International Journal of Elementary Education
Volume 6, Number 3, Tahun 2022, pp. 551-557
P-ISSN: 2579-7158 E-ISSN: 2549-6050
Open Access: https://doi.org/10.23887/ijee.v6i4.54086

Elementary School Students' Mathematical Disposition Ability Oriented with STEAM Approach

Rahma Hidayanthi[1*], Yanti Fitria[2], Hendra Syarifuddin[3], Yalvema Miaz[4]

[1,2,3,4] Pendidikan Dasar, Fakultas Ilmu Pendidikan, Universitas Negeri Padang, Padang, Indonesia

ARTICLE INFO

Article history:
Received September 02, 2022
Accepted November 15, 2022
Available online November 25, 2022

Kata Kunci:
Disposisi Matematis, Pendekatan STEAM, Siswa Sekolah Dasar

Keywords:
Mathematical Disposition, STEAM Approach, Elementary School Students

ABSTRAK

Minat, ketekunan, dan kecenderungan siswa dalam belajar matematika masih rendah. Hal ini disebabkan karena siswa mengalami kesulitan belajar dan tidak tertarik pada matematika. Untuk mengembangkan kebiasaan matematis yang kokoh, siswa membutuhkan disposisi matematis untuk mempelajari matematika. Penelitian ini bertujuan untuk menganalisis bagaimana pendekatan STEAM mempengaruhi disposisi matematika siswa sekolah dasar. Jenis penelitian yang digunakan dalam penelitian ini adalah penelitian kuantitatif dengan menggunakan teknik eksperimen. Desain Kelompok Kontrol Tidak Ekuivalen digunakan dalam penelitian ini. Populasi penelitian ini adalah anak-anak sekolah dasar kelas V. Kelas VA dijadikan sebagai kelas eksperimen untuk penelitian ini, dan kelas VB dijadikan sebagai kelas kontrol. Kuesioner merupakan instrumen yang digunakan dalam penelitian ini. Analisis yang digunakan adalah independent sample t-test, uji normalitas dan uji homogenitas. Hasil penelitian menemukan bahwa penerapan pendekatan STEAM berpengaruh signifikan terhadap disposisi matematis siswa kelas kecepatan dan debit sesuai hasil analisis uji t yang memiliki nilai signifikansi. Pembelajaran dengan pendekatan STEAM menjadikan siswa berperan aktif dalam kegiatan pembelajaran.

ABSTRACT

Student's interest, persistence, and tendency in learning mathematics were still low. This is because students have learning difficulties and are not interested in mathematics. To develop solid mathematical habits, students need a mathematical disposition to study mathematics. This study aims to analyses how the STEAM approach affected primary school students' disposition for mathematics. The sort of research used in this study was quantitative research using experimental techniques. The Nonequivalent Control Group Design is used in this study. The population of this study comprised fifth-grade primary school children. Class VA served as the experimental class for this study, and class VB served as the control class. A questionnaire is an instrument utilized in this study. The analysis used is independent sample t-test, normality and homogeneity tests. The result found that the application of the STEAM approach has a significant effect on the mathematical disposition of class students on speed and discharge according to the results of the t-test analysis which has a significance value. Learning with the STEAM approach makes students play an active role in learning activities.

1. INTRODUCTION

Education is a process as well as a medium for learning something new in human life. Education is a process consisting of several organized actions to change student behavior, which is represented in knowledge, attitudes, and behavior in the context of home, school, and society (Ediyanto et al., 2020; Leong & Rasli, 2014). Through teaching and training, education is a process of changing the behavior and attitudes of a person or group to mature the human being himself (Andayani et al., 2020; yanti fitria, Helsa, 2019). Thus it can be formulated that the experience experienced by humans in their environment is a process of self-maturation which then becomes a teaching process and provides an educational outcome.

The issues of the 21st century can be distinguished by the globalization age, which has made the world feel borderless and led to international comparisons between educational institutions, assessment methods, and student accomplishment (Nurtanto et al., 2019; Santhi & Pangestika, 2021). This is among the fastest technological advances in recorded history (Amran et al., 2019; Falloon, 2020). Knowledge of science and technology is necessary to succeed in the globalization era. This necessitates the ability of diverse parties to build capabilities about the development of capabilities in the sphere of technology

*Corresponding author.
E-mail addresses: rahma77@gmail.com (Rahma Hidayanthi)

(Nurhikmayati, 2019; Weiwei et al., 2021). To produce a generation of countries that are ready and reliable to face the period of globalization, the government has pursued the growth of students' talents in understanding technology in every curriculum update (Dewi Puspita Ningsih, 2019; Husain & Kaharu, 2020). STEAM is a unified learning approach that is oriented to a variety of courses, including all existing components (Arsy & Syamsulrizal, 2021; S. Zubaidah, 2019).

Referring to the stages of STEAM-based learning, the stages of the STEAM learning approach consist of 6 stages contained in the book entitled How To STEAM your classroom (Riyanti et al., 2020). These stages are: (1) Focus, the teacher chooses an important (essential) question to be solved or a problem to find a solution for. (2) Detail, the teacher looks for the dominating component related to the problem or question during the detail phase. (3) Discovery, research discovery, and integrated teaching that can be applied globally are the essence of discovery. Students identify the best solution to the problem they face in this step. (4) Application, students can start developing self-determined solutions after students are involved in developing, responding, and assessing problems or questions as well as solutions and what still needs to be done to make the results better. (5) Presentation, students make a product. (6) Link, students reflect on the input or feedback that has been given by the teacher and students. After students reflect on the product, the next step is to improve or revise the product according to suggestions and input so that the product is efficient (Liliawati et al., 2018; Siti Zubaidah, 2019).

Based on observations and interviews conducted at SDN 17 Kampung Baru, Pariaman, it was found that the mathematical disposition of fifth graders was still low. Results of interviews with fifth-grade teachers and school principals provide evidence in support of this. The teacher said that the student's interest, persistence, and tendency in learning mathematics were still low. This is because students have learning difficulties and are not interested in mathematics. After the researchers investigated, it turned out that the main cause was that they did not understand and did not understand what was informed by the teacher, the learning carried out so far has not emphasized the development of student's abilities in understanding the concepts of content in the subject matter. In the observation, the data on student learning success is still low, namely at the percentage of 43.75%, which means that no more than half of the fifth-grade students have learning difficulties and fail in learning mathematics.

Five interconnected elements make up good mathematical aptitude: a mathematical mindset, competitive strategy, adaptive reasoning, procedural fluency, and conceptual comprehension (Feldaus, 2018; Saefurohman et al., 2021). So it can be concluded that if the ability of strategic competition, adaptive reasoning, procedural fluency, and conceptual understanding is good, without a good mathematical disposition, the student's mathematical abilities will be lacking (Miranda Ramadhani, Sukamto, 2020; Riyanti et al., 2020). One of the difficulties and inability to learn mathematics is characterized by passivity, hesitation, lack of confidence, difficulty concentrating, laziness, and pessimistic. This results in when students find questions to work on, students are already not interested. Students also said they did not like mathematics or in other words, the students' mathematical disposition was low (Dwinta, 2018; Maulyda, 2019). Since it will enable them to persevere through more challenging tasks, take charge of their education, and develop solid mathematical habits, students need a mathematical disposition to learn mathematics (Escarez Jr. & Ching, 2022; Miftakhun Nizammudin, Sukamto, 2022).

The purpose of this study was to analyses how the STEAM approach affected elementary school disposition mathematichal for mathematics. The importance of students' mathematical dispositions to understand the basic concepts of mathematics, not only by rote, but with mastery and understanding of the material and formulas in mathematics. The ability to correctly and appropriately apply mathematical formulas is demanded of students. And have a positive disposition on the value of mathematics in daily life, which includes interest, curiosity, and focus in mastering the subject as well as a persistent and self-assured approach to problem-solving (Dewi et al., 2020; Supriatna & Lusa, 2020)..

2. METHOD

This researcher combines experimental and quantitative methodologies. By analyzing the relationship between variables, quantitative research employs methodologies to evaluate specific hypotheses. Typically, variables are measured using research tools so that numerical data can be examined using statistical computation techniques. The Nonequivalent Control Group Design is employed in this study. Research that seeks to learn from experiments based on the treatment of an experimental unit within the design parameters established in the experimental class to get data that describes what is anticipated is known as a quasi-experiment (Adhi Kusumastuti, 2020; Miller et al., 2020).

This study was carried out at SDN 17 Kampung Baru, Pariaman. The sampling method employed by the technical researcher is non-probability sampling, which refers to a sampling method that does not give each component of the population an equal chance to be chosen as a sample. Purposive sampling is

the sampling method used. Purposive Sampling involves taking samples for a specific reason or purpose. Because the researcher assumes that someone or something holds the data needed for research (Ames et al., 2019; Gainau, 2021).

To determine the experimental and control classes, prerequisite tests were carried out in determining the sample, namely normality and homogeneity tests and the comparison of the average values was close to the same to obtain a representative sample. A questionnaire in the form of an open questionnaire or a reasoned questionnaire is the research tool employed in this study. This questionnaire contains 20 statements that are following the indicators of mathematical disposition, which consist of 15 positive statements and 5 negative statements. The survey employed in this study employs a Likert scale, in which positive statements are scored from the biggest to the smallest number and negative statements are scored from the smallest to the largest number.

In this study, the data analysis technique used was the independent sample t-test. It is important to assess the conditions for data analysis, particularly the normality and homogeneity tests before the data are studied. The data distribution for the t-test test must be homogeneous and regularly distributed (Hidayanti et al., 2019; Maya Saftari, 2019). If the study's hypothesis, H_0 is adopted, it suggests that the STEAM approach's use in class V at SDN 17 Kampung Baru, Pariaman has no discernible impact on students' mathematical dispositions on speed and discharge material. If H_a is approved, it will signify that the STEAM approach has had a substantial impact on the class V student's mathematical disposition on speed and discharge material of SDN 17 Kampung Baru, Pariaman.

3. RESULT AND DISCUSSION

Result

The problem formulation and hypotheses in this study, namely whether there was a significant influence from the implementation of the STEAM approach on the mathematical disposition of students on the speed and discharge material for class V SDN 17 Kampung Baru, Pariaman, were answered using the description of the student's questionnaire scores. In the form of a frequency distribution table, graphs, and central phenomena, the data description displays the mean, standard deviation, range of values, highest and lowest values, and central phenomena. The results from an experimental class study on how students responded to the STEAM approach is show in Table 1. The data obtained from the student questionnaire above is depicted through the histogram is show in Figure 1.

Table 1. Frequency Distribution of Experimental Class Questionnaire Data

Interval Class	Frequency	The Midpoint
67 - 72	3	69.5
73 - 78	7	75.5
79 - 84	7	81.5
85 - 90	6	87.5
91 - 96	1	93.5

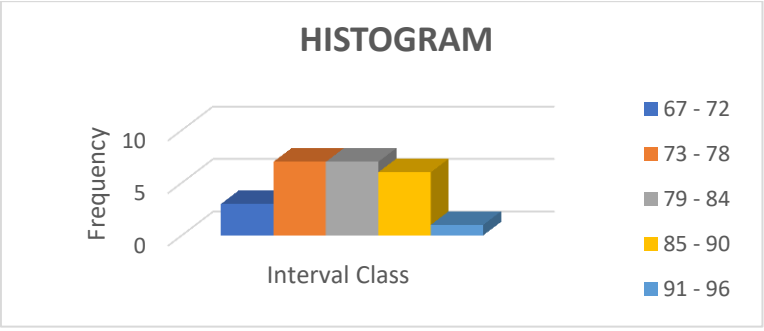

Figure 1. Histogram of Experimental Class Mathematical Disposition

Based analysis data, show data presented in the description table above, it is found that the mean, median, and mode are data centers. where the range is 26, with 67 being the lowest value and 93 being the highest. The average data center's score is 80.42, which falls under the very good category. The standard deviation is a measure of the spread of the data by 6.057, so it can be concluded that the data above is centered at 80.42 and spreads from 0 to 6 units from the average. Here is the following data of

the control class of students' responses to conventional learning as show in Table 2. The data obtained from the student questionnaire above is depicted through the histogram that show in Figure 2.

Table 2. Frequency Distribution of Control Class Questionnaire Data

Interval Class	Frequency	The Midpoint
47 - 52	1	49.5
53 - 58	3	55.5
59 - 64	3	61.5
65 - 70	6	67.5
71 - 76	5	73.5
77 - 82	6	79.5

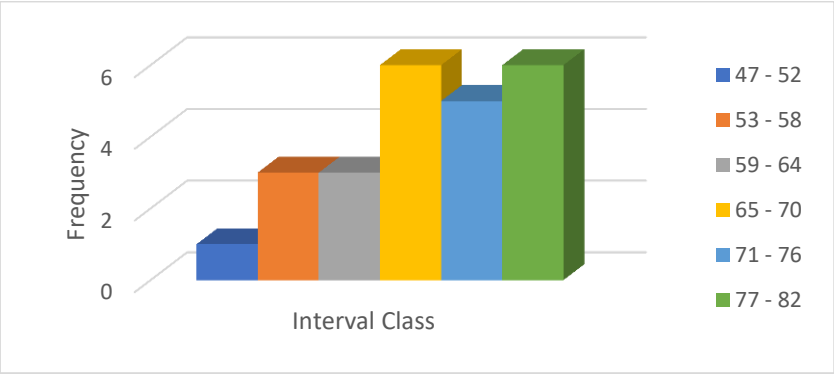

Figure 2. Histogram of Control Class Mathematical Disposition

Based on data analysis, it is found that the mean, median, and mode are data centers. where the range is 31, with the lowest value being 47 and the highest being 78. The average data center's value, which falls under the good category, is 68.17. The standard deviation is a measure of the spread of the data by 8.463 so it can be concluded that the data above is centered at 68.17 and spreads from 0 to 8 units from the average. The normality test was used to determine whether or not the data from the experimental class and control class were normally distributed. The Shapiro-Wilk test should be performed to evaluate whether the data is normal if there are fewer than 50 respondents. The data are not regularly distributed if the significance level is less than 0.05. The data are regarded as being regularly distributed if the significance level is greater than 0.05. Normality test for experiment class and control class is show in Table 3.

Table 3. Normality Test for Experiment Class and Control Class

Model	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Control Class	0.133	24	0.200	0.922	24	0.065
Experiment Class	0.089	24	0.200	0.983	24	0.946

Base on Table 3, show findings of the normality test for the experimental class were significant at 0.065 or greater than 0.05 (0.065 > 0.05), while the results for the control class were significant at 0.964 or greater than 0.05 (0.964 > 0.05), as shown in the aforementioned table. As a result, it may be claimed that the values of mathematical disposition are evenly distributed in both the experimental class and the control class. The next step is to perform a homogeneity test, presuming that the data from the experimental class and control class are normally distributed. To determine whether the data's variance was uniform or homogenous, a homogeneity test was conducted. According to the homogeneity test reference, the data have the same homogeneous variance if the significance value is more than 0.05. The variance of the data is uneven or heterogeneous if the significance threshold is less than 0.05.

Base on data analysis, due to the homogeneity test of the experimental class and control class yielding a significance value of 0.090 or greater than 0.05 (0.090 > 0.05), the statistical leveane of 2.992, it can be concluded from the above table that the experimental class and control class data have the same variance or are homogeneous. According to the justification provided above, the preconditioning test

using the normality test and homogeneity test has been satisfied. The t-test is additionally utilized to examine hypotheses (independent sample t-test). The independent sample t-test was used in this study's data analysis to compare experimental class data from the STEAM approach to control class data from traditional learning. When making decisions, the following guidelines should be followed: Ho is rejected if the significance (2-tailed) is 0.05, and Ha is accepted if it is > 0.05. If it is > 0.05, Ho is accepted and Ha is rejected. An independent sample t-test was carried out using SPSS. The independent sample t-test results are displayed in Table 4.

Table 4. Independent sample t-test

Model		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Mathematical Disposition	Equal variances assumed	2.992	0.090	-5.766	46	0.012	-12.250	2.124	-16.526	-7.974
	Equal variances not assumed			-5.766	41.66	0.012	-12.250	2.124	-16.538	-7.962

According to the Table 4 show the significance value (2-tailed) is 0.012 < 0.05, there is a significant effect from the implementation of the STEAM approach to disposition mathematics class students on velocity and discharge material at SDN 17 Kampung Baru, Pariaman. H0 is therefore disregarded, but Ha is approved.

Discussion

Analyzing and computing the mathematical dispositions of the experimental class's students using the STEAM approach and the control class's students using the conventional teaching method yielded different results. The experimental class outperformed the control class when comparing the two classes' average scores. Therefore, the STEAM approach has a greater effect on pupils' mathematical disposition. This is due to the STEAM approach's numerous benefits for the implementation process (Mardlotillah et al., 2020), including: (1) The STEAM approach increases students' motivation to be actively involved in an effective learning process in the classroom, which leads to positive results in terms of student knowledge, (2) The STEAM approach encourages students to tackle challenges in active, inventive, and creative ways, (3) Students can research concepts using cutting-edge technologies, (4) The STEAM approach allows for quantitative connections between abstract concepts and science, technology, inquiry, and the arts, (5) The use of art in STEAM will encourage students' creativity in the development of teaching materials that fun (6) Students can use their learning in real world situations.

Learning with the STEAM approach makes students play an active role in learning activities. Students do not just sit quietly listening to the teacher's explanation, but students find out the knowledge they want to get. Students work together to collect and process information from other sources and share information that has been obtained with all friends in the class (Liliawati et al., 2018; Riyanti et al., 2020). From these activities, students are taught to cooperate in groups and are responsible for completing all assignments given by the teacher (Conradty & Bogner, 2020; Hawari & Noor, 2020). Previous study state that students employing traditional methods in the control class typically have poor mathematical dispositions (Mardlotillah et al., 2020). This is because learning is more teacher-centered. When students have the chance to ask questions or voice their ideas, students do not dare to express them. Previous study also state that learning activities also do not involve student interaction as a whole, making it easy for students to feel bored when studying (Arsy & Syamsulrizal, 2021). The implications of this study provide an overview of the application of elementary school students' mathematical disposition ability oriented with the steam approach. This research provides benefits for educators or teachers as a reference in providing an overview of the steam approach. The limitation of this research lies in the scope of the research such as the research subject which is still very limited which only involves one school.

4. CONCLUSION

Due to the t-test analysis's significant (2-tailed) value H0 is rejected and Ha is approved. Using the STEAM approach to the mathematical disposition of class students has a significant impact on the speed and discharge of material of SDN 17 Kampung Baru, Pariaman, according to the study's findings. The

mathematical dispositions of the fifth-grade pupils in 17 Kampung Baru, Pariaman who used the STEAM learning approach, and those who did not differ significantly.

5. REFERENCES

Adhi Kusumastuti, D. (2020). *Metode Penelitian Kuantitatif*. CV Budi Utama.

Ames, H., Glenton, C., & Lewin, S. (2019). Purposive sampling in a qualitative evidence synthesis: A worked example from a synthesis on parental perceptions of vaccination communication. *BMC Medical Research Methodology*, *19*(1), 1–10. https://doi.org/10.1186/s12874-019-0665-4.

Amran, A., Perkasa, M., Jasin, I., Satriawan, M., & Irwansyah, M. (2019). Model Pembelajaran Berbasis Nilai Pendidikan Karakter Untuk Generasi Indonesia Abad 21. *Lentera Pendidikan : Jurnal Ilmu Tarbiyah Dan Keguruan*, *22*(2). https://doi.org/10.24252/lp.2019v22n2i5.

Andayani, A., Akbar, M., & Situmorang, R. (2020). How is The Program Planning for Strengthening Character Education in Elementary Schools. *International Journal of Multicultural and Multireligious Understanding*, *6*(6), 796–803. https://doi.org/10.18415/ijmmu.v6i6.1216.

Arsy, I., & Syamsulrizal, S. (2021). Pengaruh Pembelajaran STEAM (Science, Technology, Engineering, Arts, and Mathematics) Terhadap Kreatifitas Peserta Dididk. *Biolearning Journal*, *8*(1), 24–26. https://doi.org/10.36232/jurnalbiolearning.v8i1.1019.

Conradty, C., & Bogner, F. X. (2020). STEAM teaching professional development works: effects on students' creativity and motivation. *Smart Learning Environments*, *7*(1), 1. https://doi.org/10.1186/s40561-020-00132-9.

Dewi Puspita Ningsih, I. M. (2019). Implementasi Kurikulum 2013 Dalam Membentuk Karakter Siswa Pada Pembelajaran Tematik Integratif Kelas IV di SDN I Gapuk. *Jurnal Ilmu Sosial Dan Pendidikan*, *3 NO 1*. https://doi.org/http://dx.doi.org/10.36312/jisip.v3i1.988.

Dewi, V. F., Suryana, Y., & Hidayat, S. (2020). Pengaruh Penggunaan Jarimatika Terhadap Kemampuan Berhitung Perkalian Peserta Didik Kelas IV Sekolah Dasar. *EduBasic Journal: Jurnal Pendidikan Dasar*, *2*(2), 79–87. https://doi.org/10.17509/ebj.v2i2.26816.

Dwinta, N. (2018). Buku Brain Gym untuk Mengembangkan Disposisi Matematis Siswa Sekolah Dasar. *Pedadidaktika: Jurnal Ilmiah Pendidikan Guru Sekolah Dasar*, *5*(3), 267–275. https://ejournal.upi.edu/index.php/pedadidaktika/article/view/13191.

Ediyanto, E., Gistituati, N., Fitria, Y., & Zikri, A. (2020). Pengaruh Pendekatan Realistic Mathematics Education Terhadap Motivasi Dan Hasil Belajar Materi Matematika Di Sekolah Dasar. *Jurnal Basicedu*, *4*(1), 203–209. https://doi.org/10.31004/basicedu.v4i1.325.

Escarez Jr., Y. F. D., & Ching, D. A. (2022). Math Anxiety and Mathematical Representations of Grade 7 Students. *International Journal of Educational Management and Development Studies*, *3*(1). https://doi.org/10.53378/352868.

Falloon, G. (2020). From digital literacy to digital competence: the teacher digital competency (TDC) framework. *Educational Technology Research and Development*, *68*(5), 2449–2472. https://doi.org/10.1007/s11423-020-09767-4.

Feldaus, C. A. (2018). How Mathematical Disposition and Intellectual Development Influence Teacher Candidates' Mathematical Knowledge for Teaching in a Mathematics Course for Elementary School Teachers. *Indonesian Journal of Primary Education*, *3*(9). https://search.proquest.com/openview/1665de640a92456c5268f0a7d1ac045c/1?pq-origsite=gscholar&cbl=18750.

Gainau, M. B. (2021). *Pengantar Metode Penelitian*. PT Kanisius.

Hawari, A. D. M., & Noor, A. I. M. (2020). Project Based Learning Pedagogical Design in STEAM Art Education. *Asian Journal of University Education*, *16*(3), 102–111. https://doi.org/10.24191/ajue.v16i3.11072.

Hidayanti, T., Handayani, I., & Ikasari, I. H. (2019). Statistika Dasar Panduan Bagi Dosen dan Mahasiswa. *Journal of Chemical Information and Modeling*, *53*(9), 1689–1699. https://ejournal.unesa.ac.id/index.php/bapala/article/view/46362/39033.

Husain, R., & Kaharu, A. (2020). Menghadapi Era Abad 21: Tantangan Guru Pendidikan upaten Bone Bolango. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *5*(1), 85. https://doi.org/10.31004/obsesi.v5i1.527.

Leong, C. T., & Rasli, A. (2014). The Relationship between Innovative Work Behavior on Work Role Performance: An Empirical Study. *Procedia - Social and Behavioral Sciences*, *129*, 592–600. https://doi.org/10.1016/j.sbspro.2014.03.717.

Liliawati, W., Rusnayati, H., Purwanto, & Aristantia, G. (2018). Implementation of STEAM Education to Improve Mastery Concept. *IOP Conference Series: Materials Science and Engineering*, *288*(1).

https://doi.org/10.1088/1757-899X/288/1/012148.

Mardlotillah, A. N., Suhartono, & Dimyati. (2020). Pengaruh Pembelajaran STEAM Terhadap Keterampilan Berpikir Tingkat Tinggi Pada Siswa Kelas V Mi Hidayatul Mubtadi'in Jagalempeni. *Jurnal JPSD (Jurnal Pendidikan Sekolah Dasar)*, *7*(2), 157–167. https://doi.org/http://dx.doi.org/10.26555/jpsd.v7i2.17280.

Maulyda, M. A. (2019). *Paradigma Pembelajaran Matematika Berbasis NCTM*. CV IRDH.

Maya Saftari, N. F. (2019). Penilaian Ranah Afektif Dalam Bentuk Penilaian Skala Sikap Untuk Menilai Hasil Belajar. *Jurnal Ilmu Pendidikan Dan Kependidikan*, *7*(1). https://doi.org/https://doi.org/10.35438/e.v7i1.164.

Miftakhun Nizammudin, Sukamto, W. P. (2022). Analisis Kemampuan Disposisi Dan Kemampuan Penalaran Matematis Siswa Kelas Iv Pada Materi Bangun Datar Di Sd Negeri Bantengmati 02 Demak. *Wawasan Pendidikan*, *2*(1), 566–573. https://doi.org/10.26877/wp.v2i2.10033.

Miller, C. J., Smith, S. N., & Pugatch, M. (2020). Experimental and quasi-experimental designs in implementation research. *Psychiatry Research*, *283*. https://doi.org/10.1016/j.psychres.2019.06.027.

Miranda Ramadhani, Sukamto, A. T. D. (2020). Analisis Kemampuan Disposisi Matematis Pada Pembelajaran Matematika Siswa Sdn 01 Kebonsari Kabupaten Temanggung Semester Genap Tahun Ajaran 2019/2020. *Elementary School, Universitas PGRI Semarang, Indonesia*, *68*(1), 1–12. https://doi.org/https://doi.org/10.31316/esjurnal.v1i1.1109.

Nurhikmayati, I. (2019). Implementasi STEAM dalam Pembelajaran Matematika. *DidNurhikmayati, I. (2019). Implementasi Steam Dalam. Didactical Mathematics, 1(2), 41–50.Actical Mathematics*, *1*(2), 41–50. https://doi.org/https://doi.org/10.31949/dmj.v1i2.1508.

Nurtanto, M., Sofyan, H., Fawaid, M., & Rabiman, R. (2019). Problem-based learning (PBL) in industry 4.0: Improving learning quality through character-based literacy learning and life career skill (LL-LCS). *Universal Journal of Educational Research*, *7*(11), 2487–2494. https://doi.org/10.13189/ujer.2019.071128.

Riyanti, E. D., Roshayati, F., & Purnamasari, V. (2020). The Profile of Elementary Teachers ' Understanding in STEAM (Science , Technology , Engineering , Art , and Mathematics) Approach. *Jurnal Ilmiah Sekolah Dasar*, *4*(4), 678–686. https://doi.org/http://orcid.org/0000-0002-9970-3763.

Saefurohman, S., Maryanti, R., Azizah, N. N., Al Husaeni, D. F., Wulandary, V., & Irawan, A. R. (2021). Efforts to increasing numeracy literacy of Elementary School Students through Quiziz learning media. *ASEAN Journal of Science and Engineering Education*, *1*(3), 11–18. https://doi.org/http://dx.doi.org/10.17509/xxxx.xxxx.

Santhi, F. F., & Pangestika, R. R. (2021). Hubungan Sintaks Belajar Polya Dengan High Order Thinking Skill Pada Pembelajaran Matematika Sekolah Dasar. *Jurnal Ilmiah Pendidikan Dasar*, *8*(1), 63. https://doi.org/10.30659/pendas.8.1.63-76.

Supriatna, I., & Lusa, H. (2020). Peningkatan Kemampuan Disposisi Matematis Siswa Sd Melalui Pembelajaran Auditory, Intellectualy, Dan Repetition. *Attadib: Journal of Elementary Education*, *4*(1), 36. https://doi.org/10.32507/attadib.v4i1.628.

Weiwei, H. U., Kamalraj, R., & Velmayil, V. (2021). Thinking abilities and professional learning abilities for English majors based on double tutor system. *Aggression and Violent Behavior*, *April*, 101648. https://doi.org/10.1016/j.avb.2021.101648.

yanti fitria, Helsa, H. (2019). The learning tool for electric circuit and mathematics logic integration. *Journal of Physics : Conference Serie*, *2*(1). https://doi.org/1321 032108.

Zubaidah, S. (2019). Pembelajaran untuk memberdayakan keterampilan abad ke-21. *Seminar Nasional Matematika Dan Sains*, 1–18. https://www.researchgate.net/profile/Siti-Zubaidah-7/publication/336065211_STEAM_Science_Technology_Engineering_Arts_and_Mathematics_Pembelajaran_untuk_Memberdayakan_Keterampilan_Abad_ke-21/links/5d8cb46ea6fdcc25549b33aa/STEAM-Science-Technology-Engineeri.

Zubaidah, Siti. (2019). STEAM (Science, Technology, Engineering, Arts, and Mathematics): Pembelajaran untuk Memberdayakan Keterampilan Abad ke-21. *Seminar Nasional Matematika Dan Sains*, *September*, 1–18. https://doi.org/https://doi.org/10.14697/jkase.2012.32.6.1072.