



# Differentiated Learning Number Division Material Increases Elementary School Students' Interest and Learning Outcomes

Endang Supartiningsih<sup>1\*</sup>, Setiawan Edi Wibowo<sup>2</sup> 

<sup>1,2</sup> Basic Education, Yogyakarta State University, Yogyakarta, Indonesia

## ARTICLE INFO

### Article history:

Received July 04, 2023

Accepted November 10, 2023

Available online November 25, 2023

### Kata Kunci:

Pembelajaran Berdiferensiasi, Minat, Hasil Belajar

### Keywords:

Differentiated Learning, Interests, Learning Outcomes



This is an open access article under the [CC BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.

Copyright © 2023 by Author. Published by Universitas Pendidikan Ganesha.

## ABSTRAK

Rendahnya minat dan hasil belajar siswa dalam pembelajaran matematika, disebabkan karena kurangnya penerapan model pembelajaran yang bervariasi, sehingga dalam proses pembelajaran siswa lebih banyak tidak fokus. Adapun tujuan dari penelitian adalah untuk menganalisis pengaruh pembelajaran berdiferensiasi terhadap minat dan hasil belajar siswa kelas IV sekolah dasar. Penelitian ini tergolong kedalam jenis penelitian eksperimen dengan desain non-equivalent control group. Subjek yang terlibat dalam penelitian ini yakni siswa kelas IV SD. Pengumpulan data dalam penelitian ini dilakukan dengan menggunakan metode observasi, wawancara, penyebaran angket, dan tes. Data mengenai minat belajar dikumpulkan dengan angket dan hasil belajar diukur dengan tes berbentuk pilihan ganda dan essay. Data yang diperoleh dalam penelitian ini kemudian dianalisis dengan teknik analisis multivariat analisis of variance (Manova). Hasil analisis data menunjukkan bahwa pada hipotesis pertama yaitu hipotesis nol ditolak dan hipotesis alternatif diterima. Selanjutnya pada hipotesis kedua yaitu hipotesis nol ditolak dan hipotesis alternatif diterima. Pada hipotesis ketiga angka signifikansi  $F$  hitung kurang dari 0,05 maka hipotesis nol ditolak dan  $H_a$  diterima. Berdasarkan hasil tersebut maka dapat disimpulkan bahwa pembelajaran berdiferensiasi memberikan pengaruh positif terhadap minat dan hasil belajar siswa kelas IV sekolah dasar dalam pembelajaran matematika. Pembelajaran berdiferensiasi dapat meningkatkan minat dan hasil belajar siswa

kelas IV sekolah dasar.

## ABSTRACT

Students' low interest and learning outcomes in learning mathematics are due to the need for more application of varied learning models, so in the learning process, students are more unfocused. The research aims to analyze the effect of differentiated learning on the interests and learning outcomes of fourth-grade elementary school students. This research is classified as experimental with a non-equivalent control group design. The subjects involved in this research were fourth-grade elementary school students. Data collection in this research was carried out using observation, interviews, questionnaires, and tests. Data regarding learning interest is collected using a questionnaire, and learning outcomes are measured using multiple-choice tests and essays. The data obtained in this research was then analyzed using the multivariate analysis technique analysis of variance (Manova). The results of the data analysis show that the first hypothesis, namely the null hypothesis, is rejected, and the alternative hypothesis is accepted. Next, the second hypothesis, namely the null hypothesis, is rejected, and the alternative hypothesis is accepted. The calculated  $F$  significance number is less than 0.05 in the third hypothesis, so the null hypothesis is rejected, and  $H_a$  is accepted. Based on these results, differentiated learning positively influences the interest and learning outcomes of fourth-grade elementary school students in learning mathematics. Differentiated learning can increase fourth-grade elementary school students' interest and learning outcomes.

## 1. INTRODUCTION

Mathematics is a field of science that is taught at all levels of education, from early childhood education to university level (Dwianjani & Candiasa, 2018; Setyowati & Mawardi, 2018). The word mathematics comes from the Greek word *mathematikos* which means exact science, so it can be said that mathematics is one of the areas of exact science which is the basis for the development of other sciences (Filahanasari, 2019; Primadewi & Agustika, 2022). Mathematics learning at elementary school level is carried out with the aim of developing students' thinking abilities, so that students are able to improve their intellectual abilities, improve their ability to solve problems, practice communication, and develop students' character (Damayanti & Qohar, 2019; Tanjung, HS, & Nababan, 2018). Students with good mathematical skills will be able to think and analyze the problems they face and find solutions to these problems (Armin & Purwati, 2021; Rabbani et al., 2022). The high and low levels of students'

\*Corresponding author.

E-mail addresses: [endangsupartiningsih.2021@student.uny.ac.id](mailto:endangsupartiningsih.2021@student.uny.ac.id) (Endang Supartiningsih)

mathematical abilities can be seen from the interest and learning outcomes shown by students during the learning process (Handayani & Abadi, 2020; Heryandi & Nur'aini, 2022). This is because interest in learning refers to students' liking or interest in a learning process, where interest generally comes from the encouragement within students to carry out/participate in the learning process happily without any pressure (Agustin & Kumoro, 2018; Gery et al., 2022).

Interest in learning has a very big role and function in the success of the learning process, this is because if students have an interest in a learning process, then they will be serious about learning (Mumlahana et al., 2022; Nugraha et al., 2021). Apart from that, interest will be able to help students facilitate the process of focusing students' minds on the lesson (Fatmasari & Supriyatna, 2019; Setiawan et al., 2022). Students' high interest will make it easier for them to face the competition and challenges they face (Awalia et al., 2021; Dayani et al., 2020). Apart from interest, the level of student ability in learning mathematics can also be seen from student learning outcomes, where learning outcomes are a form of change in behavior shown by students in the form of increasing abilities, skills and attitudes towards a better direction (Primadewi & Agustika, 2022; Setyowati & Mawardi, 2018; Silva et al., 2019). Learning outcomes have an important role in the learning process, this is because learning outcomes can be used as a guide to determine the level of students' understanding of a concept of material that has been studied previously (Armin & Purwati, 2021; Sutopo, 2019).

However, the reality on the ground shows that student interest and learning outcomes in student subjects are still in the low category. This can be seen from the results of observations and interviews conducted in class IV UPTD SD Inpres Barakkang. The results of observations and interviews show that 73.25% of students are not interested in participating in mathematics learning in class, this is indicated by a learning atmosphere that appears stiff and seems boring. Furthermore, the results of observations also show that in the implementation of the mathematics learning process, many students are not yet involved in the learning process, talking when the teacher explains the material, going in and out of the classroom while learning is in progress, and there are still some students who do not answer questions about learning from the teacher. Such learning activities then have an impact on low student learning outcomes, and if allowed to continue this will of course have an impact on not achieving mathematics learning goals.

One effort that can be made to overcome this problem is by implementing a differentiated learning model. Differentiated learning is a way of teaching that pays attention to students' differences in interests, talents and learning styles to bring diversity to the classroom (Pitaloka & Arsanti, 2022; Saputra & Marlina, 2020). Apart from that, the meaning of differentiated learning also includes adapting learning to students' interests, learning preferences, and readiness to improve learning outcomes (Aprima & Sari, 2022; Avivi et al., 2023). Before starting to implement differentiated learning, we can classify learning requirements into three categories, namely student readiness to learn, interests, and learning profile (Maulidia & Prafitasari, 2023; Naibaho, 2023). This is done so that educators can design educational activities that can meet each of these characteristics. In this case, differentiation is one of the strategies in an effective learning process in the classroom (Jumiarti & Kurniawati, 2023; Suwartiningsih, 2021). In differentiated learning, the learning process pays attention to students' interests. For this reason, it is very important for educators to understand the characteristics of students as a basis for developing learning methods and strategies. Learning styles, intelligence levels, students' origins, and social interactions between students are examples of these characteristics. Willingness, responsibility, dedication, motivation, and cooperation are additional characteristics that educators can understand (Kamal, 2021; Syarifuddin & Nurmi, 2022). The application of differentiated learning will be able to create a diverse classroom atmosphere, and be able to provide opportunities for students to retain information, process ideas, and improve their individual performance so that they can learn more efficiently (Hamidah & Oktaviani, 2023; Nawati et al., 2023).

Several studies that have been conducted previously revealed that differentiated learning can increase the activity and mathematics learning outcomes of class XI high school students (Kamal, 2021). Other research results also prove that differentiated learning is able to provide learning that suits students' learning needs so that students participate actively and learn according to their needs (Cindyana et al., 2022). The results of further research revealed that there was a significant difference between students' science learning outcomes before and after using differentiated learning strategies using the problem based learning model (Nawati et al., 2023). Based on several research results, it can be said that the differentiated learning model can significantly improve student learning outcomes. It's just that in previous research, there have been no studies that specifically discuss the effect of differentiated learning in number division material on the interests and learning outcomes of fourth grade elementary school students. So this research focuses on this study with the aim of knowing and describing the effect of differentiated learning on the interests and learning outcomes of fourth grade elementary school students.

## 2. METHOD

This research is classified as a quasi-experimental research type with a non-equivalent control group design. This research was conducted on two classes, namely the experimental and control classes so that treatment was not given randomly. A quasi-experimental research design is an experimental design in which treatment is not given randomly to participants (non-random assignment). Treatment in the form of differentiated learning was given to the experimental class, while the control class was given treatment conventional learning with the same time allocation and meetings. The subjects involved in this research were fourth grade elementary school students. Data collection in this research was carried out using observation, interviews and distributing questionnaires. Data collection technique using questionnaires to measure students' learning interest and tests to measure student learning outcomes. The technique used to analyze data to test research hypotheses is Multivariate Analysis of Variance (Manova). Before to carry out hypothesis testing, there are several requirements that must be met and need to be proven. The requirements in question are that the data being analyzed must have a normal distribution and knowing that the data being analyzed is homogeneous. These two prerequisites must be proven first, so to fulfill this, an analysis prerequisite test is carried out by carrying out a normality test and a homogeneity test. Normality test using SPSS 25.00 for windows Kolmogorov Smirnov statistical test at a significance of 0.05. Meanwhile, testing for homogeneity of variance in this study was carried out using Levene's Test of Equality of Error Variance with the help of SPSS via the Box's M test.

Testing the three hypotheses carried out using Multivariate Analysis of Variance (Manova). Hypotheses 1 and 2 were carried out using the F variant test through Manova analysis using the Test of Between Subject Effects with the testing criteria for a significance level of  $F = 5\%$ , assisted by SPSS 25.00 for windows . Meanwhile hypothesis 3 carried out with the F test through decisions taken using Pillae Trace, Wilk Lambda, Hotelling's Trace, Roy's Largest Root analysis, with the significance level testing criteria of  $F = 5\%$ . If the calculated F significance number is less than 0.05 then the null hypothesis is rejected and  $H_a$  is accepted.

## 3. RESULT AND DISCUSSION

### Result

The research began by carrying out learning in experimental classes and control classes with different learning models. It appeared that learning was differentiated has a significant influence on student interest and learning outcomes. Average value of learning interest and learning outcomes of students taught with differentiated learning higher than conventional learning. This is supported by several theories that reveal several advantages of differentiated learning than conventional learning. The data that has been collected will be processed using descriptive and inferential statistical calculations. The results of the summary of descriptive data on student interests and learning outcomes obtained by calculating descriptive statistics using differentiated learning and conventional learning is explained in detail [Table 1](#).

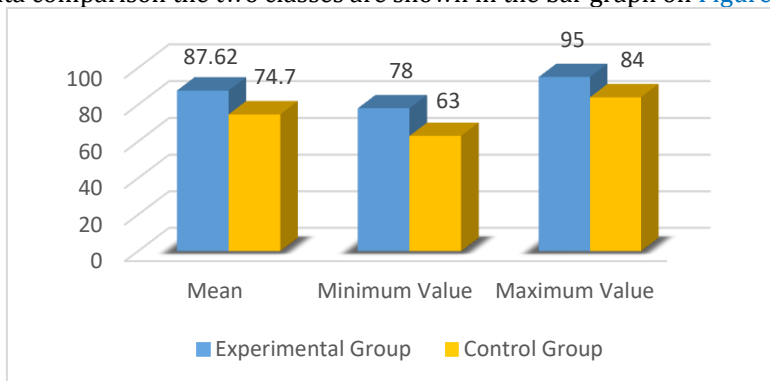
**Table 1.** Recapitulation of Interest Score Calculation Results and Student Learning Outcomes

Variable	Class	Mean	Std. Deviation	N	Median	Min Value	Max Value
Interest to learn	Experimental Group	87.6190	4.19612	42	88	78	95
	Control Group	74.7000	5.26332	40	76	63	84
Learning outcomes	Experimental Group	85.9762	7.76951	42	87	68	100
	Control Group	70.4000	8.47258	40	71	55	87

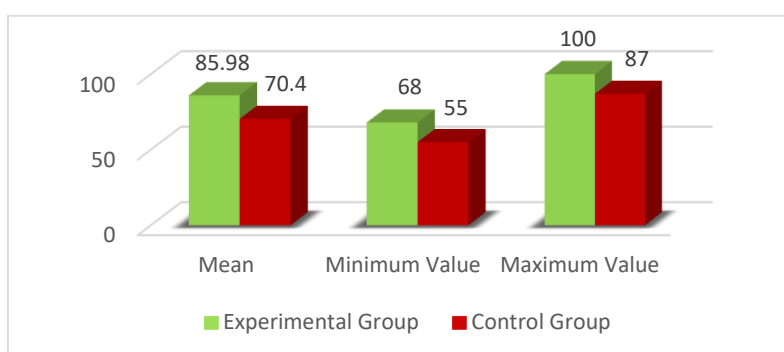
Based on the data in [Table 1](#), it can be seen that the interest in learning in the experimental group that used differentiated learning obtained the highest score of 95 and the lowest score of 78, the number of children (N) was 42 children, the mean score was 87.62, the standard deviation (SD) was 4.196 and The median was 88. Furthermore, data related to interest in learning in the control group who used conventional learning obtained the highest score of 84 and the lowest score of 63, the number of children (N) was 40 children, the mean score was 74.70, the standard deviation (SD) was 5.263 and the median was 76 . Comparison of two class data is displayed in the bar graph below [Figure 1](#).

Furthermore, data was also obtained regarding student learning outcomes in the experimental group that used differentiated learning, which obtained the highest score of 100 and the lowest score of 68, the number of children (N) was 42 children, the mean score was 85.98, the standard deviation (SD) was 7.769 and the median was 87. Furthermore, data related to learning outcomes in the control group

that used conventional learning obtained the highest score of 87 and the lowest score of 55, the number of children (N) was 40 children, the mean score was 70.40, the standard deviation (SD) was 8.473 and the median was 71. Data comparison the two classes are shown in the bar graph on [Figure 2](#).



**Figure 1.** Comparison of Learning Interest Scores in the Experimental and Control Groups



**Figure 2.** Comparison of Learning Outcome Scores in the Experimental and Control Groups

Before testing the hypothesis, the interest score data and student learning outcomes were subjected to prerequisite tests, namely the normality test and homogeneity test. The first step is to carry out a data normality test. The normality test was carried out using Kolmogorov Smirnov, by looking at the Asymp.Sig. The criterion for accepting normality is that if the significance value of the calculation results is greater than  $\alpha = 0.05$  then the distribution is normal, conversely if it is smaller than  $\alpha = 0.05$  then the distribution is declared abnormal. A summary of the data normality test results can be seen in [Table 2](#).

**Table 2.** Normality Test Results

Variable	Class	Kolmogorov-Smirnov		Decision
		Sig.	Criteria	
Interest to learn	Experimental Group	0.066	p > 0.05	Normally distributed
	Control Group	0.132		Normally distributed
Learning outcomes	Experimental Group	0.105		Normally distributed
	Control Group	0.200		Normally distributed

From [Table 2](#) above, it is found that the significance value of this normality test is greater than  $\alpha = 0.05$ . Thus, it can be concluded that the overall data in the control group and experimental group is normally distributed. Furthermore, in this study, a homogeneity of variance test was carried out on the variance between the experimental group and the control group. Testing for the homogeneity of variance in this study was carried out using Levene's Test of Equality of Error Variance with the help of SPSS via the Box's M test. The complete calculation of the data distribution homogeneity test is presented in [Table 3](#).

**Table 3.** Variance Homogeneity Test Results

Box's Test of Equality of Covariance Matrices	
Box's M	2.354
F	0.763

df1	3
df2	1250020.348
Sig.	0.514

Based on Table 3 above, it is known that the resulting Box's M value is 2.354 ( $p = 0.514$ ), where the value is  $0.514 > 0.05$ , so it can be concluded that the covariance matrix between groups is assumed to be the same or homogeneous. Based on the data analysis prerequisite tests, it was found that the interest data and learning outcomes of the experimental and control groups were normal and homogeneous. After obtaining the results from the data analysis prerequisite tests, proceed with testing the research hypothesis. From the results of data processing in hypotheses 1 and 2, the F test of variants was carried out using Manova analysis using the Test of Between Subject Effects with the testing criteria for a significance level of  $F = 5\%$ , if the calculated F significance number is less than 0.05 then the null hypothesis is rejected and  $H_a$  accepted. The test calculations are presented in Table 4.

**Table 4. Variant F Test Results Using the Test of Between Subject Effects**

Tests of Between-Subjects Effects							
Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Interest to learn	3419.451a	1	3419.451	151.781	0.000	0.655
	Learning outcomes	4970.704b	1	4970.704	75.391	0.000	0.485
Intercept	Interest to learn	539801.890	1	539801.890	23960.516	0.000	0.997
	Learning outcomes	500998.802	1	500998.802	7598.697	0.000	0.990
Class	Interest to learn	3419.451	1	3419.451	151.781	0.000	0.655
	Learning outcomes	4970.704	1	4970.704	75.391	0.000	0.485
Error	Interest to learn	1802.305	80	22.529			
	Learning outcomes	5274.576	80	65.932			
Total	Interest to learn	547444.000	82				
	Learning outcomes	513981.000	82				
Corrected Total	Interest to learn	5221.756	81				
	Learning outcomes	10245.280	81				

From the data processing results seen in Table 4, it can be described as follows: first hypothesis, the calculated F value is 151.781,  $df = 1$ , and  $sig = 0.000 < 0.05$ . This means significance  $< 0.05$ . Thus the null hypothesis ( $H_0$ ) is rejected and the alternative hypothesis ( $H_a$ ) is accepted. So based on the results of the first hypothesis analysis, there is a significant difference in student interest in learning between students taught with differentiated learning and students taught with conventional learning. Looking at the research data, theoretically it can be said that differentiated learning is better and more effective in increasing students' interest in learning in the learning process.

Next, the second hypothesis, the research results show that the calculated F value is 75.391  $df = 1$ , and  $sig = 0.000 < 0.05$ . This means significance  $< 0.05$ . Thus the null hypothesis ( $H_0$ ) is rejected and the alternative hypothesis ( $H_a$ ) is accepted. So based on the results of the first hypothesis analysis, there is a significant difference in student learning outcomes between students taught with differentiated learning and students taught with conventional learning. Looking at the research data, theoretically it can be said that differentiated learning is better and more effective in improving student learning outcomes.

Third hypothesis, carried out with the F test through decisions taken using Pillai Trace, Wilk Lambda, Hotelling's Trace, Roy's Largest Root analysis, with the significance level testing criteria of  $F = 5\%$ . If the calculated F significance number is less than 0.05 then the null hypothesis is rejected and  $H_a$  is accepted. The test calculations are presented in Table 5.

**Table 5. Multivariate Test Results**

Multivariate Tests <sup>a</sup>							
	Effect	Value	F	Hypothesis df	df error	Sig.	Partial Eta Squared
Class	Pillai's Trace	0.769	131.204b	2.000	79.000	0.000	0.769
	Wilks' Lambda	0.231	131.204b	2.000	79.000	0.000	0.769
	Hotelling's Trace	3.322	131.204b	2.000	79.000	0.000	0.769
	Roy's Largest Root	3.322	131.204b	2.000	79.000	0.000	0.769
	Root						



Based on [Table 5](#), the research results show that the calculated F value of Pillai Trace (F calculated = 131.204), Wilk Lambda (F calculated = 131.204), Hotelling's Trace (F calculated = 131.204), Roy's Largest Root (F calculated = 131.204), all have significance  $0.000 < 0.05$ , so the null hypothesis ( $H_0$ ) is rejected and the alternative hypothesis ( $H_a$ ) is accepted. Thus, based on the analysis of the third hypothesis, there is a significant difference in interests and learning outcomes together between students taught with differentiated learning and students taught with conventional learning. Looking at the research data, theoretically it can be said that differentiated learning is better and more effective in increasing student interest in learning and learning outcomes.

## Discussion

Based on the results of the analysis that has been carried out, several findings were obtained in this research, including: the first finding shows that there is a significant difference in interest between students in the experimental class (IV B) who were taught with differentiated learning and students in the control class (IV A) who were taught directly. These results then show that differentiated learning is measurably better and more effective in increasing students' learning interest in the learning process and proven to be able to boost students' interest and enthusiasm in learning ([Aprima & Sari, 2022](#); [Avivi et al., 2023](#)). Learning strategies that are more varied and interesting will tend to increase students' interest and involvement in the learning process, which will ultimately increase their desire to learn ([Andriani et al., 2023](#); [Pane et al., 2022](#)). It was further explained that the application of differentiated learning in learning basic mathematics material was considered very effective, as evidenced by the increase in understanding of each indicator tested, differentiated learning was also considered more interesting compared to other learning because in the differentiated learning process, many learning media were presented that were in accordance with the learning style needs of each student, so that students are more interested in participating in the learning process ([Jumiarti & Kurniawati, 2023](#); [Naibaho, 2023](#); [Suwartiningsih, 2021](#)). As a result, the implementation of differentiated learning will affect classrooms, schools, teachers, and most importantly students ([Kamal, 2021](#); [Syarifuddin & Nurmi, 2022](#)).

The second finding shows that the application of differentiated learning better and more effective in improving student learning outcomes. These results then prove that Differentiated learning can improve student learning outcomes. According to students' learning needs, differentiated learning can provide instruction so that students are actively involved and learn what they need ([Avivi et al., 2023](#); [Cindyana et al., 2022](#)). Differentiated learning can improve student learning outcomes so that students are more active and enthusiastic in participating in learning, more confident, and able to respect others ([Hamidah & Oktaviani, 2023](#)). It is further explained that differentiated learning will be able to help students achieve optimal learning outcomes, because the products that will be produced will suit their interests ([Listiani, 2022](#); [Maulidia & Prafitasari, 2023](#)). Differentiated learning strategies are efforts that can be made to improve student learning outcomes by taking a heterogeneous cognitive approach to students and can be applied in all learning by accommodating student learning needs ([Jumiarti & Kurniawati, 2023](#); [Safarati & Zuhra, 2023](#)).

The third finding shows that differentiated learning is better and more effective in increasing student interest in learning and learning outcomes. The application of differentiated learning can improve learning outcomes, by attracting children's attention while they are learning in order to achieve targeted learning goals ([Saputra & Marlina, 2020](#); [Suwartiningsih, 2021](#)). This explains that differentiated learning is creating a class that has diversity by providing opportunities for students to obtain content, process ideas and improve the learning outcomes of each student so they can learn more effectively ([Faiz et al., 2022](#); [Miqwati et al., 2023](#)). The results obtained in this study are in line with the results of previous research, which also revealed that differentiated learning can increase the activity and mathematics learning outcomes of class XI high school students ([Kamal, 2021](#)). Other research results also prove that differentiated learning is able to provide learning that suits students' learning needs so that students participate actively and learn according to their needs ([Cindyana et al., 2022](#)). The results of further research revealed that there was a significant difference between students' science learning outcomes before and after using differentiated learning strategies using the problem based learning model ([Nawati et al., 2023](#)). So based on several research results, it can be said that the differentiated learning model can significantly improve student learning outcomes.

## 4. CONCLUSION

Based on the results of hypothesis testing and discussion of research results, it can be concluded that there are significant differences in interest and learning outcomes together between experimental

class students who are taught with differentiated learning and control class students who are taught with conventional learning. So that differentiated learning has a positive influence on the interest and learning outcomes of fourth grade elementary school students in learning mathematics.

## 5. REFERENCES

- Agustin, R., & Kumoro, J. (2018). The Influence of Motivation and Interest in Learning on Learning Achievement in Office Technology Subjects for Class. *Journal of Educational Administration*, 3(4), 197–211.
- Andriani, S., Mudzanatun, Patonah, S., & Paryuni. (2023). Teachers' Efforts to Increase Learning Motivation Through a Differentiated Approach for Class V SDN Gajahmungkur 04. *Tambusai Education Journal*, 7(2), 5913–5919. <https://doi.org/10.31004/jptam.v7i2.6633>.
- Aprima, D., & Sari, S. (2022). Analysis of the Application of Differentiated Learning in the Implementation of the Independent Curriculum in Elementary Mathematics Learning. *Cendikia: Educational Scientific Journal Media*, 13(1), 95–101. <https://doi.org/10.35335/cendikia.v13i1.2960>.
- Armin, R., & Purwati, WH (2021). The Effect of Using Multiplication Smart Board Media on Mathematics Learning Results for Multiplication Material for Class II Students at SD Negeri 75 Buton. *Academic Journal of Mathematics Education*, 1(1), 81–86. <https://doi.org/10.55340/japm.v7i1.394>.
- Avivi, AA, Pramadhitta, AD, Rahayu, FF, Saptariana, M., & Salamah, AU (2023). Implementation of Differentiated Learning with the Project Based Learning Model for Class X High School Students on Biotechnology Material. *Journal of History Education and Social Humanities Research*, 3(3), 251–258.
- Awalia, LM, Pratiwi, IA, & Kironoratri, L. (2021). Analysis of the Use of Online Learning Applications on Student Interest in Learning in Karangmalang Village. *Basicedu Journal*, 5(5), 3940–3949. <https://doi.org/10.31004/basicedu.v5i5.1354>.
- Cindyana, EA, Alim, JA, & Noviana, E. (2022). The Effect of Differentiated Learning Assisted by Rme-Based Geometry Teaching Materials on the Mathematical Reasoning Ability of Grade 3 Elementary School Students. *JOURNAL OF PAJAR (Education and Teaching)*, 6(4), 1179–1187. <https://doi.org/10.33578/pjr.v6i4.8837>.
- Damayanti, PA, & Qohar, A. (2019). Development of Powerpoint-Based Interactive Mathematics Learning Media on Conic Material. *Kreano, Journal of Creative-Innovative Mathematics*, 10(2), 119–124. <https://doi.org/10.15294/kreano.v10i2.16814>.
- Dayani, H., Yenes, R., Masrun, & Setiawan, Y. (2020). Study of Student Interest in Field Tennis. *Patriot Journal*, 2(3), 9–16. <https://doi.org/10.24036/patriot.v2i3.669>.
- Dwianjani, NKV, & Candiasa, IM (2018). Identify Factors that Influence Mathematical Problem Solving Ability. *NUMERICAL: Journal of Mathematics and Mathematics Education*, 2(2), 153. <https://doi.org/10.25217/numerical.v2i2.276>.
- Faiz, A., Pratama, A., & Kurniawaty, I. (2022). Differentiated Learning in the Mobilizing Teacher Program in Module 2.1. *Basicedu Journal*, 6(2), 2846–2853. <https://doi.org/10.31004/basicedu.v6i2.2504>.
- Fatmasari, F., & Supriyatna, A. (2019). Career Selection and Development Based on Teenagers' Interests, Talents and Personalities Using Forward Chaining. *JUITA: Journal of Informatics*, 7(1), 33. <https://doi.org/10.30595/juita.v7i1.4128>.
- Filahanasari, E. (2019). Students' Mathematical Strategic Ability, Thinking Type Personality, Solving Mathematics Problems, Class XI High School Linear Program Material. *Journal of RESIDUES*, 3(21), 1–23.
- Gery, MI, Ghani, MAA, Yudi, MT, & Mulyanto. (2022). Increasing Students' Interest in Learning Sports During the Covid-19 Pandemic. *Olympia Journal*, 4(1). <https://doi.org/10.33557/jurnalolympia.v4i1.1834>.
- Hamidah, J., & Oktaviani, O. (2023). The Influence of Learning Motivation in Differentiated Learning on the Indonesian Language Learning Outcomes of Man 1 Pulang Pisau Students. *Prima Magistra: Educational Scientific Journal*, 4(3), 254–262. <https://doi.org/10.37478/jpm.v4i3.2652>.
- Handayani, R., & Abadi, IBGS (2020). The Influence of the Direct Learning Model Assisted by Image Media on the Mathematical Knowledge Competency of Fourth Grade Elementary School Students. *Undiksha Science Forum*, 25(1), 120–131. <https://doi.org/10.23887/mi.v25i1.24767>.
- Heryandi, Y., & Nur'aini, N. (2022). The Effect of Using Learning Video Media to Reduce Students' Mathematics Misconceptions. *Integral : Mathematics Education*, 13(1), 13–25. <https://doi.org/10.32534/jnr.v13i1.3108>.
- Jumiarti, DN, & Kurniawati. (2023). Improving XXI Century Skills in Social Sciences Subjects through Differentiated Learning. *Journal of Educational Action Research*, 7(2), 160–168. <https://doi.org/10.23887/year.v7i2.55428>.

- Kamal, S. (2021). Implementation of Differentiated Learning in an Effort to Increase Activities and Mathematics Learning Outcomes of Class Xi Mipa Students at Sma Negeri 8 Barabai. *Julak Journal of Learning and Educators*, 1(1), 89–100.
- Listiani, I. (2022). Optimizing Differentiated Learning Using Brain Based Learning. *Journal of Geography Education*, 3(2), 1–5.
- Maulidia, FR, & Prafitasari, AN (2023). Differentiated Learning Strategies to Meet Students' Learning Needs. *ScienceEdu*, 6(1), 55. <https://doi.org/10.19184/se.v6i1.40019>.
- Miqwati, Susilowati, E., & Moonik, J. (2023). Implementation of Differentiated Learning to Improve Natural Science Learning Outcomes in Elementary Schools. *Elementary School Education*, 1(1), 30–38.
- Mumtangana, L., Ikmal, H., & Sari, AA (2022). Students' Interest in Learning Using Dice Throwing Media and the Question and Answer Method in the Aqidah Morals Subject. *Chalim Journal of Teaching and Learning*, 2(1), 1–6. <https://doi.org/10.31538>.
- Naibaho, D.P. (2023). Differentiated Learning Strategies Can Improve Students' Understanding of Learning. *Journal of Creative Student Research (JCSR)*, 1(2), 81–91. <https://doi.org/10.55606/jcsrpolitama.v1i2.1150>.
- Nawati, A., Yulia, Y., Havifah, B., Khosiyono, C., Pendidikan, P., Universitas, D., & Tamansiswa, S. (2023). The Effect of Differentiated Learning with the Problem Based Learning Model on Science Learning Outcomes in Elementary School Students. *Pendas: Journal of Elementary Education*, 8(1), 6167–6180. <https://doi.org/10.23969/jp.v8i1.8880>.
- Nugraha, F.A., Nur'aeni, E., Suryana, Y., & Muharram, MRW (2021). The Effectiveness of Powerpoint Media in Learning Triangle Area Material to Increase Students' Interest in Learning in Elementary Schools. *Educative: Journal of Educational Sciences*, 3(5), 2760–2768. <https://doi.org/10.31004/EDUKATIVE.V3I5.931>.
- Pane, RN, Lumbantoruan, S., & Simanjuntak, SD (2022). Implementation of Differentiated Learning to Improve Students' Creative Thinking Abilities. *BULLET : Multidisciplinary Journal of Science*, 1(3), 173–180.
- Pitaloka, H., & Arsanti, M. (2022). Differentiated Learning in the Independent Curriculum. *journal of education*, 4(1), 34–37.
- Primadewi, A., & Agustika, S. (2022). Problem-Based Learning Oriented Animation Videos to Increase Mathematics Learning Motivation for Fourth Grade Elementary School Students. *Undiksha Edutech Journal*, 10(1), 167–177. <https://doi.org/10.23887/jeu.v10i1.46477>.
- Rabbani, A., Baidowi, B., Wahidaturrahmi, W., & Sripatmi, S. (2022). Mathematical Problem Solving Ability Judging from the Myers Briggs Type Indicator (MBTI) Personality Type of Class IX Students. *Scientific Journal of the Educational Profession*, 7(3b), 1525–1533. <https://doi.org/10.29303/jipp.v7i3b.815>.
- Safarati, N., & Zuhra, F. (2023). E-learning assisted AIR learning model to improve students' critical thinking skills. *Journal of Educational Technology Innovation*, 10(2), 181–188. <https://doi.org/10.21831/jitp.v10i2.53648>.
- Saputra, AM, & Marlina, M. (2020). Effectiveness of Differentiated Learning Strategies to Increase Learning Concentration for Children with Learning Difficulties. *Journal of Education EXPERTS*, 18(2), 94–104.
- Setiawan, A., Nugroho, W., & Widyaningtyas, D. (2022). The Influence of Interest in Learning on the Learning Outcomes of Class VI Students of Sdn 1 Gamping. *RESPONSE: Journal of Basic Education Research and Innovation*, 2(2), 92–109. <https://doi.org/10.55933/tjripd.v2i2.373>.
- Setyowati, N., & Mawardi, M. (2018). Synergy of Project Based Learning and Meaningful Learning to Improve Mathematics Learning Outcomes. *Scholaria: Journal of Education and Culture*, 8(3), 253–263. <https://doi.org/10.24246/j.js.2018.v8.i3.p253-263>.
- Silva, IP, Purnomo, D., & Zuhri, MS (2019). The Effectiveness of the Constructivist Approach Assisted by Android-Based E-Book Media on Learning Outcomes Judging from the Learning Style of Class X Students at SMKN 11 Semarang. *Imaginer: Journal of Mathematics and Mathematics Education*, 1(6), 310–316. <https://doi.org/10.26877/imaginer.v1i6.4859>.
- Sutopo, S. (2019). Increasing Activities and Mathematics Learning Outcomes about KPK with the Card Sort Learning Model Assisted by Number Card Media. *ANARGYA: Scientific Journal of Mathematics Education*, 2(2), 92–98. <https://doi.org/10.24176/anargya.v2i2.3945>.
- Suwartiningsih, S. (2021). Application of Differentiated Learning to Improve Student Learning Outcomes in Science Subjects, Land and Sustainability of Life in Class IXb, Even Semester, SMPN 4 Monta, Academic Year 2020/2021. *Indonesian Journal of Education and Learning (JPPI)*, 1(2), 80–94. <https://doi.org/10.53299/jppi.v1i2.39>.
- Syarifuddin, S., & Nurmi, N. (2022). Differentiated Learning in Improving Mathematics Learning Outcomes



for Class IX Students, Even Semester, SMP Negeri 1 Wera, Academic Year 2021/2022. *JagoMIPA: Journal of Mathematics and Science Education*, 2(2), 93–102. <https://doi.org/10.53299/jagomipa.v2i2.184>.

Tanjung, HS, & Nababan, SA (2018). Development of Mathematics Learning Tools Oriented to Problem Based Learning Models (Pbm) to Improve Critical Thinking Abilities of High School Students in Kuala Nagan Raya Aceh. *Genta Mulia: Educational Scientific Journal*, IX(2), 56–70.