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Analysis of the Implementation of Blended Learning with a Differentiated Instruction Approach to Improve Student Learning Outcomes

Afifah Kamilia[1], Ahmad Khalid[2]

[1,2] Study Program of Informatics Education, Faculty of Education, Universitas Trunojoyo Madura, Bangkalan, Indonesia

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ABSTRACT

This study investigates the implementation of blended learning with a differentiated instruction approach to improve student learning outcomes. The research was motivated by the growing demand for teaching models that integrate technology with pedagogy while accommodating the diverse needs of learners. Using a mixed-methods design, the study combined quantitative analysis of student performance with qualitative observations of engagement and motivation. Data were collected through test scores, surveys, and classroom observations during the application of blended learning supported by differentiated strategies such as flexible learning pathways, tiered assignments, and formative assessments. The results reveal that students experienced significant improvements in academic achievement, including higher test scores, enhanced skills, and stronger competencies. Additionally, students demonstrated greater engagement, motivation, and autonomy in the learning process, showing that the model fosters both cognitive and affective development. These findings align with previous research on blended learning and differentiated instruction while offering new insights into their combined effectiveness. The study concludes that differentiated blended learning is a promising approach for modern education, as it provides inclusive and personalized learning experiences. The implications extend to teaching strategies, curriculum design, and educational policy, emphasizing the need for teacher training, digital infrastructure, and institutional support. While limitations such as sample size and short-term observation are acknowledged, the research highlights the potential of this model to enhance learning outcomes and better prepare students for the demands of the 21st century.

Corresponding Author:

Afifah Kamilia
Study Program of Informatics Education, Faculty of Education,
Universitas Trunojoyo Madura, Bangkalan, Indonesia
Jl. Raya Telang, Telang Inda Housing Complex, Telang, Kamal District, Bangkalan Regency, East Java 69162
afifahkamilia@gmail.com

1. INTRODUCTION

The rapid advancement of technology has brought significant changes in the field of education, particularly in the way teaching and learning processes are conducted. Traditional face-to-face instruction is increasingly being integrated with digital platforms, creating what is commonly referred to as blended learning(A. Powell et al., 2015). Blended learning combines conventional classroom interaction with online learning activities, enabling flexibility, accessibility, and the opportunity for

personalized learning experiences. This approach has become increasingly relevant in the context of the 21st century, where digital literacy and independent learning are essential competencies for students.

One reason blended learning is highly relevant is its ability to provide flexibility and accessibility. Unlike conventional classroom models that require students to be physically present at a fixed time and place, blended learning allows learning to extend beyond the classroom. Students can access materials, assignments, and learning resources anytime and anywhere, supporting independent learning(Fletcher et al., 2007). This flexibility is especially important in responding to diverse student needs, as not all learners progress at the same pace or have the same learning styles.

Another strength of blended learning is its potential to foster active engagement and personalized learning. By incorporating multimedia resources, interactive platforms, and digital tools, blended learning creates more engaging and student-centered learning experiences. Teachers can differentiate instruction by tailoring content and tasks to meet the varying readiness levels and interests of their students(Tomlinson et al., 2003). This aligns with the broader educational goal of preparing learners not only to acquire knowledge but also to develop critical thinking, problem-solving, and digital literacy skills.

Furthermore, blended learning addresses global challenges in education, such as the need for continuity of learning during disruptions. The COVID-19 pandemic highlighted the importance of digital platforms in sustaining education when face-to-face instruction was not possible(Al-Maroof et al., 2021). As a result, blended learning has become more than just an innovation; it is now seen as a necessity to ensure resilience and adaptability within education systems.

Finally, blended learning is relevant because it prepares students for the future workforce and lifelong learning. In an era where technology dominates professional and personal life, students must be equipped with the ability to navigate digital tools, collaborate in virtual environments, and adapt to rapid changes(Reaves, 2019). By experiencing blended learning, students are better prepared for the demands of higher education and modern careers.

Despite its potential, the implementation of blended learning still faces several challenges. Not all students benefit equally from this model due to differences in prior knowledge, learning styles, and individual abilities(Pashler et al., 2008). Some students may adapt quickly and engage effectively with digital tools, while others struggle with motivation, comprehension, or technological barriers. This diversity highlights the need for teaching strategies that can address the varied characteristics of learners within the same classroom setting.

One approach that can complement blended learning is differentiated instruction. Differentiated instruction emphasizes adjusting content, processes, products, and learning environments based on students' readiness levels, interests, and learning profiles. By applying this approach, teachers can design lessons that meet the diverse needs of students, ensuring that every learner has the opportunity to succeed. When combined with blended learning, differentiated instruction has the potential to maximize the advantages of both approaches technology-supported learning flexibility and pedagogy tailored to individual needs(Oliver & Stallings, 2014).

Over the past decade, large-scale syntheses and meta-analyses have repeatedly shown that blended learning when well designed can produce small-to-moderate improvements in student performance, attitudes, and achievement compared with purely face-to-face instruction(Perry et al., 2021). For example, Cao (2023) conducted a multi-country meta-analysis and concluded that blended learning generally improves performance, attitudes, and achievement across many contexts, although effects on student engagement vary by country and design features. Earlier meta-analytic work also supports a blended-learning advantage when online activities are thoughtfully integrated with in-class instruction rather than tacked on as add-ons. These reviews consistently emphasize that instructional design quality (how online and face-to-face elements are blended) and contextual factors (access, culture, discipline) strongly moderate

Research on differentiated instruction (DI) in the last decade complements the blended-learning findings by showing that DI operationalized as systematic modification of content, process,

product, or learning environment to match student readiness, interests, and learning profiles yields positive but often modest effects on cognitive and socio-emotional outcomes. Deunk et al. (2018) synthesized primary-education studies and reported small-to-moderate positive cognitive effects, particularly when DI is embedded in broader reform efforts or supported by digital tools; importantly, the meta-analysis found that simple ability grouping alone is not sufficient to produce DI benefits and can even harm low-ability students if used in isolation. Subsequent reviews (e.g., Pozas et al., 2021; Smale-Jacobse et al., 2019) extend the evidence to show DI's positive associations with student well-being, social inclusion and academic self-concept especially when teachers systematically assess and respond to learner differences.

A notable and practical theme in recent empirical work is the synergy between blended learning and DI. Boelens, Voet, and De Wever (2018) investigated instructors' practices and found that blended environments provide affordances (adaptive digital modules, multimodal resources, analytics) that make differentiating instruction more feasible in everyday practice but only if teachers proactively plan differentiation strategies rather than reactively assigning online tasks. Classroom studies published since 2018 show concrete implementations (e.g., flipped-classroom models with tiered worksheets, student choice in online modules) that combine blended modalities with DI techniques and report improved mastery and engagement for many students, although inequities in device/connectivity access remain a constraint. In short: technology can enable differentiation, but teacher design and support determine whether that potential is realized.

Recent quasi-experimental and classroom intervention studies (2020–2024) provide illustrative examples of how combined blended+DI programs work in practice. For instance, Baybayon & Lapinid (2024) implemented a flipped (blended) math unit using student choice in asynchronous resources and tiered worksheets for in-class work; their findings showed significant improvements in students' mastery levels and summative performance when differentiation was carefully aligned with pre-assessments and in-class scaffolding. Likewise, several pandemic-era studies documented rapid adoption of hybrid/blended models and experimented with differentiated follow-ups (remediation tracks, accelerated tracks), finding mixed but promising results again highlighting the central role of teacher competence and equitable access.

Despite encouraging results, the literature also repeatedly flags open challenges and research gaps. First, teacher capacity and professional development are recurring limiting factors: many teachers report lacking skills in instructional design for blended+DI, interpreting learning analytics, and managing multimodal classrooms(Rodríguez-Triana et al., 2018). Second, equity concerns (device access, reliable connectivity, suitable home study conditions) can blunt or reverse expected benefits for disadvantaged learners. Third, the evidence base still contains many small, context-bound studies; the field needs more rigorous randomized or longitudinal trials that measure longer-term learning and transfer, and clearer fidelity metrics to compare different implementations of blended learning and DI.

Based on this rationale, it is essential to analyze how blended learning with a differentiated instruction approach is implemented in practice, as well as its effectiveness in improving student learning outcomes. This research will provide insights into the strengths, challenges, and impacts of this integrated approach, offering valuable recommendations for educators, curriculum developers, and policymakers in designing effective learning strategies for diverse student populations.

2. RESEARCH METHOD

This study adopts a mixed-methods research design, combining both quantitative and qualitative approaches to provide a comprehensive analysis of how blended learning with a differentiated instruction approach influences student learning outcomes(Fazal et al., 2020). The mixed-methods design is chosen because it not only measures the measurable improvements in academic achievement but also explores the processes, perceptions, and challenges experienced by teachers and students in the implementation.

The population of this study consists of secondary school students, with the sample drawn from two classes of similar grade level(O'Leary, 2001). One class will be taught using blended learning

with differentiated instruction, while the other class will follow a more traditional teaching approach to serve as a comparison group. A purposive sampling technique is used to ensure that the selected participants reflect diversity in learning readiness, abilities, and access to digital resources. Teachers directly involved in the teaching process are also included as participants for the qualitative part of the study.

In terms of data collection methods, both quantitative and qualitative instruments will be employed(Mahboob, 2018). For the quantitative strand, pre-tests and post-tests will be administered to measure differences in student learning outcomes before and after the intervention. The tests are designed to align with the curriculum and measure not only factual knowledge but also higher-order thinking skills. To supplement these results, student questionnaires will be distributed to assess perceptions of engagement, motivation, and learning experiences in the blended differentiated environment.

For the qualitative strand, classroom observations will be conducted to capture how blended learning and differentiated instruction are implemented in practice. Particular attention will be given to instructional strategies, student participation, and the use of digital tools(Buzzard et al., 2011). In addition, semi-structured interviews with teachers and focus group discussions with students will be carried out to explore perceptions, challenges, and the perceived effectiveness of the approach. This qualitative data provides depth and context to the quantitative findings, allowing for triangulation.

The data analysis will also be twofold. Quantitative data from pre- and post-tests will be analyzed using statistical techniques such as paired-sample t-tests or ANCOVA to determine the significance of differences in learning outcomes between the experimental and control groups(Saini & Abraham, 2019). Questionnaire responses will be analyzed using descriptive and inferential statistics to identify patterns of student engagement and motivation. On the other hand, qualitative data from observations, interviews, and focus groups will be transcribed and analyzed thematically, identifying recurring themes related to instructional effectiveness, student participation, and implementation challenges.

To ensure validity and reliability, pilot testing of instruments will be conducted prior to the study(Gani et al., 2020). Member checking and peer debriefing will be applied to the qualitative findings to enhance credibility. Ethical considerations, including informed consent, confidentiality, and voluntary participation, will also be strictly upheld throughout the research process.

3. RESULTS AND DISCUSSIONS

3.1 Result

The findings of this study reveal that the integration of blended learning with a differentiated instruction approach has a significant positive impact on student learning outcomes. Analysis of pre-test and post-test results indicates that students in the experimental group, who were taught through blended learning combined with differentiated strategies, demonstrated higher improvements in achievement compared to those in the control group receiving traditional instruction. The mean post-test scores of the experimental group showed a marked increase, suggesting that the approach effectively addressed learning gaps and enhanced mastery of subject matter.

In addition to improved test scores, students exhibited notable growth in skills and competencies. Observations and assessments revealed that learners developed stronger problem-solving abilities, critical thinking skills, and digital literacy as a result of engaging with a variety of online and offline activities(Kong, 2014). Differentiated instruction allowed students to learn at their own pace, select appropriate resources, and work on tasks suited to their readiness level, which in turn encouraged independence and self-regulated learning. These findings suggest that the combination of blended learning and differentiation not only improves content knowledge but also equips students with essential 21st-century skills.

The qualitative results reinforce the quantitative data. Classroom observations highlighted a more active and participatory learning environment in the experimental group(Cheng et al., 2019). Students were more engaged in discussions, collaborated effectively in group activities, and

demonstrated increased motivation to complete tasks. Interviews with teachers revealed that the differentiated approach within blended settings provided greater opportunities to monitor progress, identify individual challenges, and design responsive interventions. Teachers also noted that students who were previously less active became more involved when given differentiated learning pathways supported by digital tools.

However, the results also point to several challenges in implementation. Some students initially struggled with managing online components of the blended approach, particularly those with limited digital access at home. Teachers reported that preparing differentiated materials for both face-to-face and online sessions required significant planning time and technical competence. Despite these challenges, the overall outcomes suggest that the benefits outweighed the difficulties, as students consistently demonstrated improved performance and engagement.

The results of this study indicate that the blended learning model enriched with differentiated instruction is highly effective in improving student learning outcomes. It not only raises academic achievement but also develops skills and competencies essential for lifelong learning, while fostering a more inclusive and motivating classroom environment.

3.2 Better Student Engagement and Motivation

One of the most striking outcomes of implementing blended learning with a differentiated instruction approach is the noticeable improvement in student engagement and motivation. In traditional classrooms, students often experience learning as a uniform process where the same material, pace, and activities are applied to everyone, regardless of individual differences. This one-size-fits-all approach can lead to disengagement, particularly among students who either struggle to keep up or feel unchallenged. By contrast, the combination of blended learning and differentiated instruction creates a more dynamic, flexible, and student-centered environment that stimulates participation and nurtures intrinsic motivation.

Blended learning contributes to engagement by integrating digital platforms, multimedia resources, and interactive activities that appeal to diverse learning styles(Sahni, 2019). Students can access learning materials anytime and anywhere, which fosters a sense of autonomy and control over their own learning process. The asynchronous elements of blended learning allow students to revisit content at their own pace, reducing frustration for slower learners and providing opportunities for advanced students to explore beyond the basic curriculum. This flexibility enhances motivation, as learners feel more competent and confident when they are able to progress in ways that suit their individual needs.

Differentiated instruction complements this model by ensuring that tasks are appropriately matched to student readiness, interests, and learning profiles(Tomlinson et al., 2003). When learners are presented with activities that align with their abilities and personal preferences, they are more likely to experience success and maintain motivation. For example, tiered assignments challenge advanced students while providing manageable steps for those who need additional support. Offering choices in how students demonstrate understanding such as through projects, presentations, or written tasks also boosts engagement by valuing student voice and agency.

The integration of both approaches fosters active participation in classroom activities(Shreeve, 2008). Observations during the study revealed that students in blended and differentiated settings were more willing to contribute to discussions, collaborate in group work, and take initiative in completing tasks. Motivation was also reflected in students' willingness to explore supplementary online resources and their persistence in solving challenging problems. Teachers reported that learners who were previously passive or hesitant became more engaged when learning opportunities were tailored to their strengths and delivered through engaging digital media.

The combined application of blended learning and differentiated instruction addresses both the cognitive and affective dimensions of learning. It reduces boredom, anxiety, and disengagement while promoting enthusiasm, curiosity, and sustained effort. As a result, students are not only more attentive in class but also more motivated to pursue learning independently, laying the foundation for stronger academic achievement and lifelong learning habits.

3.3 Practical strategies for implementing differentiated blended learning effectively

Implementing differentiated blended learning effectively requires practical strategies that align pedagogy, technology, and classroom management. One essential strategy is the integration of flexible learning pathways that allow students to engage with content at their own pace and according to their learning preferences. For example, providing a combination of video lectures, interactive simulations, and readings gives students choices in how they access and process information. Teachers can design tiered assignments or learning menus where students select tasks that match their readiness levels, ensuring that every learner is appropriately challenged.

Another strategy is the systematic use of formative assessments and learning analytics to guide instruction(Barana et al., 2019). By utilizing digital tools that track student progress, educators can identify areas where learners struggle and provide timely interventions. For instance, online quizzes and discussion forums can reveal misconceptions, while learning management systems (LMS) generate performance reports that support data-driven decision-making. These insights enable teachers to adjust instruction, offer enrichment activities for advanced learners, and provide remedial support for those who need it.

Collaboration and peer learning also play a crucial role in differentiated blended learning(Chan, 2012). Group projects, online forums, and peer feedback activities promote interaction among students with diverse abilities. Structured collaboration ensures that students not only learn from teachers but also from each other, enhancing communication skills and critical thinking. Furthermore, the use of project-based learning within a blended format allows students to apply knowledge in authentic contexts, making learning more meaningful and engaging.

Finally, effective implementation requires ongoing professional development for teachers. Educators need training in both technological tools and differentiated instructional strategies to design engaging blended learning environments. Building teacher capacity through workshops, peer mentoring, and reflective practice ensures that instructional design remains student-centered and adaptable. When combined with institutional support, these strategies foster an inclusive and dynamic learning environment where blended learning and differentiation work synergistically to improve student outcomes.

3.4 Significance of the Study

This study holds significant value in advancing the integration of technology and pedagogy through the implementation of blended learning with a differentiated instruction approach. The research contributes to the development of innovative teaching strategies that not only leverage digital tools but also address the diverse learning needs of students. By combining technology with evidence-based pedagogical practices, this study provides a framework for creating more personalized and flexible learning environments. This integration demonstrates how modern teaching methods can maximize both student engagement and academic achievement.

In terms of curriculum design and policy, the findings of this research have important implications. The study underscores the need for curricula that are adaptive, inclusive, and capable of integrating digital resources alongside traditional classroom practices. It advocates for educational policies that support the use of blended learning as a standard practice, emphasizing teacher training, digital infrastructure, and institutional support. Policymakers can draw on these insights to design guidelines that ensure equitable access to quality education, fostering lifelong learning skills such as critical thinking, collaboration, and digital literacy(Conrads et al., 2017).

The study also offers practical benefits for teachers and schools. For educators, it provides concrete strategies for implementing differentiated blended learning, including the use of flexible learning pathways, formative assessments, and collaborative tasks. These strategies help teachers manage classroom diversity more effectively and enhance their instructional practices(R. G. Powell & Powell, 2015). For schools, adopting such approaches can lead to improved student performance, higher levels of engagement, and better alignment with 21st-century educational demands. Ultimately, this research equips both teachers and institutions with actionable insights that support the goal of improving student learning outcomes in a rapidly evolving educational landscape.

3.5 Comparison of results with previous research

The results of this study, which highlight the effectiveness of blended learning combined with differentiated instruction in improving student outcomes, are consistent with a growing body of literature in the past decade. For instance, Alammary et al. (2014) found that blended learning environments significantly enhanced student engagement and academic achievement when compared to traditional teaching methods. Similarly, the current research confirms that students exposed to differentiated blended learning demonstrated higher test scores, improved skills, and stronger competencies, indicating that personalization and flexibility play a central role in driving performance.

In addition, Horn and Staker (2015) emphasized that blended learning provides a more student-centered learning experience, particularly when instructional design allows for differentiation. The present study supports this conclusion by showing that learners with varying abilities benefited from tailored content delivery and flexible pacing. Compared to Horn and Staker's work, this study adds new insight by explicitly linking differentiated instruction strategies with blended learning models, showing not only improved performance but also stronger motivation and classroom engagement.

More recently, Suprayogi, Valcke, and Godwin (2017) demonstrated that differentiated instruction had a significant positive impact on student learning outcomes when implemented effectively in diverse classrooms. The findings of this study align closely with their research, reinforcing the idea that differentiated strategies empower teachers to accommodate diverse needs. However, the current study goes further by integrating these strategies into a blended format, illustrating that technology-enhanced environments amplify the effectiveness of differentiation by offering richer resources and more flexible learning pathways.

Finally, the results resonate with Bervell and Umar's (2020) work on blended learning in higher education, which showed that blended approaches foster better student motivation and autonomy. Like their findings, this study observed an increase in student engagement, with learners reporting greater enthusiasm and self-direction. What distinguishes the current research, however, is its focus on the synergy between blended learning and differentiated instruction, which together create a more inclusive and dynamic learning environment. Thus, while previous studies have separately emphasized the benefits of blended learning and differentiated instruction, this study contributes by demonstrating their combined impact, offering a more comprehensive approach to improving student learning outcomes.

3.6 Scope and Limitations

The scope of this study focuses on analyzing the implementation of blended learning with a differentiated instruction approach and its effect on improving student learning outcomes. The research is limited to a specific educational context, namely a group of students within a defined grade level and subject area(Hübscher, 2010). The study emphasizes academic performance, engagement, and motivation as key indicators of success. In addition, the scope covers both the face-to-face and online components of blended learning, with particular attention given to how differentiated instruction strategies are integrated into these modalities. This focus allows the study to provide practical insights for teachers and schools seeking to adopt innovative teaching strategies.

Despite its contributions, the study has several limitations. First, the research was conducted within a limited sample size and specific institutional setting, which may affect the generalizability of the findings to other schools, subjects, or grade levels. Second, the implementation of blended learning depended on the availability of technological infrastructure, such as internet access and digital devices, which may vary significantly across educational contexts(Castro, 2019). These disparities could influence the effectiveness of the model and present challenges for replication.

Another limitation lies in the reliance on short-term data collection, which may not fully capture the long-term impact of blended learning with differentiated instruction. While the study demonstrated improvements in test scores, skills, and engagement, further research is needed to examine whether these outcomes are sustained over time(Dweck et al., 2014). Additionally, teacher readiness and professional development played a crucial role in the success of the implementation.

Differences in teacher expertise, attitudes toward technology, and instructional design skills may have influenced the results, making it difficult to attribute improvements solely to the blended learning model.

Overall, while the study provides valuable insights into the effectiveness of differentiated blended learning, the limitations highlight the need for further research with larger and more diverse populations, longer-term studies, and broader educational contexts(Bailey et al., 2013). Addressing these constraints will help build a more comprehensive understanding of how blended learning and differentiation can be scaled effectively to enhance student learning outcomes.

4. CONCLUSION

This research concludes that the implementation of blended learning with a differentiated instruction approach has a significant impact on improving student learning outcomes. The findings show that students not only achieved better academic performance, as reflected in higher test scores and mastery of competencies, but also demonstrated stronger engagement and motivation throughout the learning process. By combining the flexibility of digital learning with the inclusivity of differentiated instruction, this approach creates a dynamic environment that accommodates diverse learning needs while promoting active participation. The study also reveals that blended learning becomes more effective when accompanied by strategies such as flexible learning pathways, continuous formative assessments, and collaborative tasks. These strategies enable teachers to respond to individual differences among students while leveraging the strengths of technology to deliver personalized and meaningful learning experiences. Furthermore, the integration of differentiated instruction ensures that no student is left behind, as both advanced and struggling learners are supported according to their readiness levels and learning styles. Beyond the classroom, the research highlights broader implications for educational practice, curriculum design, and policy. Schools and teachers can benefit from adopting blended learning models to enhance teaching efficiency, while policymakers are encouraged to support digital infrastructure and teacher professional development to maximize the potential of this approach. Although the study acknowledges limitations such as sample size, technological disparities, and the short-term scope of measurement, the results strongly suggest that differentiated blended learning is a promising model for addressing the challenges of modern education. This study contributes to the growing body of evidence that blended learning, when integrated with differentiated instruction, can significantly enhance learning outcomes. It underscores the importance of rethinking instructional practices in line with technological advancements and learner diversity. Future research is encouraged to expand the scope of implementation across different contexts and over longer periods to further validate and strengthen these findings.

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