Soedirman Economics Education Journal

Vol. 8, No. 1, April 2026

Differentiated learning: Implementation and challenges to student learning outcomes

[a]Yeni Septianingrum, [b*]Elsa Puspasari, and [c]Oki Anggraeni

Affiliation:
[a] STKIPNU Tegal, Indonesia
[b] faculty of economics and business, Universitas Jenderal Soedirman, Indonesia

Contact:
elsa.puspasari@unsoed.ac.id

DOI:
10.32424/seej.v8i1.18414

Article History:
Received: 13 November 2025
Revised: 08 January 2026
Accepted: 02 March 2026
Published: 21 April 2026

Abstract

This study aims to examine the effectiveness of differentiated learning on students' learning outcomes and identify the challenges faced in its implementation. The study employed a quantitative experimental design featuring a pretest-posttest control group. The sample in this study consisted of 44 students from two classes. The experimental class received differentiated learning, integrated with a Problem-Based Learning (PBL) model that differentiated instruction by content, process, and product. Students in this class were grouped based on their learning readiness and needs, engaged in contextual problem scenarios, and demonstrated understanding through varied forms of assessment. The control class used a conventional learning model. The research instruments included learning outcome tests and teacher questionnaires on implementation challenges. A t-test analysis of the data showed a significant difference in student learning outcomes between the experimental and control classes 0,000 ($p < 0.05$) and t value 4,573, indicating that differentiated learning is effective in improving student learning outcomes. However, the questionnaire data revealed several challenges faced by teachers, such as time constraints, lack of training, and difficulties in grouping students by learning needs. These findings have important implications for education policy and practice to support the optimal implementation of differentiated learning.

Keywords: Differentiated Learning, Learning Outcomes, Problem-Based Learning Model

Introduction

Education is one of the key factors in developing human potential and is fundamental to a country's development. Therefore, future education must focus on change (Arini, et.al., 2021). These changes are expected to provide students with opportunities to obtain quality knowledge and skills regardless of background. This aligns with Law No. 20 of 2003 concerning the Education System, which states that 'the government is obliged to provide services and facilities, and guarantee the implementation of

quality education for every citizen without discrimination. The creation of a fair education system for all citizens will enable students to learn according to their abilities, as each student has different characteristics and learning needs (Rachmadhani & Kamalia, 2023). Technological developments and globalisation make competition in education more complex and intense today, posing a challenge to educators to achieve optimal learning outcomes.

The challenges in education today lie not only in technological advances, but also in the diversity of students' characteristics and potential. For this reason, effective management is required to maximise learning outcomes. One approach is to implement learning methods that focus on students' differences. Classroom learning can be implemented through a variety of methods within the curriculum framework to achieve learning objectives (Baderiah, 2018). In line with Law No. 20 of 2003, the curriculum is a set of learning plans related to objectives, content, teaching materials and methods used as guidelines in teaching activities. In Indonesia, the curriculum has undergone several changes and improvements according to the needs of the times and to improve student learning outcomes. Differentiated learning is a core instructional approach promoted by the Merdeka Curriculum to address this diversity. It is defined as an instructional model that optimises every learner's potential through the diversification of content, process, and product, tailored to students' readiness, interests, and learning profiles (Tomlinson, 2001);Saputra, 2021).

Grounded in Vygotsky's theory and brain-based learning principles, differentiation creates supportive learning environments that accommodate individual needs and has demonstrated effectiveness in promoting student motivation and engagement. Previous research has highlighted the effectiveness of differentiated instruction in promoting learning skills and improved learning outcomes, confirming that it empowers all learners to find relevance and meaning in learning content and activities. When integrated with active learning strategies such as Problem-Based Learning (PBL), differentiated instruction can further enhance outcomes by engaging students in contextual problem scenarios, collaborative group work, and varied forms of assessment suited to different learning profiles. PBL is a student-centered pedagogical strategy that emphasizes active learning through the exploration of complex real-world problems, fostering critical thinking, problem-solving abilities, and the practical application of knowledge. (Sakti & Luthfiyah, 2024) found that student learning outcomes improved significantly from Cycle I to Cycle II following the implementation of differentiated instruction in the PBL model. Furthermore, PBL through differentiated instruction is also effective in enhancing the critical thinking skills of vocational high school students (Ni’mah et al., 2024). The literature also indicates that this combination enhances critical thinking skills, collaboration, and independent learning, which are key

indicators of meaningful learning outcomes. Differentiated learning is a learning model designed to optimise the development of the potential of each diverse learner through the deversification of content, processes and products to be developed (Saputra, 2021).

However, research specifically focused on vocational secondary schools remains notably scarce, even though vocational education possesses unique characteristics that underscore the importance of differentiated instruction. Furthermore, no study to date has specifically investigated the integration of differentiated learning with a Problem-Based Learning (PBL) model within an Indonesian vocational school context. Differentiated learning is a way to provide knowledge to students according to students' talents and learning styles, while the teacher is a facilitator in the learning process (Fauzia and Ramadan, 2023). The Merdeka curriculum and differentiated learning have a relationship in the learning process, namely efforts to implement the Merdeka curriculum in education units. SMK NU Hasyim Asy'ari Tarub is one of the schools that has implemented the Merdeka curriculum in all departments and levels, but there are still students in the Banking department who have not obtained optimal learning outcomes. this is indicated by learning outcomes below the KKM score of 75, A total of 20 students scored below the passing grade for accounting subjects.

Research investigating the implementation of differentiated instruction utilizing the Problem-Based Learning (PBL) model has explored its effectiveness in enhancing students' critical thinking skills at the high school level (Kinanthi et al., 2023; Khoirunnisa & Ubaidah, 2025). However, these prior investigations primarily assessed the impact of differentiated instruction with the PBL model on learning outcomes through a two-cycle classroom action research methodology. Addressing this fenomena and research gap, the present study aims to examine implementation of differentiated learning integrated with a Problem-Based Learning (PBL) model on student learning outcomes and to identify the challenges teachers face in its implementation within a vocational education context. The findings are expected to contribute to instructional practice in vocational education, support the effective implementation of the Merdeka Curriculum, and inform teacher professional development in differentiated instruction.

Literature Review

Differentiated learning is an instructional technique in which teachers use a variety of methods to cater for the individual needs of each student. These needs may relate to existing knowledge, learning styles, interests, or understanding of the subject (Sugianto, 2022). According to(Tomlinson, 2001), differentiated learning involves adjusting lessons to accommodate, serve and acknowledge the diversity of students in the learning process, taking into account their readiness, interests and learning preferences. Learning is

defined as students learning alongside teacher facilitators to achieve predetermined learning objectives. The word 'different' has multiple meanings, referring to a variety of variations. Therefore, differentiated learning can be defined as the process of students learning, facilitated by teachers, through different approaches to implementing learning components.

(Smale-Jacobse et al., 2019) stated that differentiated learning recognises and teaches according to learners' different talents and learning styles. In differentiated learning, adjustments are made to learners' interests, learning preferences and readiness in order to improve learning outcomes (Rintayati, 2022). (Sugianto, 2022) revealed that four factors contribute to improving differentiated learning: content, process, product and learning environment. In principle, the learning objectives in the classroom should be the same, although the teaching materials, assessment and delivery methods can differ based on each student's needs. Teachers can differentiate learning in these four ways.

1. Content:

   The first way is to differentiate the content, i.e. the learning material provided by the teacher, so that it can be tailored to the different learning styles of the learners. There are visual, auditory and kinaesthetic learners.

2. Process:

   In the learning process, context is the provision of appropriate instruction to learners. Teachers therefore need to understand their students' interests and abilities in order to apply the right learning strategies, models and media.

3. Product:

   This aspect involves the method used by the teacher to determine the level of mastery of the teaching material by each student. To assess mastery, teachers can conduct cognitive and non-cognitive diagnostic tests.

4. Learning environment

   A quiet, conducive learning environment improves learning outcomes, whereas a noisy environment reduces students' concentration and understanding of the subject matter.

(Marlina, 2020) mentioned that the difference between classes with traditional learning and classes with differentiated learning lies in differentiated learning guiding students according to their interests, learning is based on students' readiness, interests and learning profiles, recognising multiple intelligences, and student-centred learning. Differentiated learning strategies also emphasise the importance of educators' response to learners' learning needs, where educators do not impose learning but focus on the learning needs of individual learners (Himmah & Nugraheni, 2023).

The use of differentiated instruction in a range of student-centered learning approaches is an essential part of modern education. Student-centered learning can be accomplished through a variety of approaches, such as cooperative learning, project-based learning, and problem-based learning. There is a need for learning approaches that can enhance students' capacity for critical thought and problem-solving in the face of diversity. One learning paradigm that meets these needs in the student learning process is called Problem-Based Learning (PBL). Putting students at the center of the learning process is the goal of both differentiated instruction and PBL.

Based on Tomlinson's paradigm, differentiated education aims to respect each person's uniqueness by altering the learning environment, methods, and subject matter. (Guay, 2022) Self-Determination Theory, which highlights the significance of meeting students' individual needs in order to promote their empowerment, supports this. PBL, on the other hand, uses real-world problem-solving to bring the classroom to life. When the two are combined, educators do more than just instruct; they create a welcoming environment where each student can develop to the fullest extent possible. Research conducted by (Kinanthi et al., 2023; Khoirunnisa & Ubaidah, 2025) shows that the implementation of differentiated instruction using PBL successfully enhances the learning creativity of 10th-grade students. (Maulidiawati & Darmawan, 2024) noted that differentiated instruction provides students with more opportunities to tailor their learning experiences according to their individual potential, such as interests, readiness, and weaknesses. The learning autonomy of 10th-grade students at SMA Negeri 2 Palembang increased with the implementation of a differentiated approach using the PBL model (Anggraini et al., n.d.).

The integration of differentiated instruction with PBL supports student-centered learning through several mechanisms. First, the presentation of open-ended problems in PBL offers a form of process differentiation, enabling students to choose problem-solving approaches that align with their learning styles. Second, product differentiation allows for varied learning outputs, such as written reports and presentations, that still align with the same learning objectives. Third, teachers act as facilitators, providing individualized support during the problem-investigation process. (Winahyu et al., 2024) found that student learning outcomes improved significantly from Cycle I to Cycle II following the implementation of differentiated instruction in the PBL model. Furthermore, PBL through differentiated instruction is also effective in enhancing the critical thinking skills of vocational high school students (Fanani et al., n.d.). The literature also indicates that this combination enhances critical thinking skills, collaboration, and independent learning, which are key indicators of meaningful learning outcomes. Research findings indicate that every student has distinct characteristics; not all students can be taught

using the same learning methods, so differentiated instruction is more suitable for implementation (Amalia, 2023).

Conceptually, differentiated instruction, PBL, learning outcomes, and implementation challenges form an interconnected system. Differentiated instruction is an adaptive approach that tailors PBL to accommodate student diversity. PBL serves as the primary pedagogical framework, fostering active engagement and authentic problem-solving. Together, they synergistically improve learning outcomes across cognitive, affective, and psychomotor domains. However, their integrated implementation faces challenges, including time constraints, teacher competency in designing differentiated instruction, and the need for more complex, authentic assessments. Therefore, the success of this model heavily depends on teacher readiness, institutional support, and systematic, reflective lesson planning.

(Sulistyosari et al., 2022) found that differentiated learning has a positive impact on students and teachers. However, teachers are still confused about how to implement it, which means that learning is not optimal. (Wahyuningsari et al., 2022), however, found that it has a significant influence, enabling students to achieve the best possible learning outcomes. This is consistent with the findings of (Laia et al., 2022), who demonstrated that differentiated learning strategies tailored to students' diverse learning needs can overcome learning outcome issues. These findings provide strong evidence that differentiated learning strategies have the potential to improve learning outcomes. However, the findings of this study contradict those of (O. A. Awofala & O. Lawani, 2020), who stated that there was no significant difference in the main effect on students' mathematics learning outcomes when focusing on their learning styles and cognitive abilities. Based on the above literature review, several hypotheses can be formulated to test the effect of differentiated learning on student achievement. The following hypotheses have been proposed:

H1: Differentiated Learning affects Learning outcomes in Accounting Subjects of SMK NU Hasyim Asy'ari Tarub

Research Methodology

This research uses quantitative with the research design of the Quasi Experimental Design method. Experimental research is used when researchers want to know the effect of cause and effect between independent and dependent variables (Sugiyono, 2020). The form of design used by researchers is Nonequaivalent Control Group Design. This design is almost the same as the pretest-Posttest control group design, the only difference is that in this design the experimental group and control group are not randomly selected. The population in this study was 490 students, while the sample in this study amounted to 44 students who were divided into experimental and control class groups. This study

employs a non-probability sampling technique, specifically purposive sampling. Meanwhile, purposive sampling is a type of non-probability sampling in which the sample is determined based on specific considerations aligned with the research objectives (Hardani et al., 2020). The sample criteria used were classes with the same average score on the PSTS for Economics and classes with the same number of students.

Sample in this study using Class X Banking services 2 is used as a sample whose learning uses a differentiated learning model PBL as an experimental class. And class X Banking Services 1 as a sample whose learning uses a conventional model (control class). Data collection techniques were carried out using tests and questionnaires. Tests are used to find out student learning outcomes. While the questionnaire used in this study aims to determine the effect of differentiated learning on student learning outcomes. The instrument in this study uses a Likert scale. Hypothesis testing in this study used the independent samples t-test

Results and Discussions

Validity is intended to state the extent to which the instrument (questionnaire) measures what you want to measure. This means that the measuring instrument used can actually measure the nature of the object under study or measure other properties. To assess the validity of each question item, it can be seen from the corrected item total correction of each question item. The results of the validity test of this research questionnaire are as follows:

Table 1. Validity Test Result

Variabel	Item	r calculate	r tabel	siginificance	Description
X	X1	0,543	0,432	0,000	Valid
	X2	0,560	0,432	0,000	Valid
	X3	0,489	0,432	0,000	Valid
	X4	0,466	0,432	0,000	Valid
	X5	0,482	0,432	0,000	Valid
	X6	0,497	0,432	0,000	Valid
	X7	0,498	0,432	0,000	Valid
	X8	0,444	0,432	0,000	Valid
	X9	0,433	0,432	0,000	Valid
	X10	0,509	0,432	0,000	Valid
	X11	0,461	0,432	0,000	Valid

	X12	0,450	0,432	0,000	Valid
	X13	0,466	0,432	0,000	Valid
	X14	0,560	0,432	0,000	Valid
	X15	0,531	0,432	0,000	Valid
Y	Y1	0,517	0,432	0,000	Valid
	Y2	0,550	0,432	0,000	Valid
	Y3	0,447	0,432	0,000	Valid
	Y4	0,588	0,432	0,000	Valid
	Y5	0,794	0,432	0,000	Valid
	Y6	0,491	0,432	0,000	Valid
	Y7	0,603	0,432	0,000	Valid
	Y8	0,603	0,432	0,000	Valid
	Y9	0,612	0,432	0,000	Valid
	Y10	0,438	0,432	0,000	Valid
	Y11	0,475	0,432	0,000	Valid
	Y12	0,746	0,432	0,000	Valid
	Y13	0,623	0,432	0,000	Valid
	Y14	0,530	0,432	0,000	Valid
	Y15	0,447	0,432	0,000	Valid

Reliability has the nature of trust. In other words, a measuring instrument has reliability if the measurement results are relatively consistent when the measuring instrument is used repeatedly by the same researcher or other researchers. The test results can be seen in the reliability level table, then the results are compared with the reliability level based on the Alpha value if the calculated Alpha value is greater than the r table, the research instrument is declared reliable. The results of the reliability test of this research variable are as follows:

Tabel 2. Reliability test result

Cronbach's Alpha Based on Standardized Items	N of Items
0,899	2

The test results can be seen in the satistic reliability level table, based on the Alpha value, the calculated Alpha value is greater than the r table, so the research, instrument is declared reliable.

Tabel 3. Normality Test Result

Tests of Normality

	Shapiro-Wilk Statistic	Df	Sig.
Posttest experiment	0.944	22	0.244
Posttest control	0.923	22	0.086

The output table above shows sig. values of 0.244 for the experimental post-test and 0.086 for the control post-test. Thus, the results of the tests carried out produce a significance value. If the sig. value is greater than 0.05, then the experimental and control posttest data can be declared to have a normal distribution.

Table 4. Hipotesis result independent sample t-test

Independent Samples Test

		Levene's Test for Equality Variances		oft-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Result	Equal variances assumed	2.417	0.128	-4.573	42	0.000	-4.545	0.994	-6.551	-2.540
	Equal variances not assumed			-4.573	36.049	0.000	-4.545	0.994	-6.561	-2.530

Tabel 5. t-test result

Group Statistics

Class		N	Mean	Std. Deviation	Std. Error Mean
Result	Class Control	22	56.50	2.540	0.542
	Class Experiment	22	61.05	3.909	0.833

Based on the above table, the two-tailed Sig value is 0.000. According to the decision-making criteria, this indicates that Ho is rejected and Ha is accepted. Meanwhile, the conclusions drawn from testing using the SPSS 25 programme and the T-test formula also reject Ho and accept Ha. Therefore, it can be concluded that 'there is an effect of differentiated learning on learning outcomes in accounting subjects'.

Discussion

The results of the independent samples t-test revealed a statistically significant difference between the experimental and control groups, with a significance value of $p = 0.000$ ($p < 0.05$), a t-value of 4,573. The experimental class, which received differentiated learning through a problem-based learning (PBL) model, achieved a mean post-test score of 3,909, compared to standard deviation 2,540 in the control class, which used a conventional learning model. These findings confirm that differentiated learning had a significant positive effect on student learning outcomes, as shown in Table 5. The experimental class that was given a learning treatment using differentiated learning through a problem-based learning model had a higher average value than the control class that used a conventional learning model. This means that differentiated learning by taking into account learning styles, characteristics, content and learning processes tailored to students has a significant impact on improving students' understanding of the material provided by the teacher so that the learning outcomes obtained also increase. This study guides students to solve problems using different accounting materials in each group. Through group discussions, students are expected to exchange ideas and respect each other's opinions. At the end of the lesson, an evaluation is conducted, consisting of individual problem-solving tasks for each student.

The integration of the Project-Based Learning (PBL) model with a differentiated approach has demonstrably improved student learning outcomes. This indicates the efficacy of a learning approach that considers individual differences in the learning process, utilizing varied learning strategies, diverse learning media, and differentiated products (e.g., discussion outcomes or group analysis presentations) to enhance student comprehension of the learning material. Consequently, this translates to improved

student learning evaluation outcomes that consistently exceed minimum proficiency standards. (Winahyu et al., 2024) found that student learning outcomes improved significantly following the implementation of differentiated instruction in the PBL model. Furthermore, PBL through differentiated instruction is also effective in enhancing the critical thinking skills of vocational high school students (Ni'mah et al., 2024). The implementation of a differentiated approach through the PBL model in the experimental class focuses on students' ability to solve problems related to the learning material. The problems presented are complex, There is a need to develop learning approaches tailored to students' needs, particularly for vocational high school students, who have diverse characteristics (Compen et al., 2025).

Differentiated learning provides students with the opportunity to explore their abilities more broadly. Students can determine how they will understand the material provided by the teacher according to their own thinking abilities and skills. In addition, classroom learning becomes more varied, enabling teachers to innovate learning methods. In line with research conducted by (Elviya & Sukartiningsih, 2023), differentiated learning provides students with the enthusiasm and motivation to learn according to their learning readiness. Student learning outcomes also improve with the implementation of differentiated learning (Fauzia & Hadikusuma Ramadan, 2023). (Rahayu et al., 2022) stated that the success of learning through an independent curriculum incorporating differentiated learning comes not only from the teacher, but from all members of the school community. Learning success, as measured by academic achievement, motivation, and learning performance, is supported by students' focus on learning and teachers' use of different instructional models (Goyibova et al., 2025).

However, the implementation of differentiated learning must overcome various internal and external challenges. These challenges can arise from the students themselves, who may not have found a learning style that suits them or recognised their talents and interests. Limited learning facilities and teachers' ability to innovate are also important challenges in the learning process. The change of curriculum in a short period of time also makes educators confused and not optimal in implementing it. (Rachmadhani & Kamalia, 2023) support this by stating that sometimes the application of differentiated learning strategies does not have a significant impact on learning outcomes.

Conclusion

This study aimed to examine the effect of a Problem-Based Learning (PBL) model integrated with a differentiated learning approach on student learning outcomes in a vocational school context. The findings confirm that there were statistically significant differences in learning outcomes between the experimental and control classes, demonstrating that differentiated learning through PBL encompassing

differentiation of content, process, and learning styles meaningfully improved students mastery of the material compared to conventional instruction. It can be concluded that the implementation of differentiated learning has had an impact on the learning outcomes of students in the Accounting Subjects Class X Banking Services at SMK NU Hasyim Asy'ari Tarub. The lack of school resources and teacher training on differentiated instruction and student-centered learning strategies is one of the barriers to implementing differentiated instruction. In addition, the diverse characteristics of vocational high school students are also an important factor to consider when implementing a learning model to optimally improve student learning outcomes in vocational high school.

References

Anggraini, K. N., Octaria, D., & Sumarno, E. (n.d.). *Implementasi Pendekatan Pembelajaran Berdiferensiasi Model Pembelajaran Problem Based Learning Untuk Meningkatkan Kemandirian Belajar Siswa Kelas X SMAN 2 Palembang*. *0*(0), 31–49.

Arini, P. D., Matin, M., & Zulaikha, S. (2021). Curriculum Management During the Covid-19 Emergency. *Journal of Education Research and Evaluation*, *5*(2), 271. https://doi.org/10.23887/jere.v5i2.31593

Baderiah. (2018). *Buku Ajar Pengembangan Kurikulum*. IAIN Palopo.

Compen, B., Verstegen, D., Maussen, I., Hülsman, C., Compen, B., Verstegen, D., Maussen, I., & Hülsman, C. (2025). Good practices for differentiated instruction in vocational education : the combined perspectives of educational researchers and teachers. *International Journal of Inclusive Education*, *3116*, 1017–1034. https://doi.org/10.1080/13603116.2024.2305652

Elviya, D. D., & Sukartiningsih, W. (2023). Penerapan Pembelajaran Berdiferensiasi Dalam Kurikulum Merdeka Pada Pembelajaran Bahasa Indonesia Kelas Iv Sekolah Dasar Di Sdn Lakarsantri I/472 Surabaya. *Https://Ejournal.Unesa.Ac.Id/Index.Php/Jurnal-Penelitian-Pgsd/Article/View/54127*, *11*(8), 1–14.

Fanani, M. A., Wafiroh, Z., & Yaqin, M. H. (n.d.). *Penerapan Model Problem Based Learning (PBL) dalam Pembelajaran Berdiferensiasi untuk Meningkatkan Keterampilan Berpikir Kritis Peserta Didik pada Pelajaran Matematika*. 537–548.

Fauzia, R., & Hadikusuma Ramadan, Z. (2023). Implementasi Pembelajaran Berdiferensiasi Dalam Kurikulum Merdeka. *Jurnal Educatio FKIP UNMA*, *9*(3), 1608–1617. https://doi.org/10.31949/educatio.v9i3.5323

Goyibova, N., Muslimov, N., Sabirova, G., & Kadirova, N. (2025). MethodsX Differentiation approach in education : Tailoring instruction for diverse learner needs. *MethodsX*, *14*(December 2024), 103163. https://doi.org/10.1016/j.mex.2025.103163

Guay, F. (2022). *Applying Self-Determination Theory to Education : Regulations Types , Psychological Needs , and Autonomy Supporting Behaviors*. https://doi.org/10.1177/08295735211055355

Hardani, Auliya, N. H., Andriani, H., Fardani, R. A., Ustiawaty, J., Utami, E. F., Sukmana, D. J., & Istiqomah, R. R. (2020). *Metode Penelitian Kualitatif \& Kuantitatif*. CV. Pustaka Ilmu. https://books.google.co.id/books?id=qijKEAAAQBAJ

Himmah, F. I., & Nugraheni, N. (2023). Analisis Gaya Belajar Siswa untuk Pembelajaran Berdiferensiasi. *Jurnal Riset Pendidikan Dasar (JRPD)*, *4*(1), 31. https://doi.org/10.30595/jrpd.v4i1.16045

Khoirunnisa, F. . K., & Ubaidah, N. (2025). *IMPLEMENTASI PEMBELAJARAN BERDIFERENSIASI DENGAN MODEL PROBLEM BASED LEARNING DALAM MENINGKATKAN KEMAMPUAN PEMECAHAN MASALAH MATEMATIS*. *14*(1), 36–44.

Kinanthi, S., Astuti, erni P., & Purwoko, R. Y. (2023). *Pembelajaran Berdiferensiasi dengan Problem Based Learning untuk Meningkatkan Kreativitas Matematis Siswa Kelas X*. *5*, 515–524.

Laia, I. S. A., Sitorus, P., Surbakti, M., Simanullang, E. N., Tumanggor, R. M., & Silaban, B. (2022). Pengaruh Strategi Pembelajaran Berdiferensiasi terhadap Hasil Belajar Peserta Didik SMA Negeri 1 Lahusa. *Jurnal Ilmiah Wahana Pendidikan*, *8*(20), 314–321. https://doi.org/10.5281/zenodo.7242959.

Marlina. (2020). *Strategi Pembelajaran Berdiferensiasi di Sekolah Inklusif*. CV. Afifa Utama.

Maulidiawati, T., & Darmawan, P. (2024). *Pengaruh Implementasi Pembelajaran Berdiferensiasi dalam Kurikulum Merdeka Di Sekolah Dasar The Effect of Implementing Differentiated Learning in the Merdeka Curriculum in Primary Schools*. *2*(2), 150–156. https://doi.org/10.17977/um084v2i22024p150-156

Ni'mah, F., Asari, S., & Huda, S. (2024). *Efektivitas Model Problem-Based Learning Terhadap Berpikir Kritis dengan Pembelajaran Berdiferensiasi pada Peserta Didik SMKN 1 Cerme*. *08*, 212–221.

O. A. Awofala, A., & O. Lawani, A. (2020). Increasing Mathematics Achievement of Senior Secondary School Students through Differentiated Instruction. *Journal of Educational Sciences*, *4*(1), 1. https://doi.org/10.31258/jes.4.1.p.1-19

Rachmadhani, S. A. D., & Kamalia, P. U. (2023). Analisis Strategi Pembelajaran Berdiferensiasi terhadap Hasil Belajar Peserta Didik: Systematic Literature Review. *Asatiza: Jurnal Pendidikan*, *4*(3), 178–192. https://doi.org/10.46963/asatiza.v4i3.1231

Rahayu, R., Rosita, R., Rahayuningsih, Y. S., Hernawan, A. H., & Prihantini, P. (2022). Implementasi Kurikulum Merdeka Belajar di Sekolah Penggerak. *Jurnal Basicedu*, *6*(4), 6313–6319. https://doi.org/10.31004/basicedu.v6i4.3237

Rintayati, P. (2022). *Strategi Pembelajaran Berdiferensiasi*. Eureka Media Aksara.

Sakti, N. C., & Luthfiyah, A. (2024). *Implementasi Pembelajaran Berdiferensiasi dengan Metode Problem Based Learning (PBL) dalam Meningkatkan Hasil Belajar*. *9*, 694–698.

Saputra, M. A. (2021). The Effectiveness of Differentiated Learning Strategies to Increase Learning Concentration of Children with Learning Difficulties. *PAKAR Pendidikan*, *18*(2), 94–104. https://doi.org/10.24036/pakar.v18i2.222

Smale-Jacobse, A. E., Meijer, A., Helms-Lorenz, M., & Maulana, R. (2019). Differentiated Instruction in Secondary Education: A Systematic Review of Research Evidence. *Frontiers in Psychology*, *10*(November). https://doi.org/10.3389/fpsyg.2019.02366

Sugianto. (2022). *pembelajaran berdeferensiasi:antara manfaat dan tantangan*. https://bgpsumsel.kemdikbud.go.id/pembelajaran-berdiferensiasi-antara-manfaat-dan-tantangannya/#:~:text=Apa itu Pembelajaran Berdiferensiasi?,siswa sesuai dengan kebutuhan mereka.

Sugiyono. (2020). *Metode Penelitian Kuantitatif Kualitatif dan R&D*. Alfabeta.

Sulistyosari, Y., Karwur, H. M., & Sultan, H. (2022). Penerapan Pembelajaran Ips Berdiferensiasi Pada Kurikulum Merdeka Belajar. *Harmony: Jurnal Pembelajaran IPS Dan PKN*, *7*(2), 66–75. https://doi.org/10.15294/harmony.v7i2.62114

Tomlinson, C. A. (2001). How to Differentiate instruction in mixedability classrooms. In *In Association for Supervision and Curriculum Development* (Issue 1). https://doi.org/10.1016/0300-483X(87)90046-1

Wahyuningsari, D., Mujiwati, Y., Hilmiyah, L., Kusumawardani, F., & Sari, I. P. (2022). Pembelajaran Berdiferensiasi Dalam Rangka Mewujudkan Merdeka Belajar. *Jurnal Jendela Pendidikan*, *2*(04), 529–535. https://doi.org/10.57008/jjp.v2i04.301

Winahyu, F. H., Nulhakim, L., & Rumanta, M. (2024). *Pengaruh Pembelajaran Problem Based Learning Berdiferensiasi dan Motivasi Belajar terhadap Hasil Belajar Matematika*. *6*(1), 661–669.