Mathematics Education Journals
Vol. 8 No. 2 August 2024

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
http://ejournal.umm.ac.id/index.php/MEJ

Implementation of STEAM and Thematic Learning Models Assisted by STEMATIK Learning Media in Elementary School

Atika Azzahro Hazima[1], Eko Prasetyo[2], Aulia Hanif Annisa[3], Ranti Maryanti[4]

[1,4] Elementary School Teaher Education, Universitas Muhammadiyah Surakarta, Indonesia
[2] Civic Education, Universitas Muhammadiyah Surakarta, Indonesia
[3] Mathematic Education, Universitas Muhammadiyah Surakarta, Indonesia.
Email: hazimaatika222@gmail.com

Corresponding author:

Atika Azzahro Hazima
hazimaatika222@gmail.com

Keywords:
learning media; STEAM; thematic; elementary school

Abstract

Learning is not only about giving theories, but instilling concepts is more important to teach to students. One of the concepts instilled in mathematics, namely the arithmetic material of addition and subtraction for elementary school. STEMATIK learning media supports students' understanding in introducing the arithmetic concepts of addition and subtraction for lower elementary school classes. This research aimed to explain the component analysis of integrating STEAM and thematic learning using STEMATIK learning media, to describe the importance of using learning media in enhancing students' independence and motivation to learn, and to present the results of using STEMATIK learning media as a tool for learning mathematics. The research method employed was a quasi-experiment. Quantitative data analysis was conducted to analyze the data collected from the research instrument, including validation instruments by two experts in the form of learning media feasibility instruments and pretest and posttest assessment results on 31 elementary school students on the control group and the experimental group. The validity test used T-test by SPSS application. The product development process was based on the ADDIE model, a systematic approach that includes five stages: analysis, design, development, implementation, and evaluation. The method used in this research was the descriptive, qualitative and quantitative method. The research results show that for the validity test the increase in knowledge scores significantly using the T test with the SPSS application produces two sides of less than 0.001. The level of student learning independence is good, achieving a score of 68,14, which according to the category is considered good. The percentage for the student learning motivation category falls into the high criterion. The result of these indicators shows a score of 83, which is categorized as high.

Hazima, A. A., Prasetyo, E., Annisa, A.H. & Maryanti, R. (2024). Implementation of STEAM and Thematic Learning Models Assisted by STEMATIK Learning Media in Elementary School. *Mathematics Education Journal*, 8(2), 159-171. DOI: 10.22219/mej.v8i2.34029

INTRODUCTION

Learning media is a tool to connect materials and clarify the delivery of messages, information, and enhance student motivation (Wulandari et al., 2023). The presence of learning media can also provide students with the same experience about their environmental events, and allow direct interaction with teachers,

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
http://ejournal.umm.ac.id/index.php/MEJ

society, and the environment (Justicia et al., 2023; Leavy et al., 2023). Visual-based or image- based media plays a crucial role in the learning process (Wulandari & Anugraheni, 2021). One way to improve the quality of education, according to Istiqamah & Zirmansyah (2024), is by implementing STEAM (Science, Technology, Engineering, Art, and Mathematics). Learning with a STEM approach is said to be capable of preparing students to face a real world full of problems and to be ready for global competition. As revealed by Widya et al. (2019), advanced countries like the United States have been using STEAM to address problems and challenges that arise in the 21st century (Priyantini et al., 2021; Wardani et al., 2021). This certainly does not rule out the possibility for developing countries like Indonesia to use STEAM, so that they can compete in various aspects in this modern era (Shonkoff et al., 2020). The STEAM approach can be implemented by creating learning media to produce optimal learning.

Challenges in mathematics and reading during childhood can have long-lasting impacts into adulthood, negatively affecting educational attainment, income, wealth, and health (Shonkoff et al., 2020). One of the goals of mathematics education is to equip students with the ability to think logically, analytically, systematically, critically, creatively, and to work cooperatively (Nurcahyono & Putra, 2023). Mathematical literacy acts as a channel that connects mathematical concepts with real-world applications. Integral aspects of mathematical literacy involve the utilization, implementation, and recognition of mathematics in various situations (Papadakis et al., 2021; Sulistyaningrum et al., 2021). Although literacy is generally associated with basic skills such as reading and writing, mathematical literacy is crucial for problem-solving in new situations and interpreting mathematics in various contexts (Evianah, 2023; Verschaffel et al., 2020). Learning is not only about giving theories, but instilling concepts is more important to teach to students. One of the concepts instilled in mathematics, namely the arithmetic material of addition and subtraction for elementary school. STEMATIK learning media supports students' understanding in introducing the arithmetic concepts of addition and subtraction for lower elementary school classes. Based on the results of observations, there are still many students in grade 1 of Muhammadiyah Elementary Islamic School of Paseban Bayat, Klaten who have difficulty in learning arithmetic concepts in the form of addition and subtraction, so that the development of STEMATIK learning media can help students in understanding arithmetic concepts.

Previous studies have discussed the development of STEAM learning models in elementary schools to support the optimization of the learning process. First, the research conducted by Twiningsih & Elisanti (2021) found that STEAM-based learning media can enhance critical thinking skills and science literacy. Second, according to Lu et al. (2022), augmented reality-based STEAM learning media can improve the quality of natural science in elementary schools. Third, the research conducted by Septinaningrum et al. (2022) resulted in the validation of STEAM-based learning media and 2C based on local wisdom. Fourth, according to Adiputra et al. (2021), STEAM-based learning videos can enhance students' trigonometry skills. Fifth, as noted by Mulder et al. (2023), web-based science learning media with a STEAM approach can enhance students' creative thinking abilities. Sixth, Suryaningsih and Ainun Nisa (2021) explained that STEAM can

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
http://ejournal.umm.ac.id/index.php/MEJ

contribute to project-based learning in measuring students' science process skills and creative thinking. Seventh, as mentioned by Purwanti & Zulkarnaen (2023), loose part learning media based on STEAM can build students' learning independence. Based on the results of previous research, there has been no research that discusses the development of STEAM-based learning and thematic learning for elementary classes in elementary schools.

Learning media that integrates the STEAM model will be more attractive to students, by optimizing creativity in creating good learning media. Integration with the thematic learning model will foster student growth in various subjects. Therefore, it is important for teachers to develop learning media by integrating STEAM and thematic learning models in designing a learning. According to research conducted by Astryani et al (2022), student worksheets using the STEAM learning model can improve student learning outcomes. Therefore, this research aims to describe the effectiveness of STEAM-based learning media in lower grades. Besides that, this research aimed to explain the component analysis of integrating STEAM and thematic learning using STEMATIK learning media, to describe the importance of using learning media in enhancing students' independence and motivation to learn, and to present the results of using STEMATIK learning media as a tool for learning mathematics.

RESEARCH METHOD

Type and Design

The research method employed was a quasi-experiment. This study tested causal results to determine the influence of one variable on another. The product development process was based on the ADDIE model, which is a systematic approach that includes five different stages: analysis, design, development, implementation, and evaluation. The sampling technique was carried out using non-probability sampling with purposive sampling. Additionally, utilizing the STEAM dan thematic learning Models Assisted by STEMATIK Learning Media, pre-and post-test instruments are employed to assess students' learning results.

Data and Data Sources

The method used in this research was the descriptive, qualitative and quantitative method. The subjects of this study were 31 elementary school students from the first grade, as the population sample. Data were collected from Muhammadiyah Elementary Islamic School of Paseban Bayat, Klaten. Anggito and Setiawan (2018) state that in qualitative research, data sources or samples are purposively (intentionally) determined, and informants (research subjects) need not represent the population. The interviewee for this research was a first-grade teacher named Mrs. Dewi Minani, who has experience in creating learning media for elementary schools.

Data Collection Technique

The data collection techniques included interviews, observations, questionnaires, field notes, and documentation. Data collection techniques include interviews, observations, questionnaires, field notes, and documentation. Interview data is used to find initial information in identifying problems and providing

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
http://ejournal.umm.ac.id/index.php/MEJ

solutions in improving learning. Observations are used to observe class conditions that will be used as research groups. Questionnaires are used to validate the developed learning media and student learning outcome questionnaires. Field notes are made to record all research results, in the form of student development scores, student psychomotor development, before and after the use of learning media. The last data collection technique is documentation, in the form of student assessment data and photos of the use of learning media as evidence of the use of learning media in the classroom. This descriptive research aimed to obtain an overview and descriptions of the learning media, student characteristics, methods, strategies, and mathematics materials studied. This study utilized data analysis techniques that refer to the Miles and Huberman model. Miles and Huberman propose that activities in qualitative data analysis are carried out interactively and continuously until completion, so that the data are saturated (Palazzolo, 2023).

Data Analysis

The first data analysis is to determine the validity of the developed learning media, Validity test using the Aiken V model which is assessed by two media validators. The second data analysis is carried out by pretest and posttest testing on the control group and the experimental group. In addition, researchers also identified the effect of the use of learning media on students' independence and learning motivation. Both indicators are analyzed using a score assessment model for increasing the quantity of students' independence and learning motivation. Conclusions in qualitative research are new findings that have not previously existed. A finding can be a description or depiction of an object that was previously unclear or dark, but after being researched becomes clear, it can be a causal or interactive relationship, hypothesis, or theory (Palazzolo, 2023). Quantitative data analysis was carried out to analyze data collected from research instruments, including validation instruments by experts in the form of learning media appropriateness instruments. Media reliability using the T-test use SPSS application. The category of scores in the scale of student independence improvement is presented in Table 1 below:

Table 1. Score category

Score	Scale / Criteria
81-100	Excellent
61-80	Good
41-60	Average
21-40	Below Average
0-20	Poor

Observations with direct actions were carried out by the researchers to determine the calculation of the level of student independence. The formula used to determine the level of student independence is as follows:

(1)

$$P = f \times 100\%$$

Where:

P = percentage f = frequency of each response n = number of data/samples

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
http://ejournal.umm.ac.id/index.php/MEJ

The assessment of the student learning motivation indicator sheet was calculated using the following formula:

(2)

$$\text{Score of motivation for each indicator} = \frac{frequency\ of\ students\ fulfilling\ indicator}{total\ number\ of\ students} \text{ x } 100\%$$

After determining the formula to be used in calculating the level of student independence, the researcher employed indicator criteria to determine the level of student independence. The researcher utilized the established indicators as shown in Table 2 below:

Table 2. Student motivation percentage category

Achievement	Criteria
75% - 100%	High
51% - 74%	Medium
25% - 50%	Low
0% - 24%	Very Low

RESULTS AND DISCUSSION

STEAM Analysis in STEMATIK Learning Media

Testing the validity of the product design is first carried out by experts with the aim of seeing the quality of the product in terms of the suitability of the learning media. Analysis of the validity of each component uses Aiken index analysis. The results of the validity analysis show that on average each validator provides a value with valid criteria for each component or aspect assessed. The results of the assessment and analysis of assessment data on content aspects are presented in Table 3.

Table 3. Validity testing result

Indicators	Aiken Indeks	Criteria
Compatibility with the Basic Competencies	0,80	Very Valid
Suitability with students' abilities	0,70	Valid
Whether the learning media supported students' abilities	0,67	Valid
Compatibility with the discovery stage	0,72	Very Valid
Whether the learning media led to the science aspect of STEAM	0,63	Valid
Whether the learning media led to the technology aspect of STEAM	0,68	Valid
Whether the learning media led to the engineering aspect of STEAM	0,78	Very Valid
Whether the learning media led to the mathematics aspect of STEAM	0,85	Very Valid

Based on the results of interviews with the teacher, the creation of learning media can use recycled materials, such as paper, ice cream sticks, cardboard, and printed images. The teacher modifies these recycled items into attractive learning media in

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
http://ejournal.umm.ac.id/index.php/MEJ

accordance with the material being taught. The creation of learning media is believed to enhance student learning outcomes. In addition, the creation of learning media can also increase creativity and cooperation among the students in the class.

Figure 1. STEMATIK Learning Media

Figure 1 shows the result of creating STEMATIK learning media for the first grade. STEMATIK learning media is a learning media that integrates the STEAM and thematic learning models. According to Mumpuni et al. (2022), the use of recycled materials can be used in learning media because they are easily obtained and not harmful to students, can train creativity, reuse unused goods, and can become art and counting learning media. The analysis of the STEAM model and thematic content using STEMATIK learning media is explained in the following Table 4.

Table 4. STEAM learning media analysis based on experts

No	STEAM Component	Meaning	Description
1.	Science	Knowledge	The knowledge in this learning media includes the study of art and the insulating properties of plastic.
2.	Technology	Tools to assist human work	With the help of this learning media, students will be assisted in performing tens to hundreds of additions and subtractions.
3.	Engineering	A systematic way of teaching something	The learning media is designed using plastic material. If marked with non-permanent black ink, the markings can be erased, allowing for the repeated use of the media.
4.	Art	Skill in creating works	The creation of learning media is integrated with students' creativity skills in sticking, drawing, and providing complements to the learning media to make it look attractive.
5.	Mathematics	Mathematics	The mathematical contents in the creation of media are measuring the length of cardboard and the squares of the media, as well as determining the precision of the learning media.

STEMATIK learning media integrates many learning contents, making it thematic. The learning contents included in the created learning media encompasses Civic Education learning content in the form of attitude assessment, Art and Culture

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
http://ejournal.umm.ac.id/index.php/MEJ

in the form of student creativity assessment, and Indonesian language in the form of reading comprehension assessment. Thematic learning is a learning method that supports specific themes to teach several curricular concepts (Setiawan, 2019). In addition, the creation process also incorporates students' multiple intelligences, accommodating a variety of student abilities. This statement aligns with the research conducted by Yavich and Rotnitsky (2020), which states that multiple intelligences encompass students' problem-solving abilities. In preparation for its creation, the students prepare materials and tools at home according to the teacher's instructions, and then independently develop the STEMATIK learning media. The thematic learning contents are explained in the following Table 5.

Table 5. Analysis of learning media thematic content based on experts

No	Learning Content	Description
1.	Mathematics	Students learn various additions and subtractions through learning media.
2.	Civic Education	Students learn independence, discipline, and cooperation in the creation of learning media.
3.	Indonesian Language	Teachers can vary questions with reading questions that are included in the HOTS (High Order Thinking Skills) problem analysis.
4.	Art and Culture	The creation of this learning media requires skills in cutting and shaping to make it look neat and good.

Development of STEMATIK Learning Media

Figure 2. Use of STEMATIK in learning

The use of STEMATIK learning media in the classroom supports the students' understanding of addition and subtraction material. The presence of learning media that they created themselves from observation results showed that students were more interested and motivated to learn. The students were more curious about whether the answers they got were correct or wrong. This opinion aligns with the research conducted by Antoneta et al. (2023) that using learning media can improve students' cognitive and psychomotor outcomes. According to observation results, the first-grade students were more interested in learning integrated with the conventional learning media. The students' learning motivation could be seen from their engagement in answering the questions that the teacher provided on the blackboard. The engagement of the students can be seen in Figure 3.

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
http://ejournal.umm.ac.id/index.php/MEJ

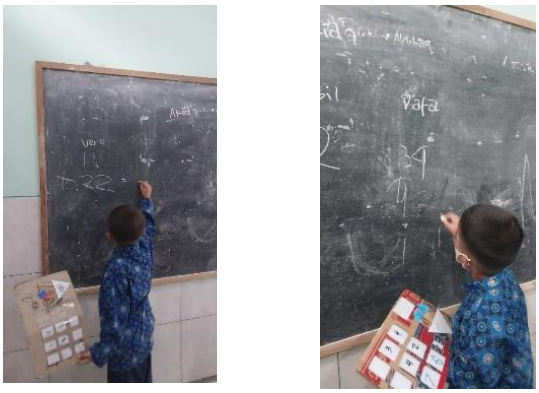

Figure 3. STEMATIK learning evaluation

The learning evaluation was conducted by answering the given questions, providing an opportunity for the students to write their answers on the blackboard. Selected students would come forward to write their answers. The students collaborate to confirm the answers written on the blackboard. The assessment system included several aspects, including oral, practical, and discussion-based assessments. This aligns with the research by Marzuki (2023), in which the assessment system can consist of administering tests, contextual mathematical exams, and assessments in the form of student character surveys that are in line with the practice of Pancasila. The oral assessment involved the students answering directly. The practical assessment consisted of giving problems to the students, who then solved them using the provided materials. The final assessment was conducted through discussions, which involved learning evaluation activities by collaboratively correcting answers. The students' learning outcomes can be seen in Figure 4.

Figure 4. Students' answers

The students were given problems with tens numbers, in line with the material they were taught. According to the teacher, the basic mathematics material that first-grade students must master is counting. Based on the interview with the teacher, in the first trimester, the students could count from 1 to 20, and in the second trimester, the students could count from 20 to 100. Subsequently, after being able to count, the students learned how to write and memorize the numbers. Afterward, the students learned about addition, subtraction, comparing numbers, sorting numbers, up to the last material which was a number pattern consisting of two images. In this assessment, two samples of mathematical assessments were taken before utilizing learning media and three meetings using STEMATIK learning media to measure the success of the learning process with the media employed (Rukayah et al., 2021; Silva-Hormazábal & Alsina, 2023).

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
http://ejournal.umm.ac.id/index.php/MEJ

Table 6. T-test Pretest and Posttest Scores

Paired Samples Test

		Paired Differences					t	df	Significance	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			One-Sided p	Two-Sided p
Pair 1	Pretest Postest	--13.387	15.673	2.815	-19.136	-7.638	-4.756	30	<,001	<,001

Table 7. Independence assessment indicators

Variable	Indicator	Observed Aspect
Learning Independence	Self-confidence	1. Displaying courage in public 2. Confident in their abilities 3. Actively asking questions 4. Not afraid to express opinions 5. Speaking loudly in public 6. Active during discussions 7. Calm in problem-solving 8. Trying to work on tasks independently
	Able to work independently	a. Having the initiative to work independently b. Completing tasks without assistance c. Feeling satisfied with their own abilities
	Able to make decisions	1. Calm in making decisions 2. Able to solve problems on their own
	Responsible	3. Having the courage to express the truth 4. Having the courage to take risks 5. Failure is not despair
	Desire to advance competitively	a. High learning motivation b. Feeling challenged to improve themselves c. High creativity
	Discipline	1. Obedient and orderly at school 2. Preparing themselves well 3. Not violating school rules
	Active in learning	a. Exchanging opinions b. Trying to find problem solutions c. Adjusting to a good learning atmosphere d. Having the courage to express opinions

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
http://ejournal.umm.ac.id/index.php/MEJ

Table 8. Results of the learning independence questionnaire

No	Indicator	Calculation	Score	Criteria
1.	Self-confidence	P = $\frac{26}{31}$ x 100%	P = 84	Excellent
2.	Able to work independently	P = $\frac{22}{31}$ x 100%	P = 71	Good
3.	Able to make decisions	P = $\frac{17}{31}$ x 100	P = 55	Average
4.	Responsible	P = $\frac{24}{31}$ x 100	P = 77	Good
5.	Desire to advance competitively	P = $\frac{24}{31}$ x 100	P = 77	Good
6.	Discipline	P = $\frac{9}{31}$ x 100	P = 29	Below Average
7.	Active in learning	P = $\frac{26}{31}$ x 100	P = 84	Excellent
Mean		**68, 14**		**Good**

Source: Processed data

Based on Table 7 above, it demonstrates that the level of student learning independence is good, achieving a score of 68,14, which according to the category is considered good. Not only that, the researchers also collected data on student learning motivation after using the learning media. The achievement indicators of student motivation research are explained by Arifin and Abduh (2021), which include student activity in carrying out learning tasks, student involvement in problem-solving, courage to ask questions, and being active in seeking learning resources

After categorizing the remaining motivation scale, the researchers calculated the level of student learning motivation after utilizing the learning media. The student data were observed by the researchers, and the calculation of the student learning motivation scale after using the learning media is as follows:

Table 9. Learning motivation indicators

Indicator	Frequency	Calculation	Criteria
When teaching and learning activities take place, students participate in carrying out their learning tasks.	31	M = $\frac{31}{31}$ x 100% = 100%	High
Students want to be involved in problem-solving in learning activities.	24	M = $\frac{24}{31}$ x 100% = 77%	High
Students want to ask friends or teachers if they do not understand the material or encounter difficulties.	26	M = $\frac{26}{31}$ x 100% = 84%	High
Students want to try to find information that can be used for solving the problems they are facing.	22	M = $\frac{22}{31}$ x 100% = 71%	High
Mean		83%	High

Source: Processed data

Based on the student motivation indicators, this research is considered successful, because out of 31 students, the percentage for the student learning motivation category falls into the high criterion. The result of these indicators shows

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
http://ejournal.umm.ac.id/index.php/MEJ

a score of 83, which is categorized as high. Therefore, the use of learning media can enhance the aspect of student learning motivation.

CONCLUSION

STEMATIK learning media are learning tools that integrate STEM and thematic learning models. STEMATIK learning media integrates many learning contents, thus encompassing multiple intelligences of students. The learning contents of the learning media created by the teacher includes civic education learning content in the form of attitude assessment, Art and Culture in the form of student creativity assessment, and Indonesian Language in the form of reading comprehension assessment.

This study has several limitations, one of which is that the data collection on student independence cannot be generalized to every student. Not all students applied honesty (avoiding peer cheating) when completing cognitive tasks.

The research results prove that a learning system adopting learning media can enhance knowledge, independence, and motivation of elementary school students. The integration of STEM and thematic learning is a good integration to implement because it covers various aspects of learning content. The easy-to-use STEM model influenced the students' interest in using the media, while its thematic content aimed to integrate several learning contents in accordance with the 2013 curriculum model that is based on thematic content.

ACKNOWLEDGMENT

The authors express gratitude to the Department of Elementary School Teacher Education of universitas Muhammadiyah Surakarta for their support in the smooth execution of this research. Thanks are also extended to the principal, teachers, and first-grade students of MI Muhammadiyah of Paseban who kindly agreed to be the subjects of this research.

REFERENCES

Adiputra, D. K., Karyaningsih, D., Ruiyat, S. A., Heryadi, Y., Sampurna, I., & Solihatulmillah, E. (2021). Development of Vocational Learning Video Based on Local account in PKN Learning in Elementary School. *Journal of Physics: Conference Series*, *1764*(1), 5–9. https://doi.org/10.1088/1742-6596/1764/1/012086

Anggito, A., & Setiawan, J. (2018). *Metodologi penelitian kualitatif*. CV Jejak (Jejak Publisher).

Antoneta, O., Udju, D., Oktoviana Bano, V., Rambu, R., Enda, H., Studi, P., Biologi, P., Wira, K., & Sumba, W. (2023). *Menggunakan media gambar untuk meningkatkan hasil belajar siswa Di Smp Negeri 4 Mauliru*. *4*(1), 155–168.

Astryani, D. S., Susanta, A., Koto, I., & Susanto, E. STEM-Integrated Student Worksheets on Space Figure Using the Discovery Learning Model for Elementary School Students. Profesi Pendidikan Dasar, 9(2), 191-205. http://dx.doi.org/10.23917/ppd.v9i2.19319

Arifin, M., & Abduh, M. (2021). Peningkatan Motivasi Belajar Model Pembelajaran Blended Learning. *Jurnal Basicedu*, *5*(4), 2339–2347.

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
http://ejournal.umm.ac.id/index.php/MEJ

Evianah, N. (2023). Transformatif pembelajaran berbasis literasi dan numerasi di Madrasah Ibtidaiyah Negeri 2 Mojokerto. *Zahra: Research And Tought Elmentary School Of Islam Journal*, *3*(2), 71–80.

Istiqamah, N., & Zirmansyah, Z. (2024). Implementasi pendekatan science, technology, engineering, art, mathematic, montessori, islamic (STEAMMI) dalam model pembelajaran kelompok di taman kanak-kanak. *Jurnal Anak Usia Dini Holistik Integratif (AUDHI)*, *6*(2), 58. https://doi.org/10.36722/jaudhi.v6i2.2634

Lu, S. Y., Lo, C. C., & Syu, J. Y. (2022). Project-based learning oriented STEAM: the case of micro–bit paper-cutting lamp. *International Journal of Technology and Design Education*, *32*(5), 2553–2575. https://doi.org/10.1007/s10798-021-09714-1

Marzuki. (2023). Analisis penilaian hasil belajar siswa mata Pelajaran Ilmu pengetahuan alam pada Kurikulum Merdeka. *Jurnal Review Pendidikan Dan Pengajaran*, *6*(17), 2771–2780.

Mulder, W. R. S. P., Khoiri, N., & Hayat, M. S. (2023). Validitas media pembelajaran IPA berbasis web dengan pendekatan STEAM untuk meningkatkan kemampuan berpikir kreatif peserta didik. *Practice of The Science of Teaching Journal: Jurnal Praktisi Pendidikan*, *2*(1), 11–17. https://doi.org/10.58362/hafecspost.v2i1.31

Mumpuni, A., Azizah, S., Rahma, S. A., Utami, D., Indah Safitri, N., Aswat Tiana, F., Kartika Putri, D. A., & Aditya Pratama, A. (2022). Pemanfaatan barang bekas sebagai media pembelajaran untuk meningkatkan literasi numerasi peserta didik di sekolah dasar. *JAMU : Jurnal Abdi Masyarakat UMUS*, *3*(01), 8–14. https://doi.org/10.46772/jamu.v3i01.748

Nurcahyono, N. A., & Putra, J. D. (2023). Penerapan differentiated instruction terhadap kemampuan siswa dalam belajar matematika. *Journal of Authentic Research on Mathematics Education*, *5*(2), 234–242.

Palazzolo, D. J. (2023). Research Methods. *Experiencing Citizenship: Concepts and Models for Service-Learning in Political Science*, 109–118. https://doi.org/10.4324/9781003444718-9

Purwanti, P., & Zulkarnaen, Z. (2023). Steam-Based Loose Part Learning Media Can Build Independent Learning Early Children. *JURNAL INDRIA (Jurnal Ilmiah …*, *8*(1), 43–57. https://journal.umpo.ac.id/index.php/indria/article/view/6519

Septinaningrum, Hakam, K. A., Setiawan, W., & Agustin, M. (2022). Developing of Augmented Reality Media Containing Grebeg Pancasila for Character Learning in Elementary School. *Ingenierie Des Systemes d'Information*, *27*(2), 243–253. https://doi.org/10.18280/isi.270208

Setiawan, A. R. (2019). Pembelajaran tematik berorientasi literasi saintifik. *Jurnal Basicedu*, *4*(1), 51–69. https://doi.org/10.31004/basicedu.v4i1.298

Shonkoff, J. P., Slopen, N., & Williams, D. R. (2020). Early childhood adversity, toxic stress, and the impacts of racism on the foundations of health. *Annual Review of Public Health*, *42*, 115–134. https://doi.org/10.1146/annurev-publhealth-090419-101940

Suryaningsih, S., & Ainun Nisa, F. (2021). Kontribusi STEAM Project Based Learning dalam Mengukur Keterampilan Proses Sains dan Berpikir Kreatif

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
http://ejournal.umm.ac.id/index.php/MEJ

Siswa. *Jurnal Pendidikan Indonesia*, *2*(6), 1097–1111. https://doi.org/10.36418/japendi.v2i6.198

Tresnaningsih, F., Santi, D. P. D., & Suminarsih, E. (2019). Kemandirian belajar siswa Kelas III SD n Karang Jalak I dalam pembelajaran tematik. *Pedagogi: Jurnal Penelitian Pendidikan*, *6*(2), 51–59. https://doi.org/10.25134/pedagogi.v6i2.2407

Twiningsih, A., & Elisanti, E. (2021). Development of STEAM Media to Improve Critical Thinking Skills and Science Literacy. *International Journal of Emerging Issues in Early Childhood Education*, *3*(1), 25–34. https://doi.org/10.31098/ijeiece.v3i1.520

Verschaffel, L., Schukajlow, S., Star, J., & Van Dooren, W. (2020). Word problems in mathematics education: a survey. *ZDM - Mathematics Education*, *52*(1), 1–16. https://doi.org/10.1007/s11858-020-01130-4

Widya, Rifandi, R., & Laila Rahmi, Y. (2019). STEM education to fulfil the 21st century demand: A literature review. *Journal of Physics: Conference Series*, *1317*(1), 0–7. https://doi.org/10.1088/1742-6596/1317/1/012208

Wulandari, A. P., Salsabila, A. A., Cahyani, K., Nurazizah, T. S., & Ulfiah, Z. (2023). Pentingnya media pembelajaran dalam proses belajar mengajar. *Journal on Education*, *5*(2), 3928–3936. https://doi.org/10.31004/joe.v5i2.1074

Wulandari, I. M., & Anugraheni, I. (2021). Pengembangan media komik matematika berbasis visual pada materi kerucut dan tabung di sekolah dasar. *Jurnal Ilmiah Wahana Pendidikan*, *7*(2), 269–277. https://doi.org/10.5281/zenodo.4683023

Yavich, R., & Rotnitsky, I. (2020). Multiple intelligences and success in school studies. *International Journal of Higher Education*, *9*(6), 107–117. https://doi.org/10.5430/ijhe.v9n6p107