

Blended Learning Environments: A Systematic Review of Effective Strategies in Educational Settings

Blended Learning Environments: Tinjauan Sistematis terhadap Strategi Efektif dalam Lingkungan Pendidikan

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ABSTRACT

Blended learning, a pedagogical approach that integrates traditional face-to-face teaching with online learning activities, has garnered significant attention in educational research. This systematic literature review examines the effective strategies of blended learning in educational settings. The study identifies various strategies, analyzes their effectiveness in enhancing student learning outcomes, and provides recommendations for educators on the use of the most effective blended learning strategies. The review reveals that well-designed blended learning strategies, tailored to student characteristics, incorporating active learning methods, diverse pedagogical approaches, and rapid feedback mechanisms, significantly improve student learning outcomes across various levels of education. The findings underscore the importance of carefully implementing and evaluating blended learning strategies to maximize their benefits in educational settings.

Keywords: Blended learning, educational settings, effective strategies, student learning outcomes.

ABSTRAK

Pembelajaran campuran, sebuah pendekatan pedagogi yang mengintegrasikan pengajaran tatap muka tradisional dengan kegiatan pembelajaran online, telah mendapatkan perhatian yang signifikan dalam penelitian pendidikan. Tinjauan literatur sistematis ini mengkaji strategi efektif pembelajaran campuran dalam lingkungan pendidikan. Studi tersebut mengidentifikasi berbagai strategi, menganalisis efektivitasnya dalam meningkatkan hasil belajar siswa, dan memberikan rekomendasi bagi pendidik mengenai penggunaan strategi pembelajaran campuran yang paling efektif. Tinjauan tersebut mengungkapkan bahwa strategi pembelajaran campuran yang dirancang dengan baik, disesuaikan dengan karakteristik siswa, menggabungkan metode pembelajaran aktif, pendekatan pedagogi yang beragam, dan mekanisme umpan balik yang cepat, secara signifikan meningkatkan hasil belajar siswa di berbagai tingkat pendidikan. Temuan ini menggarisbawahi pentingnya penerapan dan evaluasi strategi pembelajaran campuran secara hati-hati untuk memaksimalkan manfaatnya dalam lingkungan pendidikan.

Kata Kunci: Blended learning, setting pendidikan, strategi efektif, hasil belajar siswa

1. Introduction

Blended learning environments pose a unique set of challenges and opportunities in education. Boelens et al. (2017) identified four key challenges in designing blended learning: flexibility, interaction stimulation, facilitating learning processes, and fostering an effective learning climate. These challenges highlight the complexity of creating effective blended learning experiences that cater to diverse learning needs.

Moreover, Hrastinski (2019) highlighted the concept of hybrid learning environments, which combine face-to-face education with online tools, emphasizing the importance of

integrating traditional and digital learning modalities. This integration is crucial for enhancing the overall learning experience and engaging students through varied instructional methods.

In exploring attributes that support self-regulation in blended learning environments, Laer & Elen (2016) emphasized the significance of designing environments that enable students to regulate their learning effectively. This underscores the need for creating structured and supportive blended learning settings that empower students to take control of their learning processes.

Furthermore, Keskin and Yurdugül (2020) found that students with high task value, e-learning motivation, and self-efficacy tend to prefer studying in blended learning environments. This suggests that intrinsic motivational factors play a key role in shaping students' preferences for blended learning.

In conclusion, the synthesis of these references underscores the multifaceted nature of blended learning environments, highlighting the importance of addressing challenges, integrating traditional and digital tools, supporting self-regulation, and understanding students' motivational factors to create effective and engaging learning experiences.

Blended learning environments combine online learning opportunities with traditional classroom approaches, providing a hybrid learning experience. The Community of Inquiry (CoI) framework is often used to describe the essential presences in these environments: teaching presence, cognitive presence, and social presence. These presences interact to provide an educational experience, and their correlations with learning outcomes and satisfaction have been studied. For instance, teaching presence has a moderate positive correlation with actual learning, and cognitive presence has a weak correlation with actual learning. Cognitive presence and perceived learning are strongly correlated, while social presence and perceived learning have a moderate correlation. The correlation between cognitive presence and satisfaction is strong, and between teaching presence and satisfaction is moderate.

Emotional intelligence is also a key factor in blended learning environments. Self-awareness and self-motivation have direct, significant, and positive connections with study habits. The regulation of emotion and social skills are also important aspects of emotional intelligence in this context.

Sentiment evolution is a key component of interactions in blended learning environments. Text mining techniques and epistemic network analysis (ENA) have been used to examine sentiment changes over different interactions. Negative sentiments are moderately associated with other sentiments such as joking, confused, and neutral sentiments. In deep interactions, student sentiments might change from negative to insightful ones. The sentiment network built from social-emotion interactions shows stronger connections in joking-positive and joking-negative sentiments than other interaction levels.

The successful application of e-learning systems is significant for the implementation and continuous improvement of blended learning in higher education. The Unified Technology Acceptance and System Success (UTASS) model has been proposed to identify key factors affecting college students' adoption of e-learning systems in mandatory blended learning environments. System quality, social influence, and facilitating conditions have significant positive effects on behavioral intention, while information quality has no significant positive relationship with behavioral intention. The moderator effect of gender suggests that male college students are more susceptible to the impact of system quality and social influence.

In summary, blended learning environments involve a combination of online and traditional classroom approaches, and the CoI framework is used to describe the essential presences that interact to provide an educational experience. Emotional intelligence plays a role in study habits, and sentiment evolution is a key component of interactions in these environments. The UTASS model is used to identify key factors affecting college students' adoption of e-learning systems in mandatory blended learning environments (Iqbal, et al, 2022; Martin, et al. 2022; Huang, et al. 2021; Zhang, et al. 2020).

Blended learning environments present various advantages for both students and educators: Firstly, flexibility is a prominent feature of blended learning, allowing students to tailor their learning pace and schedule according to their individual needs, which proves particularly advantageous for those balancing work or familial commitments (Iqbal et al., 2022). Moreover, the combination of online and traditional classroom methods enhances engagement levels among students, fostering a more interactive and personalized learning experience (Iqbal et al., 2022). Furthermore, research suggests that blended learning, as framed within the Community of Inquiry (Col) model, correlates with improved learning outcomes by integrating teaching presence, cognitive presence, and social presence, which contribute to actual learning, perceived learning, and overall satisfaction (Martin et al., 2022). Additionally, emotional intelligence plays a significant role in students' study habits within blended learning environments, with traits like self-awareness and self-motivation showing direct, substantial, and positive associations with study habits (Iqbal et al., 2022). Understanding sentiment evolution within blended learning interactions is another crucial aspect, as it enables educators to tailor teaching strategies effectively, thus enhancing the overall learning experience (Huang et al., 2021). Lastly, the Unified Technology Acceptance and System Success (UTASS) model identifies key determinants influencing college students' adoption of e-learning systems within mandatory blended learning environments, providing insights essential for the continual enhancement of these systems (Zhang et al., 2020). In conclusion, blended learning environments offer flexibility, heightened engagement, improved learning outcomes, and opportunities for emotional intelligence development and sentiment evolution understanding. Additionally, the UTASS model aids in pinpointing factors crucial for the successful implementation and ongoing enhancement of e-learning systems within blended learning setups in higher education. The problem to be solved in this research is the identification of blended learning strategies that are most effective in improving student learning outcomes at various levels of education. This is important to provide clear guidance to educators and educational decision makers in designing and implementing effective blended learning programs.

This research aims to do three main things. First, identify various blended learning strategies that have been implemented in educational contexts. Second, analyze the effectiveness of each strategy in improving student learning outcomes. And third, providing recommendations for educational practitioners regarding the most effective use of blended learning strategies. By carrying out this identification and analysis, this research aims to provide a valuable contribution to the understanding of how blended learning approaches can be optimized to improve the quality of learning in educational environments.

This research is based on the concept that blended learning is a learning approach that combines elements of online and face-to-face learning to create a holistic and diverse learning experience. We will use this conceptual framework as a basis for evaluating and analyzing effective blended learning strategies.

This research is expected to make a significant contribution to our understanding of effective blended learning strategies in educational contexts. It is hoped that the results of this research can provide valuable guidance for educators, decision makers in the field of education, as well as researchers who are interested in developing and improving blended-based learning models.

2. Research Methods

This research will use a systematic literature review approach to explore effective strategies in educational environments in the context of Blended Learning Environments. This research uses a systematic literature review approach, which is a systematic research method for collecting, evaluating, and synthesizing relevant literature in a particular research domain.

This approach makes it possible to comprehensively explore the various blended learning strategies that have been implemented in educational contexts.

The first step is to identify relevant literature. A literature search will be conducted through academic databases such as Google Scholar, PubMed, and ProQuest using relevant keywords such as "blended learning", "effective strategies", "educational settings", and other related keywords. Literature selection was carried out based on clear inclusion criteria, such as relevance to the research topic and methodological quality.

The collected data will be analyzed systematically. This involves reading and evaluating selected literature to identify effective blended learning strategies in educational settings. The analysis will focus on aspects such as flexibility, student engagement, learning outcomes, and recommendations for educational practitioners.

Findings from the analyzed literature will be synthesized in the results and discussion chapters to provide a comprehensive picture of effective blended learning strategies in the educational environment. This synthesis will identify patterns, trends, and general conclusions from the literature that has been studied.

By using a systematic literature review approach, it is hoped that this research can provide an in-depth understanding of various effective blended learning strategies in the educational context. This will provide a valuable contribution to the development of technology-based education and innovation in learning.

3. Results and Discussions

Blended learning is a pedagogical approach that integrates traditional face-to-face teaching with online learning activities to optimize learning outcomes (Hrastinski, 2019; Kaliaskarova et al., 2022). It involves the thoughtful fusion of in-person and online learning experiences (Poon, 2014; Smith & Hill, 2018). Blended learning models aim to cater to diverse learner needs by incorporating a mix of teaching styles and activities (Alammary et al., 2014). Research has shown that this approach positively impacts student engagement, performance, and satisfaction (Picciano, 2019). While there may not be a universally accepted definition of blended learning, it generally involves leveraging both physical and digital environments to create a comprehensive educational setting (Fisher et al., 2018). The effectiveness of blended learning has been studied across various disciplines, highlighting its versatility and applicability (Previtali & Scarozza, 2019). In conclusion, blended learning is a dynamic educational strategy that combines traditional and online learning to create a holistic learning experience for students across different academic fields.

3.1 History and Development of Blended Learning

Blended learning, an educational approach that combines e-learning with traditional face-to-face instruction, has gained significant attention in recent years (Chen & Yao, 2016). It has been recognized as an effective model due to its ability to enhance learning outcomes and student satisfaction compared to traditional classroom teaching (Lazar et al., 2020). The concept of blended learning has its roots in the training and development literature but has only recently been extensively studied in management education (Arbaugh, 2014).

The history of blended learning can be traced back to the early 1990s when Chinese scholars first developed the idea (Bi & Shi, 2019). Over the years, various technologies such as television, computers, and software have been integrated into blended learning approaches with varying degrees of success (Mozelius & Hettiarachchi, 2017). The rapid development of networks has further solidified the recognition of blended learning as an effective educational model (Wang et al., 2021).

Blended learning has been implemented across different educational levels, from elementary schools to higher education institutions, showcasing its versatility and adaptability (Rombot et al., 2020; Prasetyo et al., 2023). The integration of digital technologies has played a

crucial role in the evolution of blended learning, making it a prominent feature in modern educational practices (Bykova et al., 2021). The development of technology and knowledge has accelerated the adoption of blended learning, emphasizing its importance in the contemporary learning landscape (Qudus et al., 2022).

While blended learning has shown promise in improving learning outcomes and student engagement, further empirical research is needed to establish a stronger evidence base supporting its benefits (Caird & Roy, 2019). The history of online learning, including blended learning, distance learning, and MOOCs, has demonstrated the evolution of educational delivery methods over time (Jamil et al., 2022).

In conclusion, the history and development of blended learning reflect a dynamic evolution in educational practices, driven by advancements in technology and a growing emphasis on enhancing learning experiences through innovative instructional models.

3.2 Relevant Learning Theories for Blended Learning

Blended learning, which integrates traditional face-to-face learning with online components, has gained significant attention in educational research. Studies such as Dziuban et al. (2018) and McLaughlin et al. (2015) emphasize the learner-centered nature of blended learning and its ability to combine different learning environments effectively. Rovai & Jordan (2004) highlight the creation of a stronger sense of community among students in blended courses compared to traditional or fully online courses, indicating the social benefits of this approach.

Furthermore, the application of blended learning in various disciplines has shown positive outcomes. For instance, research by Hashim & Hamidon (2022) in technical and vocational education and training institutes demonstrates how blended learning combines physical classroom activities with online technology to enhance learning interactions. Additionally, studies like Oliar & Fomin (2022) and the study on the "Development of Blended Learning-Based Learning Tools" "Development of Blended Learning-Based Learning Tools to Improve Mathematical Creativity Ability and Self-Efficacy of High School Students" (2022) underscore the role of blended learning in professional development and improving student learning outcomes through the integration of different educational models and theories.

Moreover, the effectiveness of blended learning is supported by evidence from research such as (Dewi et al., 2019), which indicates a positive impact on learning activities and outcomes. The flexibility and convenience offered by blended learning, as discussed in (Xu & Feng, 2021), contribute to improved learning efficiency and student engagement.

Overall, the literature on blended learning underscores its potential to enhance educational experiences by combining various instructional methods, fostering a sense of community, and improving student outcomes across different disciplines.

3.3 Blended Learning Approaches and Models

Blended learning, a pedagogical approach combining traditional face-to-face instruction with online learning components, has been extensively explored in educational research. Various models and approaches have been developed to implement blended learning effectively. For instance, the Bricolage Approach Model has been shown to be successful in implementing blended learning in academic institutions (Aguinaldo, 2013). This model emphasizes the right mix of online and face-to-face learning to enhance the learning experience. Additionally, studies have highlighted the positive impact of blended learning on student motivation and learning achievement (Rahman et al., 2020).

Furthermore, the development and practical implementation of blended learning models have been a subject of interest in higher educational institutions (Osadcha et al., 2022). These models often involve a combination of teaching methods, project-based learning, e-learning, and various evaluation strategies to create a comprehensive learning experience

(Liu et al., 2013). Blended learning has also been recognized as a means of professional development for teachers, incorporating various educational theories, teaching methods, and digital tools to enhance the learning process (Oliar & Fomin, 2022).

Moreover, the effectiveness of blended learning in different educational contexts, such as engineering courses and vocational education, has been investigated (Sepehri et al., 2018; Anggoro & Surjono, 2019). These studies emphasize the importance of integrating different modes of delivery and teaching styles to create a cohesive learning environment. Blended learning has been described as a strategic approach that combines traditional classroom methods with e-learning to improve the teaching-learning process (Sudewi, 2020; Hassan & Mirza, 2019).

In conclusion, blended learning offers a flexible and effective approach to education by combining the strengths of traditional instruction with digital technologies. By integrating various teaching methods, learning styles, and assessment approaches, blended learning models aim to enhance student engagement, motivation, and academic achievement across diverse educational settings.

3.4 Previous Research on Blended Learning Strategies

Blended learning has garnered significant research interest in recent years. Studies have investigated various aspects of blended learning, such as its definition and components (Hrastinski, 2019), its impact on student achievement and learning outcomes (Rafiola et al., 2020; Hidayah et al., 2022), its effectiveness in different educational settings and subjects (Ramalingam et al., 2022; Dama & Nurrijal, 2023; Chik et al., 2023), and its influence on student motivation and engagement (Banyen et al., 2016; Ritonga et al., 2022; Subarkat & Andriani, 2021).

Research has also compared blended learning with traditional learning methods (Hafeez & Akhter, 2021; Chik et al., 2023), developed models and strategies for implementing blended learning (Chaeruman et al., 2018; Syahrawati et al., 2022; Byrka, 2017), and assessed blended learning approaches (Bentri et al., 2019). Furthermore, studies have explored the role of blended learning in addressing challenges like the Covid-19 pandemic (Aznam et al., 2021; Muchtar et al., 2021), enhancing critical thinking skills (Marnita et al., 2020), and improving teacher professional development (An, 2020).

Overall, the body of research on blended learning underscores its potential to revolutionize educational practices by integrating traditional face-to-face instruction with online learning components. By utilizing a mix of instructional modalities, blended learning provides opportunities to boost student engagement, motivation, and learning outcomes across various disciplines and educational levels.

3.5 Criticism of Blended Learning

Blended learning has been a subject of both praise and criticism in educational research. While some studies highlight the benefits of blended learning in enhancing critical thinking skills and student satisfaction (Putri et al., 2023; Yu et al., 2019; Bahtiar, 2021), others have raised significant criticisms regarding its implementation and effectiveness (Seraji et al., 2019; Dewi et al., 2021).

One of the major criticisms of blended learning is the lack of available evidence on its implementation, particularly in specific contexts such as teaching clinical skills in undergraduate nurse education (McCutcheon et al., 2014). Additionally, some studies have pointed out fundamental criticisms of blended learning research, including limited terminology, overemphasis on quantitative methods, and mistaking blended learning for mere computer application in education (Seraji et al., 2019).

Despite these criticisms, research has shown that blended learning can have a positive impact on students' critical thinking abilities (Nasution et al., 2022; Marnita et al., 2020;

Dwiastuti et al., 2021). Studies have demonstrated that blended learning models, when appropriately applied, can lead to improvements in critical thinking skills, motivation, and student satisfaction (Jarrah et al., 2021; Saekawati & Nasrudin, 2021; Hardian & Chamisijatin, 2019). Furthermore, the integration of critical thinking skills in science learning through a blended learning system has been found to change the roles of teachers and students, making the learning process more engaging and effective (Prafitasari et al., 2021).

In conclusion, while there are valid criticisms of blended learning, especially regarding research methodologies and terminology, the evidence suggests that when implemented effectively, blended learning can indeed enhance critical thinking skills and overall student learning outcomes.

3.6 The most effective blended learning strategy in improving student learning outcomes at various levels of education

Blended learning is an educational approach that combines traditional face-to-face instruction with online learning components. Several studies have highlighted the effectiveness of blended learning strategies in enhancing student learning outcomes across various levels of education.

Kintu et al. (2017) emphasized the importance of analyzing the relationship between student characteristics, design features, and learning outcomes to determine the effectiveness of blended learning. The study found that a well-designed blended learning environment can significantly impact student achievement.

Harahap et al. (2019) conducted research on the impact of blended learning on students' learning achievement and science process skills, concluding that the blended learning strategy was more effective in enhancing these aspects compared to conventional methods.

Alammary et al. (2014) discussed different design approaches to blended learning in higher education, highlighting its effectiveness in accommodating diverse student populations and enriching the learning environment with online resources.

Moreover, Yu et al. (2022) conducted meta-analyses comparing blended and traditional learning outcomes, indicating that blended learning can lead to improved student attitudes and motivation, which are crucial factors influencing learning outcomes.

In conclusion, the synthesis of these studies suggests that well-designed blended learning strategies, considering student characteristics, active learning methods, diverse pedagogical approaches, and rapid feedback mechanisms, can significantly enhance student learning outcomes across various educational levels.

Research Framework



Figure 1. Research Framework

Hypothesis:

The implementation of well-designed blended learning strategies, adapted to student characteristics, integrating active learning methods, a variety of pedagogical approaches, and

fast feedback mechanisms, significantly improves student learning outcomes at various levels of education.

4. Conclusions

Based on the results and discussions presented above, it is evident that blended learning is a dynamic pedagogical approach that combines traditional face-to-face teaching with online learning activities. This integration aims to optimize learning outcomes by catering to diverse learner needs and providing a comprehensive educational experience. The effectiveness of blended learning has been widely studied across various disciplines and educational settings, showcasing its versatility and applicability.

Blended learning has shown promising results in enhancing student engagement, performance, and satisfaction. It offers flexibility in learning, allowing students to progress at their own pace and providing opportunities for personalized learning experiences. Additionally, the incorporation of online components enriches the learning environment, offering access to a wide range of resources and fostering interactive learning experiences.

Furthermore, the history and development of blended learning highlight its evolution as a prominent feature in modern educational practices. From its inception in the early 1990s to its integration with advanced technologies, blended learning has continuously adapted to meet the changing needs of learners and educators. Its widespread implementation across different educational levels underscores its adaptability and effectiveness in various contexts.

Moreover, relevant learning theories support the effectiveness of blended learning in facilitating meaningful learning experiences. By combining different learning environments and instructional methods, blended learning promotes active engagement, community building, and critical thinking skills among students.

However, while blended learning offers numerous benefits, it is not without challenges. Criticisms regarding its implementation, research methodologies, and terminology highlight the need for further empirical research to establish a stronger evidence base supporting its benefits.

In conclusion, blended learning emerges as a promising educational strategy that offers flexibility, engagement, and effectiveness in improving learning outcomes. As technology continues to advance and educational practices evolve, blended learning is poised to play a significant role in shaping the future of education, catering to the diverse needs of learners and enhancing the quality of teaching and learning experiences.

5. References

- Aguinaldo, B. (2013). Implementing blended learning in an impoverished academic institution using a bricolage approach model. *International Journal of Information and Education Technology*, 211-216. <https://doi.org/10.7763/ijiet.2013.v3.266>
- Alammary, A., Sheard, J., & Carbone, A. (2014). Blended learning in higher education: three different design approaches. *Australasian Journal of Educational Technology*, 30(4). <https://doi.org/10.14742/ajet.693>
- Alammary, A., Sheard, J., & Carbone, A. (2014). Blended learning in higher education: three different design approaches. *Australasian Journal of Educational Technology*, 30(4). <https://doi.org/10.14742/ajet.693>
- An, Y. (2020). A response to an article entitled "improving teacher professional development for online and blended learning: a systematic meta-aggregative review". *Educational Technology Research and Development*, 69(1), 39-42. <https://doi.org/10.1007/s11423-020-09844-8>
- Anggoro, A. and Surjono, H. (2019). Development of blended learning model based on student learning style in vocational high school lathe machining practice.. <https://doi.org/10.2991/iceri-18.2019.60>

- Arbaugh, J. (2014). What might online delivery teach us about blended management education? prior perspectives and future directions. *Organizational Behavior Teaching Review*, 38(6), 784-817. <https://doi.org/10.1177/1052562914534244>
- Aznam, N., Perdana, R., Jumadi, J., Nurcahyo, H., & Wiyatmo, Y. (2021). The implementation of blended learning and peer tutor strategies in pandemic era: a systematic review.. <https://doi.org/10.2991/assehr.k.210326.130>
- Bahtiar, B. (2021). The effectiveness of blended learning model to promote physics students' critical thinking skill. *Jpi (Jurnal Pendidikan Indonesia)*, 10(3), 441. <https://doi.org/10.23887/jpi-undiksha.v10i3.29619>
- Banyen, W., Viriyavejakul, C., & Ratanaolarn, T. (2016). A blended learning model for learning achievement enhancement of thai undergraduate students. *International Journal of Emerging Technologies in Learning (Ijet)*, 11(04), 48. <https://doi.org/10.3991/ijet.v11i04.5325>
- Bentri, A., Rahmi, U., Hidayati, A., & Supendra, D. (2019). The models of assessment to accommodate instructional domain in blended blended learning.. <https://doi.org/10.2991/icetep-18.2019.39>
- Bi, X. and Shi, X. (2019). On the effects of computer-assisted teaching on learning results based on blended learning method. *International Journal of Emerging Technologies in Learning (Ijet)*, 14(01), 58. <https://doi.org/10.3991/ijet.v14i01.9458>
- Boelens, R., Wever, B., & Voet, M. (2017). Four key challenges to the design of blended learning: a systematic literature review. *Educational Research Review*, 22, 1-18. <https://doi.org/10.1016/j.edurev.2017.06.001>
- Bykova, T., Ivashchenko, M., Kassim, D., & Ковальчук, В. (2021). Blended learning in the context of digitalization informatization. *Cte Workshop Proceedings*, 8, 247-260. <https://doi.org/10.55056/cte.236>
- Byrka, M. (2017). Blended learning strategy in teacher training programs. *Information Technologies and Learning Tools*, 62(6), 216. <https://doi.org/10.33407/itlt.v62i6.1802>
- Caird, S. and Roy, R. (2019). Blended learning and sustainable development., 107-116. https://doi.org/10.1007/978-3-030-11352-0_197
- Chaeruman, U., Wibawa, B., & Syahrial, Z. (2018). Determining the appropriate blend of blended learning: a formative research in the context of spada-indonesia. *American Journal of Educational Research*, 6(3), 188-195. <https://doi.org/10.12691/education-6-3-5>
- Chen, W. and Yao, A. (2016). An empirical evaluation of critical factors influencing learner satisfaction in blended learning: a pilot study. *Universal Journal of Educational Research*, 4(7), 1667-1671. <https://doi.org/10.13189/ujer.2016.040719>
- Chik, W., Zahid, A., Kamaruddin, S., & Saifullizam, N. (2023). Effect of online distance learning or blended learning versus face to face for fluid mechanics course. *International Journal of Academic Research in Progressive Education and Development*, 12(1). <https://doi.org/10.6007/ijarped/v12-i1/16133>
- Dama, L. and Nurrijal, N. (2023). Blended learning strategies through guided inquiry learning settings to increase learning acquisition of concepts and procedures in biology subjects. *Biosfer*, 16(1), 47-54. <https://doi.org/10.21009/biosferjpb.28542>
- Dewi, N., Adnyana, P., Citrawathi, D., Riawan, I., & Wibawa, I. (2021). Improving the critical thinking skills and responsibility character of students with blended learning based on tri hita karana.. <https://doi.org/10.2991/assehr.k.210312.063>
- Dewi, P., Tripalupi, L., & Irwansyah, M. (2019). The effect of blended learning method toward entrepreneurship learning activity and learning outcome of economics undergraduate students.. <https://doi.org/10.2991/teams-18.2019.47>

- Dwiastuti, S., Widoretno, S., Ramli, M., Saputra, A., & Prabowo, C. (2021). Implementation of blended learning to improve critical thinking skills and motivation. *Bioedukasi Biology Education Journal*, 14(1), 17. <https://doi.org/10.20961/bioedukasi-uns.v14i1.44223>
- Dziuban, C., Graham, C., Moskal, P., Norberg, A., & Sicilia, N. (2018). Blended learning: the new normal and emerging technologies. *International Journal of Educational Technology in Higher Education*, 15(1). <https://doi.org/10.1186/s41239-017-0087-5>
- Fisher, R., Perényi, Á., & Birdthistle, N. (2018). The positive relationship between flipped and blended learning and student engagement, performance and satisfaction. *Active Learning in Higher Education*, 22(2), 97-113. <https://doi.org/10.1177/1469787418801702>
- Hafeez, M. and Akhter, Y. (2021). Effects of blended learning in comparison of traditional learning to provide safer learning environment- a comparative review. *International Journal of Educational Research & Social Sciences*, 2(6), 1604-1615. <https://doi.org/10.51601/ijersc.v2i6.209>
- Harahap, U., Nasution, N., & Manurung, B. (2019). The effect of blended learning on student's learning achievement and science process skills in plant tissue culture course. *International Journal of Instruction*, 12(1), 521-538. <https://doi.org/10.29333/iji.2019.12134a>
- Hardian, H. and Chamisijatin, L. (2019). Project-based learning through edmodo: improving critical thinking and histology concepts. *Biosfer*, 12(1), 58-69. <https://doi.org/10.21009/biosferjpb.v12n1.58-69>
- Hashim, N. and Hamidon, Z. (2022). Blended learning in technical and vocational education and training (tv et) training institute. *International Journal of Academic Research in Progressive Education and Development*, 11(1). <https://doi.org/10.6007/ijarped/v11-i1/12343>
- Hassan, M. and Mirza, T. (2019). Curriculum complexity based model of blended learning. *International Journal of Research in Advent Technology*, 7(2), 161-164. <https://doi.org/10.32622/ijrat.72201943>
- Hidayah, E., Subandowo, M., & Karyono, H. (2022). The effect of blended learning strategy and entrepreneurship motivation on learning outcomes. *Edu tec Journal of Education and Technology*, 5(4), 866-874. <https://doi.org/10.29062/edu.v5i4.364>
- Hrastinski, S. (2019). What do we mean by blended learning?. *Tech trends*, 63(5), 564-569. <https://doi.org/10.1007/s11528-019-00375-5>
- Hrastinski, S. (2019). What do we mean by blended learning?. *Tech trends*, 63(5), 564-569. <https://doi.org/10.1007/s11528-019-00375-5>
- Hrastinski, S. (2019). What do we mean by blended learning?. *Tech trends*, 63(5), 564-569. <https://doi.org/10.1007/s11528-019-00375-5>
- Huang, C., Han, Z., Ming, L., Wang, X., & Zhao, W. (2021). Sentiment evolution with interaction levels in blended learning environments: Using learning analytics and epistemic network analysis. *Australasian Journal of Educational Technology*.
- Iqbal J, Asghar MZ, Ashraf MA, Yi X. The Impacts of Emotional Intelligence on Students' Study Habits in Blended Learning Environments: The Mediating Role of Cognitive Engagement during COVID-19. *Behav Sci (Basel)*. 2022 Jan 13;12(1):14. doi: 10.3390/bs12010014. PMID: 35049625; PMCID: PMC8773199.
- Jamil, N., Belkacem, A., & Lakas, A. (2022). On enhancing students' cognitive abilities in online learning using brain activity and eye movements. *Education and Information Technologies*, 28(4), 4363-4397. <https://doi.org/10.1007/s10639-022-11372-2>
- Jarrah, H., Alhourani, M., & Al-Srehan, H. (2021). Blended learning: the amount of requisite professional competencies in faculty members of al ain university from viewpoint of students. *Journal of Applied Research in Higher Education*, 14(4), 1433-1448. <https://doi.org/10.1108/jarhe-06-2021-0206>

- Kaliaskarova, A., Zhundybaeva, T., Triyono, M., & Kassymova, G. (2022). Blended learning as an effective method for school and university teachers of Kazakhstan. *Journal of Vocational Education*, 12(3). <https://doi.org/10.21831/jpv.v12i3.48115>
- Kintu, M., Zhu, C., & Kagambe, E. (2017). Blended learning effectiveness: the relationship between student characteristics, design features and outcomes. *International Journal of Educational Technology in Higher Education*, 14(1). <https://doi.org/10.1186/s41239-017-0043-4>
- Laer, S. and Elen, J. (2016). In search of attributes that support self-regulation in blended learning environments. *Education and Information Technologies*, 22(4), 1395-1454. <https://doi.org/10.1007/s10639-016-9505-x>
- Lazar, I., Panisoara, G., & Panisoara, I. (2020). Digital technology adoption scale in the blended learning context in higher education: development, validation and testing of a specific tool. *Plos One*, 15(7), e0235957. <https://doi.org/10.1371/journal.pone.0235957>
- Liu, X., Wang, X., & Wang, R. (2013). Application of blended learning in data structures and algorithms course teaching.. <https://doi.org/10.2991/icetis-13.2013.245>
- Marnita, M., Taufiq, M., Iskandar, I., & Rahmi, R. (2020). The effect of blended learning problem-based instruction model on students' critical thinking ability in thermodynamic course. *Jurnal Pendidikan Ipa Indonesia*, 9(3), 430-438. <https://doi.org/10.15294/jpii.v9i3.23144>
- Marnita, M., Taufiq, M., Iskandar, I., & Rahmi, R. (2020). The effect of blended learning problem-based instruction model on students' critical thinking ability in thermodynamic course. *Jurnal Pendidikan Ipa Indonesia*, 9(3), 430-438. <https://doi.org/10.15294/jpii.v9i3.23144>
- Martin, F., Wu, T., Wan, L., & Xie, K. (2022). A Meta-Analysis on the Community of Inquiry Presences and Learning Outcomes in Online and Blended Learning Environments. *Online Learning*.
- McCutcheon, K., Lohan, M., Traynor, M., & Martin, D. (2014). A systematic review evaluating the impact of online or blended learning vs. face-to-face learning of clinical skills in undergraduate nurse education. *Journal of Advanced Nursing*, 71(2), 255-270. <https://doi.org/10.1111/jan.12509>
- McLaughlin, J., Gharkholonarehe, N., Khanova, J., M., D., & Rodgers, J. (2015). The impact of blended learning on student performance in a cardiovascular pharmacotherapy course. *American Journal of Pharmaceutical Education*, 79(2), 24. <https://doi.org/10.5688/ajpe79224>
- Mozelius, P. and Hettiarachchi, E. (2017). Critical factors for implementing blended learning in higher education. *International Journal of Information and Communication Technologies in Education*, 6(2), 37-51. <https://doi.org/10.1515/ijicte-2017-0010>
- Muchtar, F., Nasrah, N., Muhammad, S., & Wahyuni, F. (2021). Implementation of blended learning model in the Covid-19 pandemic era in South Sulawesi Province.. <https://doi.org/10.4108/eai.16-10-2020.2305208>
- Nasution, E., Sintia, L., & Putri, R. (2022). The effect of blended learning models assisted by video tutorials on students' critical thinking ability in mathematics learning. *Logarithms Journal of Education and Science*, 10(01), 1-22. <https://doi.org/10.24952/logaritma.v10i01.5186>
- Oliiar, M. and Fomin, K. (2022). Blended learning as a means of future primary school teacher professional development. *Mountain School of Ukrainian Carpaty*, (26), 90-94. <https://doi.org/10.15330/msuc.2022.26.90-94>
- Oliiar, M. and Fomin, K. (2022). Blended learning as a means of future primary school teacher professional development. *Mountain School of Ukrainian Carpaty*, (26), 90-94. <https://doi.org/10.15330/msuc.2022.26.90-94>

- Osadcha, K., Osadchyi, V., Spirin, O., Krasheninnik, I., & Horbatiuk, R. (2022). Model of blended learning in higher educational institutions: development, implementation and evaluation. *Information Technologies and Learning Tools*, 91(5), 158-169. <https://doi.org/10.33407/itlt.v91i5.5045>
- Picciano, A. (2019). Blending with purpose: the multimodal model. *Online Learning*, 13(1). <https://doi.org/10.24059/olj.v13i1.1673>
- Poon, J. (2014). A cross-country comparison on the use of blended learning in property education. *Property Management*, 32(2), 154-175. <https://doi.org/10.1108/pm-04-2013-0026>
- Prafitasari, F., Sukarno, S., & Muzzazinah, M. (2021). Integration of critical thinking skills in science learning using blended learning system. *International Journal of Elementary Education*, 5(2), 434. <https://doi.org/10.23887/ijee.v5i3.35788>
- Prasetio, B., Winatha, I., & Hestiningtyas, W. (2023). The effect of blended learning on integrated social sciences learning outcomes in middle school students. *Saburai Journal Encyclopedia of Education and Learning Innovation*, 3(01), 36-47. <https://doi.org/10.24967/esp.v3i01.2125>
- Previtali, P. and Scarozza, D. (2019). Blended learning adoption: a case study of one of the oldest universities in europe. *International Journal of Educational Management*, 33(5), 990-998. <https://doi.org/10.1108/ijem-07-2018-0197>
- Putri, A., Prasetyo, Z., Purwastuti, L., Prodjosantoso, A., & Putranta, H. (2023). Effectiveness of steam-based blended learning on students' critical and creative thinking skills. *International Journal of Evaluation and Research in Education (Ijere)*, 12(1), 44. <https://doi.org/10.11591/ijere.v12i1.22506>
- Qudus, N., Kusumastuti, A., Apriyani, D., Yulia, E., & Setiawati, T. (2022). Improving the ability of students through blended learning based on practical courses., 263-268. https://doi.org/10.2991/978-2-494069-47-3_32
- Rafiola, R., Setyosari, P., Radjah, C., & Ramli, M. (2020). The effect of learning motivation, self-efficacy, and blended learning on students' achievement in the industrial revolution 4.0. *International Journal of Emerging Technologies in Learning (Ijet)*, 15(08), 71. <https://doi.org/10.3991/ijet.v15i08.12525>
- Rahman, Z., Rijanto, T., Basuki, I., & Sumbawati, M. (2020). The implementation of blended learning model on motivation and students' learning achievement. *International Journal for Educational and Vocational Studies*, 2(9). <https://doi.org/10.29103/ijevs.v2i9.2694>
- Ramalingam, S., Yunus, M., & Hashim, H. (2022). Blended learning strategies for sustainable english as a second language education: a systematic review. *Sustainability*, 14(13), 8051. <https://doi.org/10.3390/su14138051>
- Ritonga, S., Zuhri, Z., Muis, M., Rahmatillah, N., Istiqomah, E., & Zakiah, N. (2022). Analysis strategy blended learning of prospective Islamic teachers after covid 19 pandemic. *Islamic Education Journal of Islamic Education*, 11(02). <https://doi.org/10.30868/ei.v11i02.2510>
- Rombot, O., Boeriswati, E., & Suparman, M. (2020). Improving reading comprehension skills of international elementary school students through blended learning. *Al Ibtida Jurnal Pendidikan Guru Mi*, 7(1), 56. <https://doi.org/10.24235/al.ibtida.snj.v7i1.6045>
- Rovai, A. and Jordan, H. (2004). Blended learning and sense of community: a comparative analysis with traditional and fully online graduate courses. *The International Review of Research in Open and Distributed Learning*, 5(2). <https://doi.org/10.19173/irrodl.v5i2.192>
- Saekawati, R. and Nasrudin, H. (2021). Effectiveness of guided inquiry-based on blended learning in improving critical thinking skills. *Jurnal Penelitian Ilmu Pendidikan*, 14(1), 53-68. <https://doi.org/10.21831/jpipfip.v14i1.36947>

- Sepehri, M., M., L., & Adeeb, S. (2018). Evaluation of student experiences in a developed blended learning course in engineering. *Proceedings of the Canadian Engineering Education Association (Ceea)*. <https://doi.org/10.24908/pceea.v0i0.12975>
- Seraji, F., Attaran, M., & Azizi, S. (2019). Blended learning researches in iran: several fundamental criticisms. *Digital Education Review*, (36), 190-206. <https://doi.org/10.1344/der.2019.36.190-206>
- Smith, K. and Hill, J. (2018). Defining the nature of blended learning through its depiction in current research. *Higher Education Research & Development*, 38(2), 383-397. <https://doi.org/10.1080/07294360.2018.1517732>
- Subarkat, A. and Andriani, A. (2021). The analysis of blended learning on student motivation and learning activeness.. <https://doi.org/10.4108/eai.19-7-2021.2313058>
- Sudewi, P. (2020). Learning experiences using blended learning on efl learners at sulawesi barat university. *Jurnal Basis*, 7(1), 121-132. <https://doi.org/10.33884/basisupb.v7i1.1787>
- Syahrawati, E., Susantini, E., & Indana, S. (2022). Profile of blended learning implementation in learning activities. *Ijorer International Journal of Recent Educational Research*, 3(1), 45-60. <https://doi.org/10.46245/ijorer.v3i1.183>
- Wang, L., Huang, Y., & Omar, M. (2021). Analysis of blended learning model application using text mining method. *International Journal of Emerging Technologies in Learning (Ijet)*, 16(01), 172. <https://doi.org/10.3991/ijet.v16i01.19823>
- Xu, J. and Feng, L. (2021). Research on the application of “production-oriented approach” based on blended teaching in college english writing teaching in private undergraduate colleges.. <https://doi.org/10.12783/dtssehs/ehla2021/35661>
- Yu, Z., Shen, L., Zhuang, J., Chen, Y., Chen, M., Lin, Y., ... & Hu, R. (2019). Effects of blended versus offline case-centered learning on academic performance and the development of critical thinking among undergraduate nursing students.. <https://doi.org/10.21203/rs.2.14460/v1>
- Yu, Z., Xu, W., & Sukjairungwattana, P. (2022). Meta-analyses of differences in blended and traditional learning outcomes and students' attitudes. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.926947>
- Zhang, Z., Cao, T., Shu, J., & Liu, H. (2020). Identifying key factors affecting college students' adoption of the e-learning system in mandatory blended learning environments. *Interactive Learning Environments*, 30, 1388 - 1401.