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Transforming Education: Insights from Differentiated Instruction in Indonesia - A Meta-Analysis

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ABSTRAK

Pembelajaran berdiferensiasi telah menjadi fokus utama dalam pengembangan pendidikan di Indonesia. Penelitian ini bertujuan untuk menentukan dampak pembelajaran berdiferensiasi terhadap hasil belajar siswa di Indonesia. Pendekatan pengajaran ini disesuaikan dengan kebutuhan, minat, dan kemampuan individu siswa. Studi ini menggunakan metode meta-analisis dengan memanfaatkan 11 artikel dari jurnal-jurnal Indonesia sebagai subjek penelitian. Berdasarkan temuan, dapat disimpulkan bahwa penerapan pembelajaran berdiferensiasi menunjukkan hasil yang positif dalam hal materi pembelajaran, jenjang pendidikan, wilayah penelitian, rentang waktu yang berbeda, serta berbagai jenis penerapan seperti model, pendekatan, dan strategi. Data menunjukkan bahwa pembelajaran berdiferensiasi dapat meningkatkan hasil belajar siswa, karena merupakan salah satu solusi untuk mengatasi perbedaan gaya belajar siswa.
Kata Kunci: Pembelajaran Berdiferensiasi, Hasil Belajar, Meta Analisis

ABTRACT

Differentiated instruction has become a key focus in the development of education in Indonesia. This research aims to determine the impact of differentiated instruction on student learning outcomes in Indonesia. This teaching approach is tailored to the individual needs, interests, and abilities of students. The study employs a meta-analysis method, utilizing 11 articles from Indonesian journals as research subjects. Based on the findings, it can be concluded that the implementation of differentiated instruction shows positive results in terms of learning materials, educational levels, research regions, different time spans, and types of implementations such as models, approaches, and strategies. The data indicate that differentiated instruction can improve student learning outcomes, as it is one solution for addressing differences in students' learning styles.
Keywords: Differentiated instruction, Learning outcomes, Meta analysis

1. INTRODUCTION

The quality of education is a crucial factor that can influence the progress of a nation. If the educational system functions well, it will positively impact the nation's advancement. Conversely, if education lacks quality, it will negatively affect the country's development (Sitorus et al., 2022). Superior education fosters innovation and creativity, leading to progressively better generations. Therefore, it is essential for Indonesia, as a developing country, to pay greater attention to the education sector.

Education plays a significant role in enhancing the quality of human resources (Anggereni, 2019). Schools, as formal educational institutions, have a strategic role in developing quality talents. Education is a process that influences students to adapt to their environment, enabling them to function effectively in society (Surbakti, 2022).

According to Ki Hajar Dewantara, the process of teaching and education aims to develop human dignity and should liberate individuals in all aspects of life, physically, mentally, and spiritually (Wiryanto & Anggraini, 2022). Nadiem Makarim stated that this concept will be realized through the implementation of the Merdeka Belajar curriculum (Emancipated Curriculum) (Wiryanto & Anggraini, 2022). The Merdeka Belajar curriculum (Emancipated Curriculum) introduces a new paradigm, one of which is giving students the freedom to choose learning materials according to their interests (Sari et al., 2023). An example of implementing Emancipated Curriculum is providing students the freedom to select learning resources that match their learning styles to understand the subject matter better.

By adopting Ki Hajar Dewantara's philosophy and the Emancipated Curriculum concept, which considers each student's uniqueness, appropriate teaching strategies must be applied to meet the demands of the Emancipated Curriculum, especially at the senior high school level. Collaboration between teachers, students, and all stakeholders in the learning process is essential to achieving the Emancipated Curriculum's goals. One strategy that can be used to meet these demands is differentiated instruction.

Differentiated instruction refers to adapting to students' interests, learning preferences, and readiness to enhance learning outcomes (Marlina et al., 2019). These adjustments include interests, learning profiles, and student readiness to achieve improved learning outcomes. Differentiated instruction accommodates, serves, and acknowledges student diversity in the learning process by considering students' readiness, interests, and learning preferences. This concept also describes an approach to recognizing and teaching according to the diverse talents and learning styles of students (Wahyunisari et al., 2022). Differentiated instruction emphasizes that each individual has unique interests, potentials, and talents; therefore, the teacher's role is to coordinate and integrate these differences with appropriate strategies. Thus, differentiated instruction is a teaching approach tailored to students' learning needs, interests, and abilities.

The effect of a classroom implementing differentiated instruction is that all individuals feel accepted, and students from diverse backgrounds feel valued, safe, and engaged. The expectation is that teachers can teach according to learning objectives, synergy occurs between teachers and students, and students' learning needs are met and supported. This impact is expected to lead to optimal learning outcomes (Cahyono et al., 2022).

The objective of this study is to examine the impact of Differentiated Instruction on student learning outcomes in Indonesia. The factors considered include several variables such as learning materials, educational levels, research regions, time spans, and types of implementations.

2. METHOD

Meta-analysis is a widely used research method. For example, Saleh and Andis (2024) found that practicum significantly improves student learning outcomes across different class levels, subjects, research fields, and time periods. This study employed a meta-analysis approach by conducting a literature review of national journal articles that examine the impact of Differentiated Instruction on student learning outcomes. The researchers began by searching Google Scholar using the keyword 'Pengaruh Pembelajaran Berdiferensiasi terhadap Hasil

Belajar Siswa' ('Impact of Differentiated Instruction on Student Learning Outcomes'). Next, they established specific selection criteria: (1) studies conducted in Indonesia, (2) studies published within the last five years, (3) studies conducted at the school level, (4) studies that included both control and experimental groups, and (5) studies that provided standard deviation values and learning outcomes for both groups.

After reviewing the articles on each page up to page 16 of Google Scholar, out of a total of 160 articles, only 11 articles met the established criteria. The remaining 149 articles were excluded because they did not meet the criteria, such as some articles only conducting literature reviews, not providing standard deviation values, or lacking control and experimental classes. Based on these considerations, the sample used in this study consists of 11 journal articles on the Impact of Differentiated Instruction on Student Learning Outcomes.

Once the data was obtained, the research variables were identified by entering the results into the appropriate columns. Next, the mean and standard deviation for each research subject were identified, with the mean learning outcomes for the control and experimental classes being collected at this stage. The following step involved determining the standard deviation for the control group by inputting all the average control class values from all research subjects into an Excel program, then importing the Excel file in CSV format into the OpenMEE application. The effect size was then determined using the OpenMEE application, where the effect size was calculated using Glass's formula.

The criteria for evaluating effect size are as follows:

- Effect size ≤ 0.15: negligible effect
- 0.15 < Effect size ≤ 0.40: small effect
- 0.40 < Effect size ≤ 0.75: medium effect
- 0.75 < Effect size ≤ 1.10: high effect
- 1.10 < Effect size ≤ 1.45: very high effect
- Effect size > 1.45: extremely high effect

3. RESULT AND DISCUSSION

The result of the article screening process from Google Scholar yielded 11 articles that met the specified criteria. Data from these 11 articles can be observed in Table 1.

Table 1. Research Data

No	Article	Grade	Result
1.	Pengaruh pembelajaran berdiferensiasi berbantuan materi ajar Geometri berbasis RME terhadap kemampuan penalaran matematis siswa kelas 3 Sekolah Dasar (The Effect of Differentiated Instruction with RME-Based Geometry Teaching	III	$\bar{X}$ experiment = 12 $\bar{X}$ control= 10,5 SD experiment = 1.706 SD control = 2.606

	Materials on the Mathematical Reasoning Ability of 3rd Grade Elementary Students)		
2.	*Pengaruh penerapan pembelajaran berdiferensiasi terhadap hasil belajar siswa kelas IV UPT SPF SD Inpres Antang Kota Makassar* (The Effect of Implementing Differentiated Instruction on the Learning Outcomes of 4th Grade Students at UPT SPF SD Inpres Antang, Makassar City)	IV	$\bar{X}$ experiment = 85 $\bar{X}$ control= 55 SD experiment = 5.357 SD control = 7.005
3.	*Pengaruh Pembelajaran Berdiferensiasi Model Problem Based Learning Terhadap Hasil Belajar IPA Pada Siswa Sekolah Dasar* (The Effect of Differentiated Instruction Using a Problem-Based Learning Model on Science Learning Outcomes in Elementary School Students)	V	$\bar{X}$ experiment = 78,04 $\bar{X}$ control= 69,46 SD experiment = 9.751 SD control = 12.197
4.	*Analisis Hasil Belajar Peserta Didik Berdasarkan Gaya Belajar Melalui Pembelajaran Berdiferensiasi Di MTs Negeri Binjai* (Analysis of Student Learning Outcomes Based on Learning Styles Through Differentiated Instruction at MTs Negeri Binjai)	VII	$\bar{X}$ experiment = 80,54 $\bar{X}$ control = 72,19 SD experiment = 6.405 SD control = 7.000
5.	Implementasi Pembelajaran Berdiferensiasi Untuk Meningkatkan Kemampuan Berpikir Kreatif Peserta Didik (Implementation of Differentiated Instruction to Improve Students' Creative Thinking Skills)	VIII	$\bar{X}$ experiment = 79,79 $\bar{X}$ control= 72,08 SD experiment =14.705 SD control = 13.425
6.	*Pengaruh strategi pembelajaran berdiferensiasi terhadap minat dan hasil belajar peserta didik* (The Effect of Differentiated Instruction Strategies on Students' Interest and Learning Outcomes)	VIII	$\bar{X}$ experiment = 65,67 $\bar{X}$ control= 58,33 SD experiment =12.369 SD control = 13.476
7.	Efektivitas Model Pembelajaran Berdiferensiasi Terhadap Peningkatan Hasil Belajar Fiqih Kelas VIII SMP Muhammadiyah 3 Kaliwungu Kendal (The Effectiveness of Differentiated Instruction Model on Improving Fiqh Learning	VIII	$\bar{X}$ experiment = 86,67 $\bar{X}$ control= 73,68 SD experiment = 9.337 SD control = 10.441

	Outcomes for 8th Grade Students at SMP Muhammadiyah 3 Kaliwungu, Kendal)		
8.	*Pengaruh Strategi Pembelajaran Berdiferensiasi Melalui Problem-Based Learning Terhadap Hasil Belajar* (The Effect of Differentiated Instruction Strategies Through Problem-Based Learning on Learning Outcomes)	VIII	$\bar{X}$ experiment = 78,67 $\bar{X}$ control= 66,67 SD experiment = 8.4 SD control = 9.32
9.	Pengaruh Model Pembelajaran Berdiferensiasi Terhadap Literasi Berbicara Pada Mata Pelajaran Bahasa Indonesia Siswa Kelas X SMAN 1 Pangkep (The Effect of Differentiated Instruction Models on Speaking Literacy in Indonesian Language Subjects for 10th Grade Students at SMAN 1 Pangkep)	X	$\bar{X}$ experiment = 90,02 $\bar{X}$ control= 80,19 SD experiment = 5.586 SD control = 6.44
10.	Pengaruh Strategi Pembelajaran Berdiferensiasi Terhadap Keaktifan Dan Hasil Belajar Siswa Pada Materi Bioteknologi Kelas X Di SMA Muhammadiyah 3 Jember Tahun Pelajaran 2022/2023 (The Effect of Differentiated Instruction Strategies on Students' Activeness and Learning Outcomes in Biotechnology Material for 10th Grade Students at SMA Muhammadiyah 3 Jember in the 2022/2023 Academic Year)	X	$\bar{X}$ experiment = 86,89 $\bar{X}$ control= 81,25 SD experiment = 9.995 SD control = 15.24
11.	*Pengaruh Strategi Pembelajaran Berdiferensiasi Terhadap Minat Dan Hasil Belajar Peserta Didik* (The Effect of Differentiated Instruction Strategies on Students' Interest and Learning Outcomes)	XI	$\bar{X}$ experiment = 80 $\bar{X}$ control= 72,61 SD experiment = 11.28 SD control = 14.45

Table 1 presents data from 11 articles on the Impact of Differentiated Instruction on Student Learning Outcomes. All the data show that the students' scores in the experimental classes were higher than those in the control classes.

Furthermore, the journal articles in Table 1 are distinguished in detail based on the established variables. More detailed data can be observed in Table 2.

Table 2. Data Distribution of The Articles

Factor	School Level	Learning Material	Area	Year	Implementation Type
Elementary	3				
Junior High School	5				
Senior High School	3				
Science		8			
Humanities		3			
Sumatera			6		
Java			3		
Sulawesi			2		
2019				1	
2022				3	
2023				7	
Model					5
Strategy					4
Approach					2
Total	11	11	11	11	11

Table 2 shows the distribution of the data based on five predetermined variables. The majority of the variables consist of three groups, except for the learning material, which contains only two groups. Additionally, the data was analyzed to determine its effect size. The results of the studies can be seen in Table 3.

Table 3. Results of the Overall Sample Effect Size Analysis

No	Article	Effect Size	Category
1.	Pengaruh pembelajaran berdiferensiasi berbantuan materi ajar Geometri berbasis RME terhadap kemampuan penalaran matematis siswa kelas 3 Sekolah Dasar (The Effect of Differentiated Instruction with RME-Based Geometry Teaching Materials on the Mathematical Reasoning Ability of 3rd Grade Elementary Students)	0,675	medium effect
2.	*Pengaruh penerapan pembelajaran berdiferensiasi terhadap hasil belajar siswa kelas IV UPT SPF SD Inpres Antang Kota Makassar* (The Effect of Implementing Differentiated Instruction on the Learning Outcomes of 4th Grade Students at UPT SPF SD Inpres Antang, Makassar City)	4,863	extremely high effect

3.	*Pengaruh Pembelajaran Berdiferensiasi Model Problem Based Learning Terhadap Hasil Belajar IPA Pada Siswa Sekolah Dasar* (The Effect of Differentiated Instruction Using a Problem-Based Learning Model on Science Learning Outcomes in Elementary School Students)	0,766	high effect
4.	*Analisis Hasil Belajar Peserta Didik Berdasarkan Gaya Belajar Melalui Pembelajaran Berdiferensiasi Di MTs Negeri Binjai* (Analysis of Student Learning Outcomes Based on Learning Styles Through Differentiated Instruction at MTs Negeri Binjai)	1,265	very high effect
5.	Implementasi Pembelajaran Berdiferensiasi Untuk Meningkatkan Kemampuan Berpikir Kreatif Peserta Didik (Implementation of Differentiated Instruction to Improve Students' Creative Thinking Skills)	0,539	medium effect
6.	*Pengaruh strategi pembelajaran berdiferensiasi terhadap minat dan hasil belajar peserta didik* (The Effect of Differentiated Instruction Strategies on Students' Interest and Learning Outcomes)	0,582	medium effect
7.	Efektivitas Model Pembelajaran Berdiferensiasi Terhadap Peningkatan Hasil Belajar Fiqih Kelas VIII SMP Muhammadiyah 3 Kaliwungu Kendal (The Effectiveness of Differentiated Instruction Model on Improving Fiqh Learning Outcomes for 8th Grade Students at SMP Muhammadiyah 3 Kaliwungu, Kendal)	1,340	very high effect
8.	*Pengaruh Strategi Pembelajaran Berdiferensiasi Melalui Problem-Based Learning Terhadap Hasil Belajar* (The Effect of Differentiated Instruction Strategies Through Problem-Based Learning on Learning Outcomes)	1,391	very high effect
9.	Pengaruh Model Pembelajaran Berdiferensiasi Terhadap Literasi Berbicara Pada Mata Pelajaran Bahasa Indonesia Siswa Kelas X SMAN 1 Pangkep (The Effect of Differentiated Instruction Models on Speaking Literacy in Indonesian Language Subjects for 10th Grade Students at SMAN 1 Pangkep)	1,680	extremely high effect
10.	Pengaruh Strategi Pembelajaran Berdiferensiasi Terhadap Keaktifan Dan Hasil Belajar Siswa Pada Materi Bioteknologi Kelas X Di SMA Muhammadiyah 3 Jember Tahun Pelajaran	0,646	medium effect

	2022/2023 (The Effect of Differentiated Instruction Strategies on Students' Activeness and Learning Outcomes in Biotechnology Material for 10th Grade Students at SMA Muhammadiyah 3 Jember in the 2022/2023 Academic Year)		
11.	*Pengaruh Strategi Pembelajaran Berdiferensiasi Terhadap Minat Dan Hasil Belajar Peserta Didik* (The Effect of Differentiated Instruction Strategies on Students' Interest and Learning Outcomes)	0,575	medium effect

Table 2 above shows the effect size results for the entire sample from the study. It can be observed that the average indicates a positive effect, meaning that differentiated instruction is an effective approach to improving student learning outcomes. For more clarity, the following graph in Figure 1 illustrates the effect size results for the entire research sample.

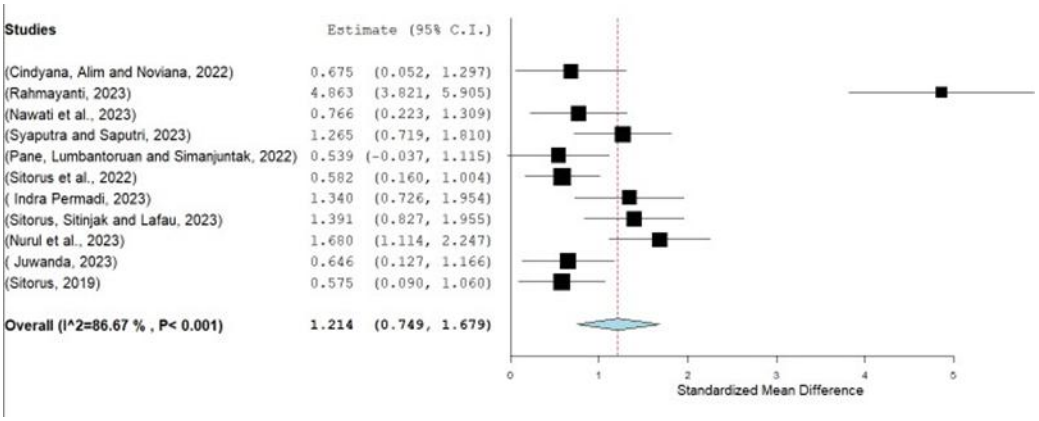

Figure 1. Overall Effect Size Graph

Based on the graph, it can be seen that there are no points to the left of zero; rather, all points are to the right of zero, indicating that all have a positive effect size. This includes medium, high, and very high effect sizes. This finding aligns with what Tomlinson (2001:45) stated, that differentiated instruction has a specific goal of helping students increase their motivation and learning outcomes, thereby reducing difficulties in understanding the material provided by the teacher. This approach serves as an alternative to improving student learning outcomes.
The first variable analyzed is the educational level. The effect size results for each category can be observed in Table 2.

Table 4. Impact of Differentiated Instruction Students' Learning Outcomes Based on Educational Level

No	Educational Level	ES	ES	Category
1.	Elementary	0,675	2,049	extremely high effect
2.		4,863		
3.		0,766		

4.	Junior School	High	1,265	1,002	high effect
5.			0,539		
6.			0,582		
7.			1,340		
8.			1,391		
9.	Senior School	High	1,680	0,955	high effect
10.			0,646		
11.			0,575		

Based on Table 4, it can be observed that the average implementation of differentiated instruction falls into the high category, indicating that it can be effectively applied at the elementary (SD), junior high (SMP), and senior high school (SMA) levels. For further clarity, refer to the effect size graph for educational levels shown in Figure 2.

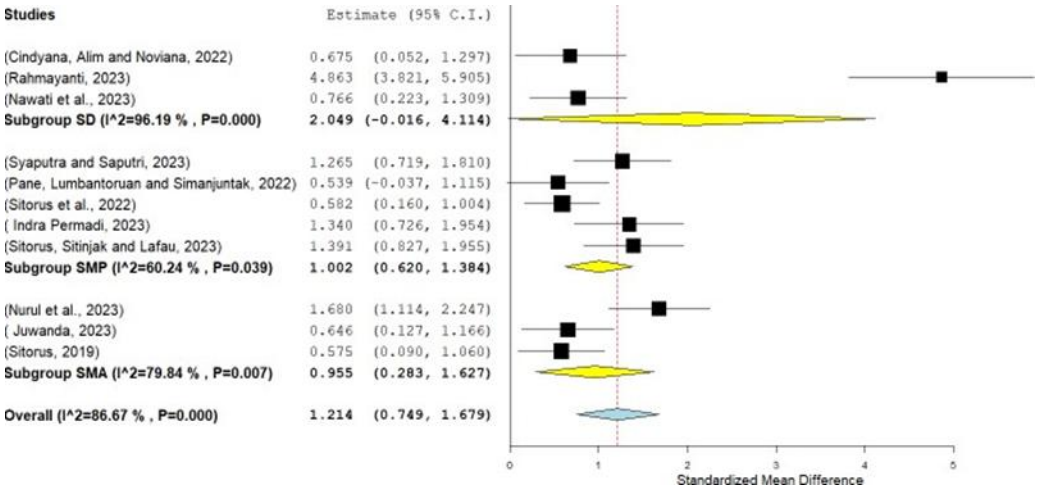

Figure 2. Effect Size Graph Based on Educational Level

Based on the graph, it can be seen that each subgroup—elementary (SD), junior high (SMP), and senior high school (SMA)—touches the red line, indicating no significant differences among them. The highest effect size is found at the elementary level. According to Kurniasih (2022), elementary education is a stage where students still require more intensive assistance and guidance from teachers in the learning process. Differentiated instruction can help teachers provide more specific and effective support by understanding students' individual characteristics and needs. Therefore, differentiated instruction is more frequently implemented at the elementary level as it allows teachers to offer more targeted and effective assistance.

The next variable analyzed is based on the type of subject matter. There are two groups: science and humanities. Detailed results can be seen in Table 5 below.

Table 5. The Impact of Differentiated Instruction on Type of Subject Matter

No	Subject Matter	ES	ES	Category
1.	Science	0,675	1,151	very high effect
2.		4,863		
3.		0,766		
4.		0,539		
5.		0,582		
6.		1,391		
7.		0,646		
8.		0,575		
9.	Humanities	1,265	1,428	very high effect
10.		1,340		
11.		1,680		

Based on Table 5, it can be seen that science subjects such as physics and biology, as well as humanities subjects like religion and Indonesian language, have very high effect sizes. There is no significant difference between the two groups, indicating that differentiated instruction can improve student learning outcomes in both types of subjects. For further clarity, refer to the effect size graph for subject matter shown in Figure 3

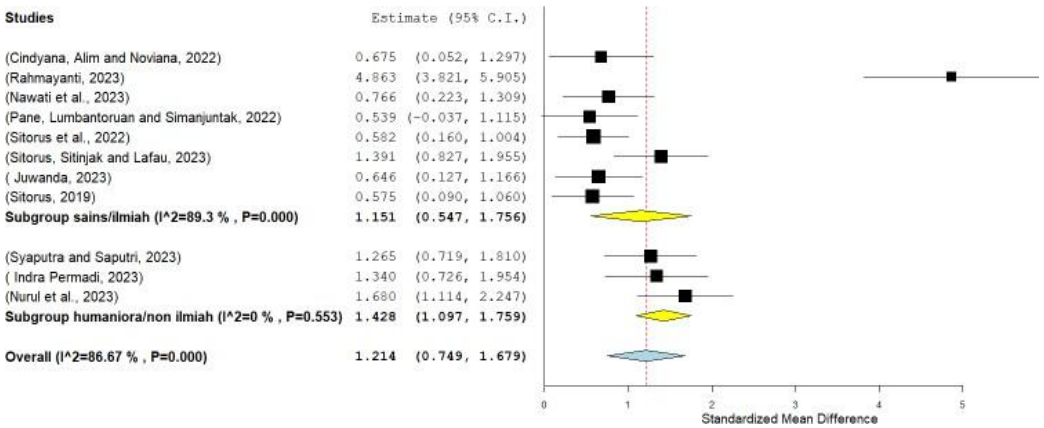

Figure 3. Effect Size Graph Based on Type of Subject Matter

Based on the graph, it can be observed that both science and humanities subjects touch the red line, indicating no significant difference between them. The highest effect size is found in humanities subjects. Humanities topics, such as history, literature, and philosophy, require deeper and more complex analysis and interpretation, which means students need more time to understand and develop their comprehension. Differentiated instruction allows teachers to provide extended time for students who need more time to grasp the material, although this could also be influenced by the teacher's ability to create engaging and effective instructional materials.

The next group analyzed is based on the variable of research region. There are three main groups, which can be further detailed in Table 6.

Table 6. The Impact of Differentiated Instruction on Area of Research

No	Area	ES	ES	Category
1.	Sumatera	0,675	0,824	High Effect
2.		1,265		
3.		0,539		
4.		0,582		
5.		1,391		
6.		0,575		
7.	Sulawesi	4,863	3,240	Extremely High Effect
8.		1,680		
9.	Jawa	0,766	0,890	High Effect
10.		1,340		
		0,646		

Based on the Table 6, it can be seen that the differences in regions do not affect the results, as all three regions display high effect sizes. Therefore, the implementation of differentiated instruction is suitable for various regions. For further clarity, refer to the graph shown in Figure 4.

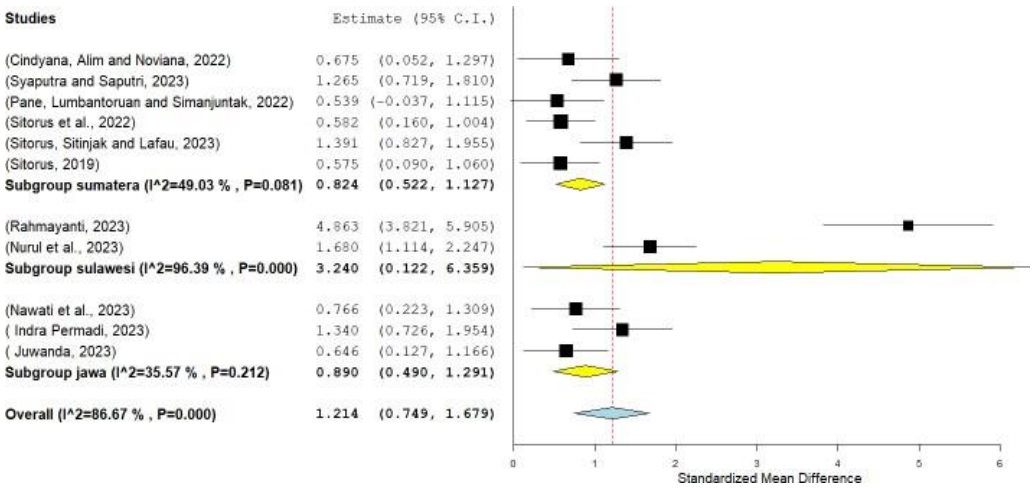

Figure 4. Effect Size Graph Based on Region

Based on the graph in Figure 4, it can be seen that the Sulawesi and Java subgroups touch the red line, indicating no significant difference between these two regions. In contrast, the Sumatra region shows a significant difference compared to the other two regions. All three regions exhibit high effect sizes.

The next variable analyzed is the year of research. Among the 11 collected articles, they can be grouped into three categories. Detailed results can be observed in Table 7.

Table 7. The Impact of Differentiated Instruction on Year of Research

No	Year	ES	ES	Category
1.	2019	0,575	0,575	Moderate Effect
2.	2022	0,675	0,592	Moderate Effect
3.		0,539		
4.		0,582		
5.	2023	4,863	1,617	Extremely High Effect
6.		0,766		
7.		1,265		
8.		1,340		
9.		1,391		
10.		1,680		
11.		0,646		

Based on Table 7, it can be seen that the implementation of differentiated instruction is most frequently applied in 2023 and has a high impact. This may be due to the fact that in 2019 and 2022, educators were still adapting to differentiated instruction. The Merdeka Curriculum, which advocates for differentiated instruction, began implementation in 2022. For further clarity, refer to the graph shown in Figure 5.

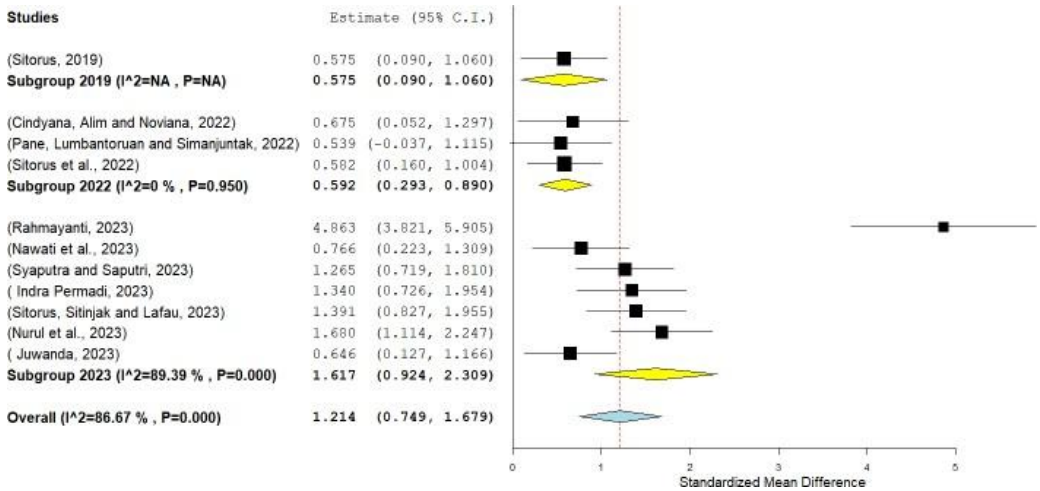

Figure 5. Effect Size Graph Based on Year of Research

Based on the graph in Figure 5, it can be seen that the two groups, namely the 2019 and 2022 subgroups, do not touch the red line, while the 2023 subgroup intersects with the red line. This indicates that the research results from 2023 differ significantly from the other two years regarding the implementation of differentiated instruction in improving student learning outcomes. Several factors could contribute to this, including educational needs, resource

limitations, teaching habits, and student learning habits. Overall, all three-year groups still fall within positive impact.

The final variable analyzed is the type of implementation of differentiated instruction. There are three groups, which can be observed in detail in Table 8.

Table 8. The Impact of Differentiated Instruction on Type of Implementation

No	Implementation Type	ES	ES	Category
1.	Model	0,675	1,130	Very High effect
2.		0,539		
3.		1,340		
4.		1,391		
5.		1,680		
6.	Approach	4,863	3,035	Extremely High Effect
7.		1,265		
8.	Strategy	0,766	0,631	Medium Effect
9.		0,582		
10.		0,646		
11.		0,575		

Based on Table 8, it can be seen that differentiated instruction can be implemented in various ways. Whether as a model, approach, or strategy, all methods show a positive effect size, making them viable solutions for implementing differentiated instruction. For further clarity, refer to the graph shown in Figure 6.

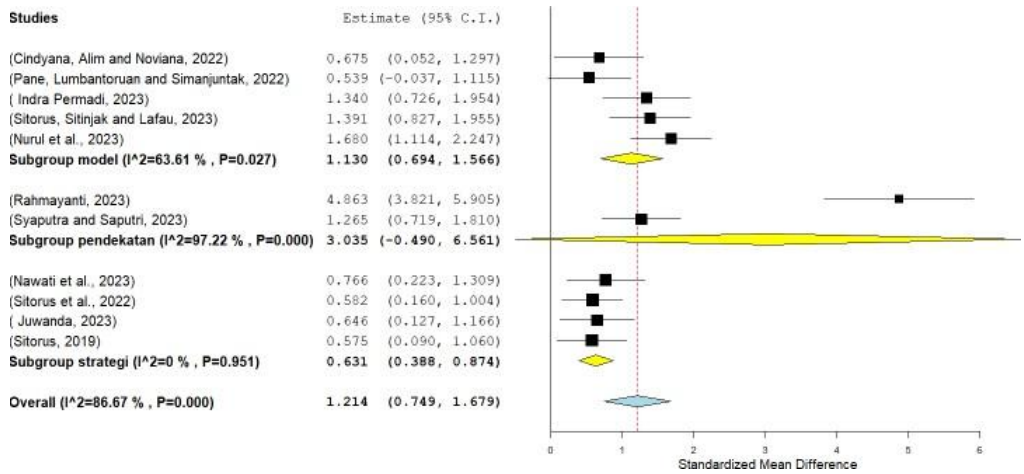

Figure 6. Effect Size Graph Based on Implementation Type

Based on the graph, it can be seen that the model and approach subgroups touch the red line, indicating no significant difference between them. The strategy subgroup, however, shows a

significant difference compared to the other two subgroups. Differentiated instruction is often considered a strategy because it can be applied across various teaching models and approaches. It is more flexible and can be integrated into different learning contexts.

Additionally, differentiation is often viewed as a specific tactic used by teachers to meet the individual needs of students in diverse classrooms. Therefore, it is more accurately categorized as a teaching strategy that can be applied within various models and approaches (Marlina, 2020).

The various analyses of the collected articles demonstrate that the implementation of differentiated instruction can enhance student learning outcomes. Diverse learning experiences can indirectly stimulate student creativity by providing ample opportunities for them to showcase what they have learned. Differentiated instruction is highly recommended in education to make learning objectives more achievable.

4. CONCLUSION

Based on the data and analysis conducted, there is a significant impact of Differentiated Instruction on student learning outcomes in Indonesia, considering factors such as grade level, subject matter, education level, research region, time span, and the type of implementation. Differentiated Instruction has a positive impact and effect size on the learning outcomes of students in Indonesia.

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