



Development of an electronic worksheet integrated with the ethnomathematics of indigenous fish trap called Bubu as the context to promote space geometry learning

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Submission: December 1st, 2024; Accepted: December 24th, 2024; Published: December 31st, 2024

DOI: <https://doi.org/10.31629/jg.v9i2.6947>

Abstract

This study aims to produce an e-worksheet product based on ethnomathematics of fish trap in the form of Bubu on valid and practical space geometry material. This type of research is Research and Development (R&D) using the ADDIE development model. According to the needs of the researchers in this study, they only carried out three stages: analysis, design, and development. The data collection instruments were expert validation sheets and teacher and student response questionnaires. The data obtained were qualitative and then converted into quantitative data on an interval scale using MSR. The results of the material expert validation obtained an assessment of 80.36% with very valid criteria, the media expert validation obtained an assessment of 82.51% with very valid criteria, and the language expert validation obtained an assessment of 82.27% with very valid criteria. The results of the practicality test by the teacher obtained an assessment of 81.09% with very practical criteria, and the practicality test by students obtained an assessment of 84.33% with very practical criteria. The ethnomathematics-based e-worksheet that was developed has achieved valid and practical criteria. Therefore, the product created is worthy of being tested for its effectiveness.

Keywords: development; e-worksheet; ethnomathematics; bubu; space geometry

How to cite: Manurung, J. L., Febrian, F. & Astuti, P. Development of an electronic worksheet integrated with the ethnomathematics of Indigenous fish trap called Bubu as the context to promote space geometry learning. *Jurnal Gantang*, 9(2), 181 – 190. <https://doi.org/10.31629/jg.v9i2.6947>

I. Introduction

Education is one of the most important aspects of life, as it forms quality human resources and allows us to follow the rapid development of the times (Mardhiyah et al., 2021). Education plays an important role in determining whether the future of the next generation of a nation is good or not. Without education, all efforts that have been designed in

such a way will be difficult to realize; therefore, quality education should be prepared to form human resources that can compete and face future development challenges (Anas, 2022).

To realize national education goals, adjustments must be made to address current educational needs. After the COVID-19 pandemic 2020, online learning has become part of the education system. The pandemic forced



the sudden implementation of online learning, but its impact showed technology's great potential to support the teaching and learning process (Mar'ah et al., [2020](#)). The sustainability and quality of online learning require serious attention and improvement, especially in terms of accessibility, facilities and infrastructure, technology, and teacher competency development. By ensuring that online learning runs effectively, the education process can be adaptive to the challenges of the times while providing solutions for areas with limited access to conventional education. This improvement also opens up opportunities to create a more flexible and innovative education ecosystem in the future.

Online learning has been implemented and implemented in almost all schools in Indonesia. However, based on the results of observations in the form of interviews with resource persons, namely mathematics teachers at SMPN 8 Tanjungpinang, the implementation of online learning in schools has not been carried out properly because there are obstacles and constraints experienced, especially in mathematics subjects which are considered difficult by most students. Students and teachers who previously interacted directly in the classroom now have to interact in a limited virtual space.

The obstacles experienced are limitations in media and interesting teaching materials that can be used during online and face-to-face learning. As in the results of research conducted by Sati et al ([2022](#)), researchers concluded that there were several obstacles in the online learning process, such as a lack of learning interaction, limited facilities and infrastructure, and a lack of readiness of human resources (HR). Students lack feelings of joy, interest, attention, and involvement in learning; this results in a decrease in student understanding of a material and a decrease in student learning outcomes, especially in mathematics.

Mathematics is not new to human life;

without realizing it, all human activities are always related to mathematics. Mathematics is not only used by several groups of people, but it is often used at all levels of society, both in academic circles, by scientists, civil servants, politicians, and ordinary people, all of whom use mathematics in all activities carried out in everyday life. The use of mathematical values in the culture of a community is called ethnomathematics.

According to Ambrosio ([1985](#)), based on Greek etymology, ethnomathematics consists of three words: *ethno*, *mathema*, and *tics*. It is a combination of mathematical ideas and procedures practised by members of different cultural groups, identified not only as Indigenous peoples but also as groups of workers, professional classes, and children of certain age groups. According to the definition, ethnomathematics is mathematics applied by a particular cultural group, such as groups of workers, farmers, fishermen, and others.

Collaboration between culture and mathematics is not new in the learning process in schools, but its implementation in the field is still very rare. According to observations conducted by Fairuz et al. ([2020](#)), students were only emphasized in working on practice questions without any deep conceptual understanding of the contextual use of mathematics, especially in the implementation of culture-based ethnomathematics. Teachers are required to develop interesting learning approaches and teaching materials that are related to everyday life.

One of the interesting teaching materials is the electronic student worksheet (e-worksheet). Electronic student worksheets can be used anywhere and anytime using a computer or smartphone (Apriliyani & Mulyatna, [2021](#)). E-worksheet, created through collaboration between mathematics and culture, can be an interesting teaching material and an answer to facilitate the online learning process to be more effective. Research on developing student worksheets based on ethnomathematics has been

carried out by other researchers, such as those carried out by Fairuz et al. (2020), Rewatus et al. (2020), and (Luthfi & Rakhmawati, 2022). These researchers developed student worksheets by relating learning to cultural objects in their regions.

The results obtained from the development show that the student worksheets meet the valid and practical criteria, and both teachers and students provide positive responses. Thus, the student worksheets can be used in learning and are expected to increase student motivation and learning outcomes.

Seeing the positive results above, researchers are interested in developing student worksheets based on ethnomathematics. The object to be used is the cultural object of the Riau Islands, namely Bubu. Bubu is a tool used by traditional fishermen in the Riau Islands to catch fish. Bubu will be connected to the learning material of space geometry in class VIII of junior high school.

II. Research Method

This type of research is research and development (R&D). The product to be produced in this study is teaching materials in the form of e-worksheet based on ethnomathematics of fish trap in the form of Bubu on the material of flat-sided space geometry for class VIII SMP.

Research and development of e-worksheet based on ethnomathematics of fish trap in the form of Bubu was carried out using the ADDIE development model developed by Dick and Carry (1996) and modified according to the needs of researchers in this study. Researchers only carried out three stages: analysis, design, and development.

At the analysis stage, the researcher conducted an analysis of students, a curriculum review, and an analysis of the material that would be included in the e-worksheet before making the product. At the design stage, the researcher designed the product to be developed. Starting from compiling instruments and designing the presentation of learning content in

the e-worksheet. At the development stage, the researcher developed the product according to the design that had been carried out. After the product was completed, the next step was to conduct validation and practicality tests by experts.

This research was conducted at SMP Negeri 8 Tanjungpinang, with 21 grade VIII students as the research subjects. The data collection instruments used in this study were interview sheets, e-worksheet validation sheets, and e-worksheet practicality questionnaire sheets.

The instrument's preparation began with identifying the needs based on the research objectives, namely assessing the validity and practicality of ethnomathematics-based worksheet. The initial draft of the instrument was prepared in the form of a rubric or questionnaire with a Likert scale, covering aspects of content feasibility, construction, language, cultural relevance, and problem-solving skills. This draft was consulted with the supervisor to obtain input and suggestions, then revised and tested on relevant respondents to test its validity and reliability. The trial results were analyzed to ensure that the instrument measured the intended aspects and provided consistent results. After the final revision and approval from the supervisor, the main study used the instrument for validation by experts and practicality assessment by teachers and students.

The e-worksheet validation sheet was used to measure the validity of the student worksheet based on ethnomathematics of fish trap in the form of Bubu, including validation sheets for material, media, and language experts. Validity criteria in developing student worksheets are assessed based on content appropriateness, language use effectiveness, materials, media display, and ethnomathematics values presented.

The practicality questionnaire sheet was used to measure the extent to which e-worksheet can be easily used by teachers and students according to learning needs. The practicality

criteria include ease of use, time suitability, and usability in learning. The practicality questionnaire sheet consists of teacher and student response assessment sheets.

III. Results and Discussion

The result of the development is teaching materials in the form of e-worksheet based on ethnomathematics of fishing tools in the form of Bubu on the material of space geometry for class VIII SMP. The product development process refers to the ADDIE development research model developed by Dick and Carry (1996). In this study, the researcher only applied three of the five stages of the ADDIE development model: analysis, design, and development. The following is a description of the stages of e-worksheet development.

1. Analysis

The initial stage of this study involved analysis. During this stage, the researcher conducted a curriculum review, material analysis, and analysis of student conditions.

a. Curriculum Review

The curriculum currently being implemented at SMPN 8 Tanjungpinang is the 2013 Revised 2017 curriculum. The curriculum review was carried out so that the e-worksheet developed is arranged following the school's current curriculum. The school syllabus lists KI and KD in all subjects. This study focused on the mathematics subject of flat-sided space geometry for class VIII SMP.

The e-worksheet developed contains basic competencies (KD) 3.9 Distinguishing and determining the surface area and volume of flat-sided space geometry (cubes, cuboids, prisms, and pyramids), and 4.9 Solving problems related to the surface area of the volume of flat-sided space geometry.

b. Material Analysis

The material analysis involves identifying the main material that students will study less. After the analysis, race geometry material studied by the 8th-grade junior high school students was then linked to the

ethnomathematics object, namely Bubu.

Space geometry is related to the ethnomathematics object, Bubu, both in terms of shape and the calculation process when making Bubu. Activities in making Bubu will be presented as contextual problems in calculating the volume and surface area of cubes, cuboids, prisms, and pyramids in the developed e-worksheet.

c. Students Analysis

Student analysis was conducted by conducting interviews with mathematics subject teachers related to the learning process at school. The learning process carried out at SMP Negeri 8 Tanjungpinang is online learning and limited face-to-face. Changes in this learning process result in an adaptation process that students and teachers must carry out. However, not all students and teachers are adaptable to the changes that occur, resulting in the learning process being less than optimal.

The learning process in schools develops alongside technological developments, but the use and utilization of this technology have not been optimal. Based on this analysis, the researcher developed a teaching material, e-worksheet, based on ethnomathematics. This teaching material was chosen because it can increase students' independence in learning and can be used anytime and anywhere.

2. Design

At this stage, the initial design of the e-worksheet is carried out, which aims to obtain an initial framework or concept for the product. This stage consists of compiling instruments and creating an e-worksheet product design.

a. Compilation of Instruments

The results of this stage are in the form of a validation questionnaire sheet and product practicality, which will be validated first. In line with what Sirait and Oktavianty (2021) said, to measure the quality of a product, a valid instrument is needed, namely a questionnaire or questionnaire. After the validation and practicality questionnaires are declared valid, they will be given to experts for validation,

which aims to determine the level of validity and practicality of the e-worksheet being developed.

b. E-worksheet Design

This phase aims to design the e-worksheet based on the initial investigation phase. The researcher first creates a Storyboard of the e-worksheet that will be developed. After that, start designing the product based on the Storyboard that has been made. The product design (e-worksheet) consists of:

1) Cover

The first page (cover) of e-worksheet contains the title and the login section, which uses identity, class level, author's name, and academic year.



Figure 1. e-worksheet cover

2) KD, IPK, and Learning Objectives

The e-worksheet competency menu page contains Basic Competencies (KD), Competency Achievement Indicators (IPK), and learning objectives from the flat-sided space structure material for class VIII SMP. At the bottom is a previous button to return to the previous page and a next button to go to the next page.

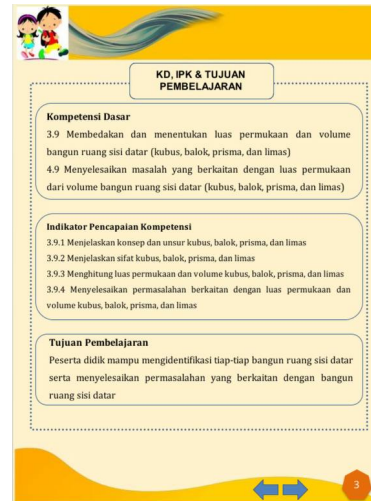


Figure 2. KD, IPK, and learning objectives

3) e-worksheet Content

This page contains material related to the research object: traditional fish trap called Bubu.



Figure 3. E-worksheet content

4) Practice Question

On this page, questions are presented that aim to hone students' abilities in the material of flat-sided space structures; the questions given are based on problems found in everyday life with objects in the form of Bubus.



Figure 4. Practice question

3. Development

The prepared e-worksheet is then validated by the validator to determine its validity. Three validators test the developed teaching materials: the material expert validator, the media expert validator, and the language expert validator. After the developed product is declared valid, teachers and students carry out a practicality test.

Validation from material experts, media experts, and language experts aims to determine whether the e-worksheet based on ethnomathematics is valid for use and to solicit criticism and suggestions so that the developed product improves. Meanwhile, the practicality test by teachers and students aims to determine whether the learning media developed is practical and relevant for use in the learning process at school.

a. Product Validation Test by Experts

The results of the validation of e-worksheet based on ethnomathematics of fish trap in the form of Bubu by material, media, and language experts are presented in Table 1 below.

Table 1. Expert validation result

No	Expert	Average (%)	Criteria
1	Material	80,36	Very Valid
2	Media	82,51	Very Valid
3	Language	82,27	Very Valid

1) Material Expert

The material experts in the development of e-worksheet are one lecturer of UMRAH Mathematics Education and one mathematics teacher of SMPN 8 Tanjungpinang. According to the expert assessment of the e-worksheet developed in terms of material, it is quite good and follows the KD in the 2013 curriculum. It is good at linking it to the object of ethnomathematics, namely Bubu. Suggestions by the validator are in the form of additional material, such as an introduction to the objects used in the study and the addition of a table of contents section.

The data on the validation sheet is qualitative. The assessment obtained is ordinal data, which is then converted into interval data through MSR transformation using Microsoft Office Excel 2010. The overall results obtained using MSR are 80.36%, with very valid criteria.

2) Media Expert

The media expert in the development of e-worksheet is one lecturer of UMRAH Mathematics Education and one mathematics teacher of SMPN 8 Tanjungpinang. The expert assessment of the e-worksheet developed in terms of media gave a positive response. The conclusion and suggestion by validator I is that the e-worksheet developed is generally quite suitable for use. Researchers are advised to pay attention to the layout of the writing, which is too close to the bottom, and the consistency in font types and sizes. According to validator II, the e-worksheet developed is good and interesting, so it can increase students' interest in learning in the learning process.

The data on the validation sheet is qualitative. The assessment obtained is ordinal data, which is then converted into interval data through MSR transformation using Microsoft Office Excel 2010. The overall results obtained using MSR are 82.51% with very valid criteria.

3) Language Expert

Language experts in the development of e-worksheet are one lecturer of Indonesian Language and Literature Education UMRAH and

one mathematics teacher of SMPN 8 Tanjungpinang. Expert assessment of the e-worksheet developed in terms of language gave a positive response. The assessment on the validation sheet carried out by validators I and II was oriented towards the categories of "agree" and "strongly agree". The conclusion and suggestion by validator I was an improvement in writing because there were still some typos in writing; the rest, in general, the e-worksheet developed could be continued to be given to students. The conclusion and suggestion given by validator II was that the e-worksheet developed already used good grammar and was easy to understand.

The data on the validation sheet is qualitative. The assessment obtained is ordinal data, which is then converted into interval data through MSR transformation using Microsoft Office Excel 2010. The overall result obtained using MSR was 82.27%, with very valid criteria.

b. Practicality Test of the Product

E-worksheet was based on ethnomathematics of fish trap in the form of Bubu, which has been validated and improved. A practicality test was conducted on teachers and students. The teacher's practicality test was conducted on a grade VIII mathematics teacher of SMPN 8 Tanjungpinang, and the students' practicality test was conducted on 21 grade VIII students. The assessment of students was carried out by filling out a response questionnaire that covered several aspects, namely aspects of learning components, ethnomathematics, interest in learning, clarity in writing, understanding of e-worksheet, interest in e-worksheet, design, and materials. This questionnaire was used to determine students' responses regarding the practicality of the e-worksheet product based on ethnomathematics of fish trap in the form of Bubu for students who use it. The results of the practicality test are presented in Table 2 below.

Table 2. Practicality test results

No	Participants	Average (%)	Criteria
1	Teacher	81,09	Very Practical

2	Students	84,33	Very Practical
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The calculation results showed that teachers and students categorized the results of the calculation of the practicality of e-worksheet as very practical. Thus, the e-worksheet that was developed is included in the practical category and can be used as supporting teaching materials in the learning process.

This development research produced a final product of e-worksheet based on ethnomathematics of fish trap in the form of Bubu on the material of space geometry for class VIII SMP. The e-worksheet that was developed refers to the ADDIE model developed by Dick and Carry (1996). However, according to the researcher's needs in this study, the researcher only carried out three stages: analysis, design, and development.

The e-worksheet, based on ethnomathematics of fish trap in the form of Bubu, which was developed, met the set assessment criteria. This can be seen in terms of material, media, and language. In terms of material, the developed e-worksheet is following the conditions of students because it has passed the curriculum review stage; in terms of media, e-worksheet has met the assessment criteria, has linked ethnomathematics values to space geometry material, and e-worksheet is easy to operate, in terms of language, e-worksheet already uses effective and easy-to-understand sentences.

The analysis stage is the first stage in this study. At this stage, the researcher conducted an analysis of initial conditions, student analysis, curriculum review, and material analysis. Changes in the learning process from distance learning to limited face-to-face learning resulted in an adaptation process that had to be carried out by students and teachers. However, not all people are adaptable to the changes that occur. This resulted in the learning process being less than optimal. Then, a curriculum review was carried out to determine the curriculum used by the school. Furthermore, the competencies that

must be developed must be identified, and then the core and basic competencies must be described into indicators. The basic competencies in question are in the material of flat-sided space geometry contained in the 2013 Curriculum.

The next stage is the design stage. At this stage, instruments and product design are prepared. At this stage, the researcher produced an initial design of e-worksheet based on ethnomathematics of fish trap in the form of Bubu on the material of space geometry. This e-worksheet was developed using Articulate Storyline 2 software. Several instruments were also produced at this stage, including the e-worksheet validation and practicality instruments. The e-worksheet validity instruments used in this study were the material expert validation questionnaire sheet, the media expert validation questionnaire, the language expert validation questionnaire, and the practicality instrument in the form of a teacher response questionnaire and a student response questionnaire.

The final stage in this research is the development, which consists of the stage of producing the product, then testing the validity of the product, making revisions if there are improvements, and the trial stage, namely conducting a trial of the product that has been validated to teachers and students to assess the practicality of the developed e-worksheet. The results at this stage are the level of product validity and the practicality of the e-worksheet product. At the product validity test stage, the validator is selected based on expertise relevant to the media and learning materials in the developed e-worksheet.

The assessment of the e-worksheet product by material experts is oriented towards the categories of "strongly agree" and "agree", and the results of the assessment in each aspect produce the categories of "very valid" and "valid". This case shows that the presentation in the developed e-worksheet follows basic competencies and includes clear indicators and

learning objectives. This aligns with what Ahyar (2014) said: the clarity of indicators and learning objectives will make it easier for students to learn in a focused manner.

The validation assessment by media experts is oriented towards the categories of "strongly agree" and "agree" to the statements on the questionnaire sheet based on the aspects divided into the questionnaire. Based on the validator's assessment regarding the media aspects of the e-worksheet, the product developed is declared valid. This means that the e-worksheet product developed using Articulate Storyline is good in ease and smooth operation of the e-worksheet application and is appropriate and clear in its appearance, in terms of text, images, and colour matching. In line with the research of Purwati and Nugroho (2019), well-designed media makes students happy while learning.

The validation assessment by language experts is oriented towards the categories of "agree" and "strongly agree" to the statements on the questionnaire sheet based on the aspects divided into the questionnaire. This indicates that the e-worksheet developed already uses sentences and language that are appropriate and easy to understand.

Based on the validation assessment by material experts, media experts, and language experts, it can be concluded that the developed e-worksheet product is declared valid with notes of improvement and is worthy of being tested. This means that the developed e-worksheet is worthy of being tested on respondents, namely teachers and students. In line with the opinion of Tanjung and Nababan (2018), the valid criteria for a media can be met if it meets three aspects: format, content, and language.

After the product in the form of e-worksheet is declared valid, a trial will be carried out to determine its practicality for teachers and students. The practicality test was conducted on grade VIII mathematics teachers of SMPN 8 Tanjungpinang and 21 grade VIII students.

Based on the results obtained from the assessment of e-worksheet by teacher and student responses, e-worksheet was declared practical, which indicates that the developed e-worksheet is practical, interesting, and easy to use in learning. The aspects measured in practicality are assessed in terms of learning components, ethnomathematics, interest in learning, clarity of writing, understanding of e-worksheet, interest in e-worksheet, design, and simple materials. This is in line with what was stated by Milala et al. (2022) that practicality refers to the condition of the learning media developed that is easy to use by users, both educators and students, so that the learning carried out is meaningful, interesting, fun, and useful for students, and increases creativity in learning. Thus, overall, it was found that the development of e-worksheet based on ethnomathematics of fish trap in the form of Bubu on the space geometry material of class VIII SMP in this development research met the criteria for validity and practicality.

IV. Conclusion

Based on this research and development results, the e-worksheet based on ethnomathematics of fish trap in the form of Bubu on the space geometry material for class VIII SMP can be used properly. This research and development refers to the ADDIE model. However, according to this study's needs, the researcher only carried out up to the development stage. The first stage is analysis; at this stage, the researcher conducted a curriculum review, material analysis, and ethnomathematics-based student analysis of space geometry material. By obtaining results in the form of information that students need and directing researchers to develop e-worksheet.

Next is the design stage, where the researcher designs e-worksheet using Articulate Storyline software. The researcher also compiled a research instrument in the form of a validity and practicality questionnaire. The results of this design stage are the product's initial design in the

form of e-worksheet and research instruments, namely expert validation sheets for material, media, language, and practicality questionnaires for teachers and students. The development stage aims to obtain the validity and practicality of the product that has been developed. Material experts obtained an average assessment of 80.36% of the e-worksheet product using valid criteria. The validation assessment by media experts obtained an overall average percentage of 82.51% with very valid criteria. The validation assessment by language experts obtained an overall average percentage of 82.27% with very valid criteria. Based on the results of the material, media, and language aspects validation, the developed e-worksheet obtained valid criteria.

After receiving suggestions and making several improvements, the next step was to conduct a trial on class VIII mathematics teachers and 21 class VIII students of SMPN 8 Tanjungpinang. The results of the practicality trial by teachers as a whole obtained an average assessment of 81.09% with very practical criteria, and the results of the practicality test of students as a whole obtained an average assessment of 84.33% with very practical criteria.

Based on the results of the validity and practicality tests that have been carried out, the e-worksheet that was developed obtained valid and practical criteria, which means that the product is feasible and easy for teachers and students to use in learning.

Reference

- Ahyar, R., Lufri, L., & Sumarmin, R. (2014). Pengembangan multimedia pada materi struktur dan fungsi organ manusia untuk siswa kelas XI sekolah menengah atas. *Kolaboratif*, 2(1).
- Anas. (2022). Sumber daya manusia Indonesia di era globalisasi. *Jurnal Ilmiah Promis*, 3(2), 110–130.
<https://www.journal.stitpemalang.ac.id/index.php/Promis/article/view/566>

- Apriliyani, S. W., & Mulyatna, F. (2021). Flipbook e-worksheet dengan pendekatan etnomatematika pada materi teorema pythagoras. *Sinasis: Seminar Nasional Sains*, 2(1), 491–500. <http://www.proceeding.unindra.ac.id/index.php/sinasis/article/view/5389>
- Dick, W. (1996). The Dick and Carey model: Will it survive the decade? *Educational Technology Research and Development*, 44(3), 55–63. https://doi.org/10.1007/978-3-540-73320-1_4
- Fairuz, F. R., Fajriah, N., & Danaryanti, A. (2020). Pengembangan lkpd materi pola bilangan berbasis etnomatematika Sasirangan di kelas VIII sekolah menengah pertama. *EDU-MAT: Jurnal Pendidikan Matematika*, 8(1), 29–38. <https://doi.org/10.20527/edumat.v8i1.8343>
- Febrian, F., Astuti, P., & Susanti, S. (2023). Ethnomathematical Study on Indigenous Fish Trap: Example from Kijang, Bintan Regency. *Jurnal Pendidikan Matematika*, 17(1), 21–36.
- Luthfi, H., & Rakhmawati, F. (2022). Pengembangan lembar kerja peserta didik (LKPD) berbasis etnomatematika pada materi bangun ruang sisi lengkung kelas IX. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 07(01), 98–109.
- Mar'ah, N. K., Rusilowati, A., & Sumarni, W. (2020). Perubahan proses pembelajaran daring pada siswa sekolah dasar di tengah pandemi covid-19 Nur. *Seminar Nasional Pascasarjana UNNES*.
- Mardhiyah, R. H., Aldriani, S. N. F., Chitta, F., & Zulfikar, M. R. (2021). Pentingnya keterampilan belajar di abad 21 sebagai tuntutan dalam pengembangan sumber daya manusia. *Lectura: Jurnal Pendidikan*, 12(1), 29–40.
- Milala, H. F., Endryansyah, Joko, & Agung, A. I. (2022). Keefektifan dan kepraktisan media pembelajaran menggunakan adobe flash player. *Jurnal Pendidikan Teknik Elektro*, 11(02), 195–202. <https://doi.org/10.26740/jpte.v11n02.p195-202>
- Purwati, H., & Nugroho, A. A. (2019). Pengujian validitas dan reliabilitas konstruk instrumen kreativitas mahasiswa pada model computer assisted instruction (CAI). *Jurnal Riset Pembelajaran Matematika*, 1(1), 1–6.
- Rewatus, A., Leton, S. I., Fernandez, A. J., & Suciati, M. (2020). Pengembangan lembar kerja peserta didik berbasis etnomatematika pada materi segitiga dan segiempat. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 04(02), 645–656.
- Sati, Setiana, D., & Amelia, A. N. (2022). Implementasi pembelajaran e-learning terhadap minat belajar peserta didik di masa pandemi covid-19. *Jurnal Basicedu*, 6(1), 51–57. <https://doi.org/10.31004/basicedu.v6i1.1899>
- Sirait, J., & Oktavianty, E. (2021). Pengembangan dan validasi angket motivasi belajar fisika (AMBF): studi pilot. *Jurnal Ilmiah Pendidikan Fisika*, 5(3), 305–316. <https://doi.org/10.20527/jipf.v5i3.3829>
- Tanjung, H. S., & Nababan, S. A. (2018). Pengembangan perangkat pembelajaran matematika berorientasi model pembelajaran berbasis masalah (PBM) untuk meningkatkan kemampuan berpikir kritis siswa sma se-Kuala Nagan Raya Aceh. *Genta Mulia*, 9(2), 56–70.
- Ubiratan D'ambrosio. (1985). FLM Publishing Association Ethnomathematics and Its Place in the History and Pedagogy of Mathematics. Source: For the Learning of Mathematics, 5(1), 44–48.

