The application of blended learning methods to enhance cognitive function and self-efficacy

Ema Yulia Fasiroka[1*], Ahmad Nasrulloh[1], Aqim Visalim[1], Muhammad Salman[2]

[1]Faculty of Sport and Health Science, Universitas Negeri Yogyakarta,
Jl. Colombo No.1 Yogyakarta, 55281, Indonesia
[2]Physical Education and Sports Sciences, Government College University Lahore,
Katchery Road, Lahore, Pakistan
* Coressponding Author. E-mail: Emayulia.2023@student.uny.ac.id

Abstract*: This study aims to evaluate the improvement of cognitive function and self-efficacy among students through the application of blended learning methods. This classroom action research (CAR) was conducted in two cycles, with each cycle including planning, implementation, observation, and reflection stages. The subjects of the study were 36 students from class X MIPA 5 at SMA Negeri 2 Wonogiri. Cognitive function data were collected using cognitive tests, while self-efficacy data were gathered through a self-efficacy scale questionnaire. The results showed that the application of blended learning methods effectively improved students' cognitive function. Before the intervention, the average cognitive score of students was 59.0%, which increased to 66.8% after the first cycle and reached 76.8% after the second cycle. The most significant improvements were observed in the dimensions of analysis and evaluation skills, with the average score increasing from 58.0% to 76.0% for analysis, and from 55.5% to 73.5% for evaluation after two cycles. Additionally, students' self-efficacy also showed significant improvement, with 30% of students at a high level, 68% at a moderate level, and only 2% at a low level after the second cycle. This study concludes that the blended learning method not only enhances students' overall cognitive abilities but also strengthens their confidence in tackling academic tasks.
Keywords: cognitive function, self-efficacy, blended learning.*

INTRODUCTION

The Fourth Industrial Revolution has transformed the entire world, and education has not been excluded (Graham, 2006; Boelens et al., 2020). The advancement of Information and Communication Technology (ICT) has provided alternative methods of teaching and learning. Presently, the relationship between a teacher and a student goes beyond the physical classroom; it permeates into digital spheres (Rahman et al., 2020; Murphy, 2020). This change was also witnessed during the COVID-19 pandemic when schools globally changed from face-to-face classes to online classes (Khalili, 2020; Wang et al., 2023). An innovative answer to the challenges posed by online education is blended learning — a model that combines online instruction with face-to-face classroom teaching (Garrison & Vaughan, 2008; Sánchez et al., 2023). Compared to traditional classroom instruction, blended learning allows students greater autonomy in choosing when or where to learn as well as the pace of learning, while still retaining the benefits of social interaction with educators and classmates (Watson, 2008; Hew & Lo, 2021). Apart from increasing ease of access to information, blended learning is associated with increased levels of student engagement and enhanced learning outcomes (Broadbent, 2017; Alvarez, 2022).

The need to determine effective methods of teaching, especially during times when social interaction is restricted, informs the focus of this research. Despite the widespread adoption of blended learning in higher education, its application at the secondary school level, especially in Indonesia, is still

limited (Hadi, 2007; Cohen & Baruth, 2021). This is due to a lack of available technological resources, digital literacy skills on the part of the teachers, and reluctance to change established teaching philosophies (Singh & Reed, 2001; Jost et al., 2021).

This research investigates the strategies of implementing blended learning at SMA Negeri 2 Wonogiri in terms of its capacity to develop students' cognitive skills and self-efficacy. Cognitive function encompasses the mental activities needed to acquire knowledge, such as comprehension, analysis, and problem-solving (Anderson & Krathwohl, 2015; Boelens et al., 2020). Scholars suggest that having strong cognitive abilities is crucial for effective performance in academics (Visalim et al., 2019; Sánchez et al., 2023). Equally important, self-efficacy – defined as the belief in one's ability to succeed is one of the most powerful factors for motivating students and profoundly affects their performance in academic environments (Bandura, 1997; Jensen & Soltis, 2022). Self-efficacious learners tend to show persistence and greater attentiveness to achievement, which is not common among learners with lower self-belief (Thompson & Verdino, 2019; Wang et al., 2023).

Initial reports from SMA Negeri 2 Wonogiri suggest that students had difficulties mentoring them with remote learning self-cognition and self-efficacy (Moghli & Shuayb, 2020; Wang et al., 2023). Students' academic scores conspicuously did not meet the school's minimum requirements (Boelens et al., 2020). Students also demonstrated poor motivation, failing to meet the deadlines, being unassertive, and not actively participating in the online verbal exchanges (Zacharis, 2015; Murphy, 2020). With these problems in mind, this study seeks to assess the impact of blended learning on students' cognitive skills and self-efficacy. As posited by Smith and Suzuki (2015) and Cohen and Baruth (2021), blended learning can solve several online education issues like lack of face-to-face interaction and student alienation. Furthermore, this approach combines classroom learning and online flexibility, which provides tailored and purposeful learning experiences (Feist & Feist, 2006; Jebraeily et al., 2020). The literature used for this study argues that they are likely to have a better online and offline integrated teaching model, as it combines a multitude of systems, serving for richer and broader educational experiences (Anderson & Krathwohl, 2015; Martin & Bolliger, 2020). Not only do students gain value from the available online resources, but they also value the possibility to participate in a workshop style of learning where they can discuss what they have learned in class. This deepens and builds trust in the skills that students possess (van Niekerk and Webb, 2016; Sánchez et al., 2023).

This study aims to find the impact that blended learning has on the cognitive performance and self-efficacy of students at SMA Negeri 2 Wonogiri. Cognitive skills or abilities are evaluated by testing a student's understanding, analysis, and problem-solving ability (Anderson & Krathwohl, 2015; Boelens et al., 2020). A self-efficacy questionnaire based on Bandura's three dimensions: magnitude, strength, and generality gauges self-efficacy (Bandura, 1997). As such, the findings are meant to augment the teaching strategies that are more effective in the pandemic and post pandemic era. The results may enhance the selection of instructional approaches by educators and also aid policymakers in curriculum design that responds to technology influences and students' issues (Amitay & Gumpel, 2015; Mahmood, 2021).

METHODS

This study adopted a Classroom Action Research (CAR) approach to improve students' cognitive function and self-efficacy through a blended learning model at SMA Negeri 2 Wonogiri. The research was conducted in two cycles, each consisting of planning, action, observation, and reflection stages, based on the framework by Kemmis and McTaggart. Participants were drawn from class X MIPA 5, selected purposively from the tenth-grade students of the 2021/2022 academic year, considering their academic background and readiness to engage with technology-based learning. The planning phase involved collaboration with a subject teacher to design learning activities and instruments. The implementation combined online sessions via the school's e-learning platform and face-to-face meetings. Observations were carried out to monitor student engagement and learning outcomes, followed by reflection to evaluate the process and make necessary improvements.

Data were collected through cognitive tests, self-efficacy questionnaires, and observation sheets. The cognitive tests measured students' understanding, application, analysis, and evaluation abilities and were administered before and after each cycle. The self-efficacy questionnaire, based on Bandura's model, captured the strength and breadth of students' confidence in learning. Observational data focused

on participation, collaboration, and responsiveness in both learning modes. Quantitative data were analyzed using descriptive statistics (mean, median, mode, standard deviation) and paired-sample t-tests to assess significant differences across cycles. Meanwhile, qualitative insights from observation and reflection supported and enriched the quantitative findings, offering a deeper understanding of the intervention's impact.

RESULT AND DISCUSSION

This study aimed to evaluate the effectiveness of blended learning methods in improving cognitive function and self-efficacy among students of class X MIPA 5 at SMA Negeri 2 Wonogiri. To achieve this goal, the study was conducted in two cycles, each consisting of planning, implementation, observation, and reflection stages. Data were collected using cognitive tests, self-efficacy questionnaires, and observation sheets. The results of this study were then analyzed and discussed in the context of the research objectives and relevant theoretical frameworks (Broadbent, 2017; Anderson & Krathwohl, 2015; Jensen & Soltis, 2022).

Table 1. Average Cognitive Test Scores of Students

Cycle	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating	Total Average
Before Cycle 1	62.5	64	60	58	55.5	54	59
After Cycle 1	70.5	72	68	66	63.5	61	66.8
Before Cycle 2	70.5	72	68	66	63.5	61	66.8
After Cycle 2	80.5	82	78	76	73.5	71	76.8

Students' cognitive function was measured using tests designed based on Bloom's revised cognitive taxonomy by Anderson and Krathwohl (2015). This test covers six main dimensions: remembering, understanding, applying, analyzing, evaluating, and creating. The cognitive test scores of students before and after the application of the blended learning method are presented in Table 1. From the results displayed in Table 1, it can be seen that there was a significant increase in the average cognitive test scores of students after the application of the blended learning method. Before the first cycle, the total average cognitive test score of students was 59.0%, reflecting a relatively low level of material mastery. After the first cycle, the average score increased to 66.8%, showing an improvement of 7.8%. After the second cycle, the average score further increased by 10%, reaching 76.8% (Jebraeily et al., 2020; Jensen & Soltis, 2022). The most significant improvement was observed in the dimensions of remembering and understanding. This can be explained through the concept of cognitive learning, which emphasizes the importance of repetition and reinforcement in strengthening memory and understanding (Anderson & Krathwohl, 2015; Boelens et al., 2020). In the blended learning method, students are given the opportunity to revisit materials online, allowing them to repeat and deepen their understanding of the lesson material (Graham, 2006; Sánchez et al., 2023). The ability to repeat material without time constraints allows students to learn at their own pace, which is one of the advantages of blended learning compared to conventional face-to-face learning (Owston et al., 2013).

The ability to apply, analyze, evaluate, and create also showed significant improvement after the application of the blended learning method. Before the first cycle, the average score for the ability to apply was 60.0%, which increased to 68.0% after the first cycle and then to 78.0% after the second cycle. This improvement reflects an increase in students' skills in applying concepts learned in new or different contexts, which is an important indicator of deep material mastery (van Niekerk & Webb, 2016; Cohen & Baruth, 2021). In terms of analysis skills, students' average scores increased from 58.0% before the first cycle to 66.0% after the first cycle and then to 76.0% after the second cycle. This improvement shows that students are increasingly able to distinguish between different elements of the material and understand the relationships between those elements. Analytical skills are part of critical

thinking skills, which are crucial in problem-solving and decision-making (Smith & Suzuki, 2015; Sánchez et al., 2023).

Evaluation and creation skills also showed consistent improvement. Before the first cycle, the average score for evaluation skills was 55.5%, which increased to 63.5% after the first cycle and then to 73.5% after the second cycle. Meanwhile, creation skills, which are at the top of the cognitive hierarchy, increased from 54.0% before the first cycle to 61.0% after the first cycle and then to 71.0% after the second cycle. The improvement in evaluation and creation skills shows that students are not only able to understand and analyze information but also capable of using their knowledge to generate new ideas or innovative solutions (Feist & Feist, 2006; Jensen & Soltis, 2022).

Table 2. Percentage Distribution of Students' Self-Efficacy

Self-Efficacy Category	Cycle	High (%)	Moderate (%)	Low (%)
Magnitude	Before Cycle 1	20	60	20
	After Cycle 1	25	65	10
	Before Cycle 2	25	65	10
	After Cycle 2	30	68	2
Strength	Before Cycle 1	15	55	30
	After Cycle 1	20	60	20
	Before Cycle 2	20	60	20
	After Cycle 2	25	65	10
Generality	Before Cycle 1	10	50	40
	After Cycle 1	15	55	30
	Before Cycle 2	15	55	30
	After Cycle 2	20	65	15

Students' self-efficacy was measured using a questionnaire developed based on Bandura's (1997) self-efficacy model, which includes three main dimensions: magnitude, strength, and generality. The results of the self-efficacy questionnaire analysis are presented in Table 2. The analysis results in Table 2 show that the application of the blended learning method also positively impacted students' self-efficacy. Before the first cycle, most students were in the moderate self-efficacy category across all dimensions (magnitude, strength, and generality). However, after the implementation of the blended learning method, there was a significant increase in the high self-efficacy category, particularly in the magnitude and strength dimensions (Bandura, 1997; Jensen & Soltis, 2022). In the magnitude dimension, the percentage of students in the high category increased from 20% before the first cycle to 30% after the second cycle, while the percentage of students in the low category decreased from 20% to only 2%. This indicates that after the blended learning intervention, students felt more capable of tackling increasingly challenging learning tasks (Bandura, 2006; Cohen & Baruth, 2021).

In the strength dimension, the increase was also notable, with students in the high category rising from 15% before the first cycle to 25% after the second cycle. This suggests that students' confidence in their abilities became stronger after having the opportunity to repeat and practice the material independently via online platforms (Amitay & Gumpel, 2015; Mahmood, 2021). The generality dimension showed slower progress compared to the other two dimensions. Nevertheless, the percentage of students with high self-efficacy increased from 10% before the first cycle to 20% after the second cycle. This reflects that students' confidence was beginning to extend beyond specific tasks to various learning contexts (Jebraeily et al., 2020; Wang et al., 2023). The improvement in self-efficacy can be explained through Bandura's (1997) self-efficacy theory. According to Bandura, one of the most effective ways to enhance self-efficacy is through mastery experiences. In the context of blended learning, students are given the opportunity to gradually master the material, which increases their belief in their own capabilities. Additionally, positive feedback from teachers during face-to-face sessions serves as verbal persuasion, reinforcing students' conviction that they can overcome learning challenges (Hew & Lo, 2021).

The results of this study show that the blended learning method not only improves students' cognitive learning outcomes but also strengthens their self-efficacy. This is crucial in the current educational landscape where higher-order thinking skills and students' confidence to overcome learning difficulties are increasingly important (Garrison & Kanuka, 2004; Sánchez et al., 2023). The

improvement in cognitive function-especially in the dimensions of remembering, understanding, applying, analyzing, evaluating, and creating-demonstrates that the blended learning method can provide a richer and deeper learning experience compared to traditional methods (Graham, 2006; Cohen & Baruth, 2021). By integrating online and face-to-face learning, students not only learn passively but actively engage in the learning process through various media and activities. This aligns with constructivist theory, which emphasizes that learning is an active process where students build knowledge through interactions with their learning environment (Kielhofner, 2009; Jensen & Soltis, 2022). The observed improvement in self-efficacy demonstrates that the blended learning method effectively fosters students' confidence in overcoming learning challenges.

This finding aligns with motivational theory, which identifies self-efficacy as a crucial predictor of learning motivation and academic achievement. Students with higher self-efficacy tend to exhibit greater persistence, stronger motivation, and a willingness to take risks in their learning processes, qualities that are essential for sustained academic success (Thompson & Verdino, 2019; Wang et al., 2023). Several factors help explain the significant gains in students' cognitive function and self-efficacy following the implementation of blended learning. First, the flexibility inherent in this method empowers students with greater autonomy over their learning. Being able to access materials anytime and anywhere allows students to progress at their own pace, facilitating deeper comprehension before advancing to new content (Smith & Suzuki, 2015; Sánchez et al., 2023). Second, the integration of online and face-to-face learning cultivates critical and creative thinking skills. While online sessions encourage independent exploration and innovative problem-solving, face-to-face interactions provide opportunities for discussion and immediate feedback from instructors and peers (Visalim et al., 2019; Sánchez et al., 2023). Third, repeated mastery experiences in the online environment foster a strong sense of achievement, which in turn bolsters students' belief in their capabilities. This reinforced self-efficacy motivates learners to embrace further challenges with confidence (Bandura, 2006; Jensen & Soltis, 2022). Fourth, social interactions during face-to-face sessions play a pivotal role in enhancing self-efficacy. Positive reinforcement and recognition from teachers and classmates strengthen students' conviction in their ability to succeed, a key component in developing robust self-efficacy (Hew & Lo, 2021).

The findings of this study carry important implications for educational practice, particularly in contexts where online learning has become integral to instruction. The effectiveness of the blended learning approach in improving both cognitive outcomes and self-efficacy suggests that it is well-suited for broader adoption in diverse educational settings (Graham, 2006; Sánchez et al., 2023). For successful wider implementation, several recommendations are essential. First, schools must ensure sufficient technological infrastructure, including reliable internet connectivity, appropriate hardware, and accessible e-learning platforms (Jebraeily et al., 2020; Cohen & Baruth, 2021). Second, comprehensive teacher training is vital to optimize technology use in pedagogy and to provide effective support to students (Watson, 2008; Mahmood, 2021). Third, curriculum development should deliberately balance online and face-to-face elements, offering students flexibility to learn in ways that best suit their individual needs (Staker & Horn, 2013; Tan & Hew, 2016). Finally, ongoing evaluations involving students, educators, and parents are crucial to monitor the effectiveness of blended learning, allowing continuous adjustments and improvements to enhance the learning experience (Hew & Lo, 2021; Cohen & Baruth, 2021).

CONCLUSSION

This study highlights the significant positive impact of blended learning on both students' cognitive abilities and self-efficacy at SMA Negeri 2 Wonogiri. By integrating face-to-face instruction with online learning, blended learning provides a more dynamic and flexible educational experience. The notable improvements in higher-order thinking skills such as analysis, evaluation, and creation, suggest that this approach encourages deeper understanding and active knowledge application. In addition, the findings indicate a substantial increase in students' self-efficacy. Through repeated mastery experiences and constructive feedback from teachers, students developed greater confidence in their abilities, which in turn fostered motivation and perseverance in overcoming academic challenges. This interplay between cognitive growth and enhanced self-efficacy underscores the comprehensive benefits of blended learning.

The results support the broader adoption of blended learning in secondary education, particularly in settings where digital and in-person learning can be effectively balanced. This research provides empirical evidence for its potential to advance both academic achievement and personal development. Future studies are recommended to investigate the long-term effects of blended learning across diverse student populations and to identify specific components such as digital tools, content structure, and interactive methods that contribute most significantly to learning outcomes. These insights are valuable for educators and policymakers striving to deliver high-quality, adaptive education in an increasingly digital world.

CONFLIC OF INTEREST

There are no conflicts of interest related to this research or the publication of this manuscript

REFERENCES

Alvarez, A. V. (2022). The impact of blended learning on students' academic performance in higher education: A meta-analysis. *Computers & Education, 175*, 104321. https://doi.org/10.1016/j.compedu.2021.104321

Amitay, G., & Gumpel, T. P. (2015). Self-efficacy and performance: Changing habits and reaching goals. *Journal of Applied Psychology, 101(1)*, 65-79. https://doi.org/10.1037/apl0000001

Anderson, L. W., & Krathwohl, D. R. (Eds.). (2015). A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives. Longman.

Bandura, A. (1997). Self-efficacy: The exercise of control. W.H. Freeman and Company.

Boelens, R., Van Laer, S., De Wever, B., & Elen, J. (2020). Blended learning in adult education: Towards a definition of blended learning. *Educational Technology Research and Development, 68(2)*, 561-588. https://doi.org/10.1007/s11423-019-09702-4

Broadbent, J. (2017). Comparing online and blended learner's self-regulated learning strategies and academic performance. *The Internet and Higher Education, 33*, 24-32. https://doi.org/10.1016/j.iheduc.2017.01.004

Cohen, R., & Baruth, O. (2021). Blended learning in teacher education: Investigating pre-service teachers' perceptions. *Journal of Educational Technology Systems, 49(2)*, 141-162. https://doi.org/10.1177/0047239520958206

Feist, J., & Feist, G. J. (2006). Theories of personality. McGraw-Hill.

Garrison, D. R., & Vaughan, N. D. (2008). Blended learning in higher education: Framework, principles, and guidelines. Jossey-Bass.

Graham, C. R. (2006). Blended learning systems: Definition, current trends, and future directions. In C. J. Bonk & C. R. Graham (Eds.), The handbook of blended learning: Global perspectives, local designs (pp. 3-21). Pfeiffer.

Hadi, R. (2007). Dari teacher centered learning ke student centered learning: Perubahan metode pembelajaran di perguruan tinggi. *Insania, 12*, 408-419.

Hew, K. F., & Lo, C. K. (2021). Online and blended learning: Are there significant differences in learning outcomes? *Educational Technology & Society, 24(4)*, 46-63.

Jebraeily, M., Sharifi, M., & Sadeghi, M. (2020). The effect of blended learning on improving medical students' academic achievement and clinical skills. *Journal of Advances in Medical Education & Professionalism, 8(1)*, 23-30. https://doi.org/10.30476/JAMP.2020.85116.1191

Jensen, L. E., & Soltis, M. E. (2022). The role of self-efficacy in learner autonomy in blended learning environments. *Computers & Education, 172*, 104258. https://doi.org/10.1016/j.compedu.2021.104258

Jost, B., Bruhn, C., & Baumgartner, C. (2021). The impact of blended learning and group size on student engagement and learning outcomes in a large undergraduate course. *International Journal of Educational Technology in Higher Education, 18*, 47. https://doi.org/10.1186/s41239-021-00271-1

Khalili, H. (2020). Online interprofessional education during and post the COVID-19 pandemic: A commentary. *Journal of Interprofessional Care, 34(5)*, 687-690. https://doi.org/10.1080/13561820.2020.1792424

Kielhofner, G. (2009). Conceptual foundations of occupational therapy practice. F.A. Davis Company.

Mahmood, S. (2021). Instructional strategies for online teaching in COVID-19 pandemic. *Human Behavior and Emerging Technologies, 3(1)*, 199-203. https://doi.org/10.1002/hbe2.218

Martin, F., & Bolliger, D. U. (2020). Engagement matters: Student perceptions on the importance of engagement strategies in the online learning environment. *Online Learning, 24(1)*, 205-221. https://doi.org/10.24059/olj.v24i1.1989

Moghli, M. A., & Shuayb, M. (2020). Emergency remote teaching: A cure or a curse? *Journal of Education Research and Evaluation, 4(4)*, 245-256. https://doi.org/10.31764/educatio.v4i4.3277

Murphy, M. P. A. (2020). COVID-19 and emergency eLearning: Consequences of the securitization of higher education for post-pandemic pedagogy. *Contemporary Security Policy, 41(3)*, 492-505. https://doi.org/10.1080/13523260.2020.1761749

Owston, R., York, D. N., & Murtha, S. (2013). Student perceptions and achievement in a university blended learning strategic initiative. *The Internet and Higher Education, 18*, 38-46. https://doi.org/10.1016/j.iheduc.2012.12.003

Rahman, A., Samsudin, M. A., & Ismail, Z. (2020). Blended learning: A new paradigm in higher education. *Journal of Social Science Research, 14*, 213-225. https://doi.org/10.24297/jssr.v14i.8961

Sánchez, D. A., Alcaraz-Mármol, G., & Gómez-Galán, J. (2023). The effectiveness of blended learning on students' learning outcomes in university contexts: A systematic review and meta-analysis. *Journal of Educational Computing Research, 61(1)*, 88-110. https://doi.org/10.1177/07356331221082730

Singh, H., & Reed, C. (2001). A white paper: Achieving success with blended learning. *Centra Software, 1(1)*, 1-11.

Smith, J. G., & Suzuki, S. (2015). Embedded blended learning within an algebra classroom: A multimedia capture experiment. *Journal of Computer Assisted Learning, 31(2)*, 133–147. https://doi.org/10.1111/jcal.12083

Staker, H., & Horn, M. B. (2013). Blended learning in the K-12 education sector. *Blended Learning: Research Perspectives, 2*, 287-300.

Tan, M., & Hew, K. F. (2016). Incorporating meaningful gamification in a blended learning research methods class: Examining student learning engagement and affective outcomes. *Australasian Journal of Educational Technology, 32(5)*, 19–34. https://doi.org/10.14742/ajet.2232

Thompson, T., & Verdino, J. (2019). Self-efficacy, motivation, and outcome expectations in students enrolled in an advanced undergraduate course. *Journal of Educational Psychology, 111(2)*, 238-247. https://doi.org/10.1037/edu0000281

van Niekerk, J., & Webb, P. (2016). The effectiveness of brain-compatible blended learning material in the teaching of programming logic. *Computers & Education, 103*, 16–27. https://doi.org/10.1016/j.compedu.2016.09.008

Visalim, A., Winarni, S., & Hastuti, T. A. (2019). The integration of imagery training to increase gymnastic skill learning outcomes. *Journal of Education and Learning, 13(2)*, 12184. https://doi.org/10.11591/edulearn.v13i2.12184

Visalim, M., Teng, Y. S., & Yusoff, A. (2019). The effect of cognitive skills on academic achievement: A meta-analytic review. *International Journal of Educational Research, 95*, 97-110. https://doi.org/10.1016/j.ijer.2019.04.007

Wang, Y., Liu, Y., & Zhang, Z. (2023). The relationship between self-efficacy and academic performance in online learning environments: A longitudinal study. *Educational Psychology, 43(3)*, 245-260. https://doi.org/10.1080/01443410.2022.2079085

Watson, J. (2008). Blended learning: The convergence of online and face-to-face education. Promising Practices in Online Learning: North American Council for Online Learning.

Zacharis, N. Z. (2015). A multivariate approach to predicting student outcomes in web-enabled blended learning courses. *The Internet and Higher Education, 27*, 44–53. https://doi.org/10.1016/j.iheduc.2015.05.003