home when face-to-face learning is limited in order to improve student learning outcomes in the context of spatial abilities

B. Method

Based on the formulation of the problem and the stated research objectives, this research includes developmental research. This research uses Thiagarajan 4-D development model. In this study, the e-module flip pdf learning media was developed based on a scientific approach on the material of simple geometrical webs. This research was carried out at MIN 2 Serdang Bedagai class V even semester of the 2021/2022 academic year on the material of simple spatial constructs. The school was chosen because the place where researchers teach and supports the use of e-modules when face-to-face is limited. The subjects in this study were all students of MIN 2 Serdang Bedagai, however, the test subjects were only taken from class VB which amounted to 25 students on the grounds that the school distributed all class V students randomly. While the object in

this research is the e-module flip pdf learning media based on a scientific approach on the material of simple geometrical webs that are used to improve students' problem-solving and spatial abilities.

Learning Media Development Procedure

In developing the e-module flip pdf learning media based on this scientific approach, the 4-D (four-D) development model is used. According to Thiagarajan (1974), the 4-D research and development model consists of 4 main stages, namely define, design, develop, and disseminate.

Data Collection Instruments

To assess the learning media that have been developed, in this development research, the following data collection instruments were used:

a. Questionnaire Lembar

Questionnaire sheets used in this study were questionnaire sheets for subject matter experts, questionnaire sheets for learning media experts, practicality questionnaire sheets for learning media teachers and students.

1. Questionnaire Sheet for Mathematics Subject Experts
2. Questionnaire Sheet for Learning Media Experts
3. Learning Media Practicality Questionnaire

b. Troubleshooting Ability Test

The problem-solving abilities observed were (1) the ability to understand problems, (2) the ability to make problem-solving plans, (3)

the ability to plan, and (4) the ability to re-examine the results of problem solving.

c. Spatial Ability Test

This spatial ability test was conducted to measure the effectiveness of the developed learning media as well as to see the students' spatial abilities.

d. Student worksheet

Student Worksheet or LKPD is an instrument used to assess the learning process and aims as a bridge for students to find or understand the concepts of the material being taught. LKPD in this research is given to students at each meeting with topics according to learning indicators. This LKPD will also be an indicator of the practicality of developing learning media to improve students' spatial abilities.

Data analysis technique

The conclusion of development research is obtained from the results of the analysis of the data obtained. The data analysis technique used in this trial can be described as follows:

- a. Learning Media Validity Data Analysis Techniques
- b. Validity and Reliability Analysis Techniques for Spatial Ability Test
- c. AnalysisData Improved problem solving and spatial ability
- d. Data Analysis of Learning Media Effectiveness
- e. Practical Data Analysis Techniques for Learning Media

C. Finding and Discussion

1. Result

a. Description of Learning E-Module Development Results

The product of this research is a pdf flip e-module based on a scientific approach on the material of simple geometrical grids for students of MIN 2 Serdang Bedagai class V even semester of the 2021/2022 academic year. The research design was carried out through 4 main stages, namely define, design, develop, and disseminate, as described below.

- Expert Validation Results**(a). Analysis of Learning Module Validation Results by Mathematics Subject Experts and Learning Media Experts**

From the data, it can be seen that the average value of the total validation of learning modules by mathematicians is 3.81 which according to the validity criteria is in the "Very Valid" category. The validator concludes that the module can be used.

Furthermore, the description of the results of validation and revision of the pdf flip e-module based on a scientific approach which was developed according to media materials experts that the total average value of learning module validation by learning media experts is 3.83 which according to the validity criteria is in the "Very Valid" category. ". The validator concludes that the module can be used.

(b). Analysis of the Results of the Validation of the Learning Implementation Plan (RPP) by Experts

From the data obtained, the average value of total validation for lesson plans is 3.79 ("Very Valid" category). Furthermore, this value is referred to the validity criteria that have been determined, so it can be

concluded that the developed lesson plans meet the criteria for validity with a valid category.

(c). Analysis of Student Activity Sheet Validation Results (LAS)

From the data obtained, the average value of total validation for LAS is 3.81. Furthermore, this value is referred to the validity criteria that have been set, so it can be concluded that the developed LAS meets the validity criteria with a very valid category.

(d). Analysis of Initial and Final Test Validation Results of Problem Solving Ability and Spatial Ability

From the data obtained, it can be seen that the two validators gave valid assessments of the initial and final tests of students' problem-solving abilities and spatial abilities. This shows that all questions can be used and are declared suitable for use by researchers in this study.

(e). Test Results of Problem Solving and Spatial Ability Test Instruments

Furthermore, validity and reliability tests were carried out. The purpose of this stage is to produce good research instruments, in the sense that they are valid and suitable for use. The results of the validity and reliability test of the instrument are described as follows:

- Test Results of Item Validity Pre-test and post-test Problem Solving Ability and Spatial Ability

Based on the interpretation data of each pre-test and post-test items are in the Very valid category. Thus, based on calculations carried out manually using excel, it is concluded that all the pre-test and post-test items can be said to be suitable for use.

- Reliability Test Results Pre-test and Post-test Problem Solving and Spatial Ability

Based on the results of calculations using the alpha-Cronbach formula, the reliability for the pre-test of problem solving abilities and students' spatial abilities was 0.89 and the reliability for the post-test was 0.97. This means that the pre-test reliability of the problem-solving abilities and spatial abilities of students developed are included in the very high category and the post-test reliability of problem-solving abilities and spatial abilities developed are included in the medium category. Thus, the pre-test and post-test can be said to be reliable to measure problem solving abilities and spatial abilities.

- **Test Result Analysis I**

After the results of the first trial are obtained, revisions will be made to the learning modules and/or devices developed based on the inputs obtained from the response questionnaires and observation sheets. It is intended that the e-module developed is truly in accordance with the objectives to be achieved.

- **Test Result Analysis II**

The second trial was conducted to measure whether the e-learning module and its devices met all the established valid, practical, and effective criteria. Overall, the results of the data analysis of the second trial show that the e-learning module developed has met all the established valid, practical, and effective criteria. A more complete explanation can be seen in the description of the validity, practicality, and effectiveness of the learning module which will be discussed next.

- **Analysis of the Results of Observation of the Implementation of Trial Learning I**

From the data, it can be seen that the average score of the observation of the implementation of learning with the e-learning module based on the scientific approach that was developed was in the category of "Poorly Implemented" with a score of 2.75. This score does not meet the criteria for the practical success of the learning module in terms of the implementation of learning.

- **Analysis of the test results of students' problem-solving abilities and spatial abilities in Trial I**

From data it can be seen that the average problem solving ability of students on the initial test is 56.54 and the final test is 74.62. Furthermore, the results of the classical final test of students' problem-solving abilities showed that the final classical final test of students' problem-solving abilities in the first trial was 30.77%. Furthermore, the description of the results of students' spatial abilities in the I . trial it can be seen that the average spatial ability of students in the initial test is 57.69 and the final test is 66.11. Furthermore, the results of the classical final test of students' spatial abilities showed that the classical mastery of the final test of students' spatial abilities in the first trial was 38.46%. So, it can be concluded that in the first trial, the application of the scientific-based learning e-module developed did not meet the criteria for achieving classical completeness ($\geq 85\%$).

- **Analysis of Student Activity Observation Results in Trial I**

that the average score of observing student activities during learning using the developed learning e-module is in the 'active' category with a score of 3.22.

- **Analysis of the Observation Results of Teachers' Ability to Manage Learning in Trial I**

that the average score of observing the teacher's ability to manage learning during learning using the developed learning module is in the 'Good' category with a score of 3.31.

- **Analysis of Student Response Questionnaire In Trial I**

Based on the results obtained from trial I showed that the aspects specified to state that the e-learning modules developed were practical and effective had not been met, the follow-up activities for developing these learning e-modules were to conduct a review of the e-learning modules that had been developed. developed and its tools.

- **Description of Practicality of Scientific-Based Learning E-Module in Trial II**

(a). Analysis of the Results of Observation of the Implementation of Trial Learning I

that the average score of the observation of the implementation of learning with the scientific-based learning e-module that was developed was in the "Well Implemented" category with a score of 3.86. The score has met the criteria for the practical success of the e-learning module in terms of learning implementation.

(b). Description of the Effectiveness of the Scientific-Based Learning Module in Trial II

- **Analysis of Student's Problem Solving Ability and Spatial Ability Test Results in Trial II**

classical completeness of the final test of problem solving ability and spatial ability of students in the second trial was 88.46%. So, it can be concluded that in the second trial, the application of the scientific-based learning e-module that was developed has met the criteria for achieving classical completeness.

- **Analysis of Student Activity Observation Results in Trial II**

That the average score of observing student activities during learning using the developed learning e-module is in the 'active' category with a score of 3.69.

- **Analysis of the Observation Results of Teachers' Ability to Manage Learning in Trial II**

that the average score of observing the teacher's ability to manage learning during learning using the developed learning e-module is in the 'Good' category with a score of 3.86.

- **Questionnaire Analysis of Student Responses and Teacher Responses in Trial II**

Overall, the conclusions of the results of the second trial are as follows: 1) the level of implementation of learning using the developed learning module is in the "Well Implemented" category; 2) the final test results of students' mathematical creative thinking skills show that the learning with the developed modules has been completed classically; 3) the results of the observation of student activities have met the specified criteria for activity; 4) the value of the teacher's ability to manage learning is classified as good; and 5) teachers and students are interested in the learning modules developed.

b. Description of Ability Upgrades

To determine the increase in students' creative thinking skills, data were obtained from the results of the initial and final tests of students' creative thinking abilities in each trial. Increasing students' problem solving abilities and spatial abilities were obtained from the normalized gain index data as follows:

Based on the normalized gain index, it was found that in the first trial there was an increase in problem solving ability with a value of 0.53 with moderate criteria. Meanwhile, for the spatial ability, the value obtained is equal to. Likewise, in the second trial there was an increase in the value of 0.49 with moderate criteria. $(0,3 < g \leq 0,7)$ $(0,3 < g \leq 0,7)$.

2. Discussion

The results of data analysis obtained from the results of trial I and trial II show that: 1) the e-Module flip pdf based on a scientific approach in improving problem solving and spatial ability developed is valid; 2) E-Module learning based on flip pdf based on scientific approach in improving problem solving and practical development of spatial abilities; 3) E-Module learning based on flip pdf based on scientific approach in improving problem solving and effective developed spatial abilities; 4) there is an increase in students' problem-solving abilities and spatial abilities through the development of a flip pdf-based learning E-Module based on a scientific approach.

a. Learning Module Validity

Based on the results of the validation of the e-learning module developed, it is found that this e-learning module is valid or has a good degree of validity. Furthermore, the results of the validation of the lesson plans (RPP), student activity sheets (LKPD), initial and final tests of problem solving abilities and spatial abilities are also valid. This means that e-learning modules and their devices can meet the demands of learning needs to improve problem solving and spatial abilities.

b. Practicality of Learning Module

Through the observation sheet on the implementation of learning with e-learning-based module developed which was given to an observer at each trial meeting I and II, the results showed that the module did not meet the practicality criteria in the first trial, namely with a score of 2.7 at the first meeting, a score of 2.8 at the second meeting, and an average score of 2.8 at the first meeting. an average of 2.75 (category "Poorly Implemented"). While in the second trial, a score of 3.53 was obtained at the first meeting, 3.8 at the second meeting, and 3.8 at the third meeting. The average result of the observation of the implementation of learning in the second trial was 3.86 with the category "Well Implemented". These results have met the criteria for practical success. So, it can be concluded that the e-learning module based on scientific developed practically.

c. Learning Module Effectiveness

Based on the results of trial I and trial II, the developed learning e-module has met the effective category in terms of classical completeness, active student activity, teacher's ability to manage learning well, and positive responses from teachers and students. This is explained

as follows.

- **Classical Completeness Test of Problem Solving Ability and Spatial Ability**

Based on the results of the test analysis in trials I and II, it was found that the problem-solving abilities and spatial abilities of students had met the criteria for classical completeness. This is because the materials and problems that exist in the e-learning module are developed in accordance with the conditions of the student learning environment. By using this e-learning module, students will more easily understand the concept of simple geometrical nets.

The classical completeness of the final test of problem solving ability in the first trial was 30.77% and for the spatial ability of 38.46%. So, it can be concluded that in the first trial, the application of -based learning e-modulesscintificdeveloped does not meet the criteria for achieving completeness classically ($\geq 85\%$). However, in the second trial, the classical completeness of the final test of problem solving abilities and spatial abilities of students had met the specified criteria, namely as many as 88.46% of students (23 people) were declared complete. So, it can be said that e-learning module based onscintifichas met the criteria for effectiveness in the aspect of classical completeness.

- **Student Activity Observation**

Based on the analysis of the results of observing student activities in trials I and II, the average score for observing student activities during learning using the -based learning module was obtainedscintificdeveloped are in the "Active" category with a score of 3.22 in the first trial and 3.69 in the second trial. So it can be concluded

that the -based learning modulescientificdeveloped to meet the criteria for effectiveness in aspects of student activity.

- **Observation of Teacher's Ability to Manage Learning**

Based on the analysis of the results of observations of the ability of teachers to manage learning, it is known that the average score of observations on the ability of teachers to manage learning during learning using e-module based learningscientificdeveloped are in the "Good" category with a score of 3.31 in the first trial and in the "Good" category with a score of 3.86 in the second trial. So that these results meet the criteria for effectiveness in the aspect of the teacher's ability to manage learning.

- **Teacher and Student Response**

Based on the analysis of the results of the teacher's response that has been described previously, it was found that in the first trial and second trial, the teacher was interested in the learning module developed. This can be seen from the average score obtained in the first trial of 3.56 and 3.67 in the second trial. In line with this, student responses also showed interest in learning with the learning modules developed. Judging from the score of the student response questionnaire in the first trial of 3.20 and the second trial of 3.73. Both are in the "Interested" category. So it can be concluded that from the questionnaire responses of teachers and students, e-learning modules based onscientificeffectively developed.

From the elaboration of the four aspects of the effectiveness of the learning media above, it can be concluded that the flip pdf-based learning e-module with a scientific approach that was developed is effective for use in learning the material for simple geometrical webs to

improve students' problem-solving and spatial abilities.

d. Improved Shiva's Problem-Solving And Spatial Ability

Based on the results of the analysis of students' mathematical creative thinking skills in the first and second trials, it showed that there was an increase in students' problem-solving abilities and spatial abilities. This increase can be seen from the average problem solving test results and students' spatial abilities obtained by students. Based on the normalized gain index, it is found that in the I . test there is an increase in problem - solving ability with a value of 0.53 with moderate criteria . Meanwhile, for the spatial ability, the value obtained is equal to. Likewise, in the second trial there was an increase in the value of 0.49 with moderate criteria $(0,3 < g \leq 0,7)$. So it can be concluded that there is an increase in the problem solving ability and spatial ability of students. So it can be concluded that the flip pdf-based learning e-module with the scientific approach developed can improve students' problem-solving and spatial abilities.

D. Conclusion

Based on the results of the analysis and discussion in this study, several conclusions are put forward as follows:

1. The validation of the e-Module flip pdf based on the scientific approach that was developed is in the 'Valid' category in terms of the analysis of the results of the validity of the learning module by the validator with a total average value of 3.78.
2. The e-module flip pdf based on the scientific approach that was developed meets the criteria for the practical success of the learning module in terms of the results of observations of the implementation

of learning. The score obtained in the first trial was 2.735 (category "Poorly Implemented") and did not meet the criteria for research success. However, after making several revisions, in the second trial the learning implementation observation score increased to 3.71 with the "Well Implemented" category. So that the e-Module flip pdf based on the scientific approach that was developed succeeded in meeting the practical criteria of the learning module.

3. The learning module developed has met the established effectiveness criteria. In the first trial of classical completeness the problem-solving ability in the first trial was 30.77% and for the spatial ability of 38.46%. and in the second trial as many as 88.46% of students (23 people) were declared complete. The average score of student activity observation was a score of 3.125 (active category) in the first trial and 3.64 (active category) in the second trial. The average score for observing the teacher's ability to manage learning was 3.31 (good category) in the first try and 3.81 (good category) in the second trial. The average student response was 3.56 (interested category) in the first trial and 3.73 (interested category) in the second trial. The average teacher response was 3.56 in the interested category) in the first trial and 3.67 (interested category) in the second trial.
4. Based on the normalized gain index, it is found that in the I. test there is an increase in problem - solving ability with a value of 0.53 with moderate criteria. Meanwhile, for the spatial ability, the value obtained is equal to. Likewise, in the second trial there was an increase in the value of 0.49 with moderate criteria. $(0,3 < g \leq 0,7)$ $(0,3 < g \leq 0,7)$ So it can be concluded that the flip pdf-based learning e-module with the scientific approach developed can improve problem solving and spatial abilities student.

Bibliography

- Asyhar, Rayandra. 2012. Kreatif Mengembangkan Media Pembelajaran. Jakarta: Referensi Jakarta
- Ferguson, A. M.. 2015. On The Relation Between Math and Spatial Ability: The Case of Math Anxiety. *Journal of Learning and Individual Differences*. Vol. 39, P: 1-12. (<http://doi.org/10.1016/j.lindif.2015.02.007>)
- Hewi, L., & Shaleh, M. (2020). Refleksi Hasil PISA (The Programme For International Student Assesment): Upaya Perbaikan Bertumpu Pada Pendidikan Anak Usia Dini). *Jurnal Golden Age*, 4(01), 30–41. <https://doi.org/10.29408/jga.v4i01.2018>
- Imdad, A.; Bhagawati, S., & Sarmah, J. 2014. Performence of Geometry among Secondary School Students of Bhurbandha CD Block of Morigaon District, Assam, India. *International Journal Of Innovative Research And Development*. Vol. 3, Issue 11, November, Page 73-77
- National Center for Education Statistics USA, NCES. 2014). PISA 2012: Data Table, Figure, and Exhibits. Available on http://nces.ed.gov./2014024_tables.
- National Research Council. 2006. Learning to Think Spatially. Washington DC: The National academic Press.
- Ozerem, A. 2012. Misconceptions in Geometry and Suggested Solution for Seventh Grade Students. *Procedia-Social and Behavioral Sciences*. Vol. 55, P: 720-729. Doi:10.1016/j.sbspro.2012.09.557
- Purwanto, A., Pramono, R., Asbari, M., Hyun, C. C., Wijayanti, L. M., Putri, R. S., & Santoso, P. B. (2020). Studi Eksploratif Dampak Pandemi COVID-19 Terhadap Proses Pembelajaran Online di Sekolah Dasar | *EduPsyCouns: Journal of Education, Psychology and Counseling*. *Journal of Education, Psychology and Counseling*, 2(1), 1–12. <https://ummaspul.e-journal.id/Edupsycouns/article/view/397>
- Saha, A. 2010. The Effects of Geogebra on Mathematics Achievement: Enlightening Coordinate Geometry Learning. *International*

- Conference on Mathematics Education Research (ICMER). Vol. 8, Page: 686-693. Doi: 10.1016/j.sbspro.2010.12.095
- Syahrial, Asrial, Kurniawan, D. A., & Piyana, S. O. (2019). E-Modul Etnokonstruktivisme: Implementasi Pada Kelas V Sekolah Dasar Ditinjau Dari Persepsi, Minat Dan Motivasi. JTP - Jurnal Teknologi Pendidikan, 21 (2), 165–177. <https://doi.org/10.21009/jtp.v21i2.11030>
- Wiryanto. (2020). Proses Pembelajaran Matematika Di Sekolah Dasar Di Tengah Pandemi Covid-19. Jurnal Review Pendidikan Dasar: Jurnal Kajian Pendidikan Dan Hasil Penelitian, 6(2), 125–132.
- Yanindah, A. T. C., & Ratu, N. (2021). Pengembangan E-Modul SUGAR Berbasis Android. Jurnal Cendekia: Jurnal Pendidikan Matematika, 5(1), 607–622. <https://doi.org/10.31004/cendekia.v5i1.445>