



Blended Learning in Post-Pandemic Era: A Systematic Review

Andreas Rio Adriyanto ¹, Wirania Swasty ¹, Atria Nuraini Fadilla ¹, Neo Mai ²,
Bijaksana Prabawa ¹, Muhammad Akbar Hafidzan ¹

¹ Telkom University, Bandung, Indonesia

² Multimedia University, Cyberjaya, Malaysia

neo.mai@mmu.edu.my

Abstract. During the pandemic, online learning gained popularity in higher education. Synchronous and asynchronous approaches to online learning have advantages and disadvantages, respectively. Various support platforms have been utilized in online learning for an optimal learning experience. As the pandemic situation gradually declined, the higher education sector faced difficulties in determining the most effective learning strategies. Teachers and students who have become accustomed to online learning are now adapting to face-to-face meetings; however, online learning remains an integral part of the educational landscape. Blended learning models, such as rotation, flex, self-blended, and enriched virtual models, can be utilized as strategies for implementing blended learning in the post-pandemic era. This article is a systematic review with the objective of analyzing various blended learning methods used during the late pandemic Covid-19 period, with a particular focus on the collaborative aspects that emerge in blended learning. The learning experiences and social interactions that occur during collaborative activities using blended learning methods are an interesting area of inquiry worth exploring. By analyzing learning patterns and best practice experiences, it is anticipated that this study will shed light on the development of learning approaches in higher education.

Keywords: Blended Learning, Post-pandemic, Collaborative, Systematic Review.

1 Introduction

In recent years, blended learning has become common in educational learning spaces. Horizon reports of 2019 and 2020 have found that blended learning continues to be a preferred instructional model for course delivery [1][2]. Thus, blended learning has emerged as a popular teaching strategy for enhancing interactions between teachers and students [3]. Blended learning combines face-to-face classroom instruction with online learning and entails "the thoughtful integration of classroom learning experiences with online learning experiences" [4], incorporating elements such as online quizzes and flipped classroom approaches. Since its implementation, research has shown that

blended learning has improved student outcomes and learning experiences while enhancing engagement with course content [5].

Many educators embrace blended learning approaches to innovate their teaching methods and provide students with better engagement with the content [2]. However, research also indicates that implementing and adopting blended learning in the curriculum is challenging, complex, and low in many developing countries [6]. Furthermore, to be effective, a blended learning framework must involve students, teachers, design, content, and technical aspects of learning [7]. Students' attitudes towards the environment influenced their satisfaction levels.

The use of online learning as the primary mode of instruction during the Covid-19 pandemic has become common in higher education worldwide. The reliance on Internet-based technology is likely to persist even after the pandemic has subsided. Blending face-to-face instruction with Internet-based technology is a prevalent approach in the post-pandemic era. On the other hand, collaborative learning, which is rooted in social constructivist pedagogy, has emerged as a teaching strategy that emphasizes the social aspects of learning and the value of experiential participation. The theory of communities of practice [8] serves as the foundation for this concept. Specifically, in design education, learning is related to signature pedagogies, communities of practice, and collaborative learning to understand tacit and embodied knowledge within design knowledge. Therefore, it is essential to understand blended learning in general, and its connection to collaboration. Both aspects were explored in this study. The approach employed in this paper is a systematic review, which aims to examine research trends by focusing on collaborative aspects [9]

2 Methods

This article provides a systematic review of research on Blended Learning. This review followed the PRISMA guidelines [10]. PRISMA is a standard peer-reviewed methodology to ensure quality and replicability. The search strategy, article selection criteria, quality assessment, data extraction, and analytical procedures are outlined in the review protocol.

2.1 Search Strategy and Selection Criteria

The search strategy for this paper was done on scopus.com, a reputable electronic database, using the keywords “blended learning” AND collaboration. After searching the database, three authors independently analyzed the retrieved papers by title and abstract. Subsequently, the two authors performed an eligibility assessment by screening the full texts based on the inclusion and exclusion criteria, as listed in Table 1.

Table 1. Exclusion and inclusion criteria.

No	Exclusion	Inclusion
1	Online learning	Blended learning
2	Topic out of collaboration context	Collaboration context

3	Engineering, math, medical, law field	Art, humanity, social science field
4	Systematic review paper	Full research/case study

This study generated a total of 740 articles. Then, 615 papers were eliminated based on filtering by open access, publication year between 2019 and 2023 (to look at the transition between pre- and post-pandemic situations), and the English language. The titles and abstracts of the remaining 125 papers were evaluated. 31 papers were reviewed and evaluated as full text. 15 of these papers did not meet the inclusion criteria. Thus, 16 studies were eligible for inclusion in this systematic review. The PRISMA guidelines for the study selection are shown in Figure 1.

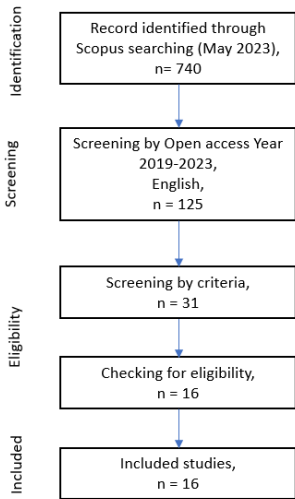


Fig. 1. Systematic review flowchart.

2.2 Data Analysis

The data were analyzed by (1) Paper’s Topic, (2) Contribution and Implications and (3) Collaboration Aspects. The analysis findings were then compared with existing practices and publications.

3 Results and Discussions

The search data based on predetermined keywords from scopus.com reveal a rising research trend in the field of blended learning from 2004 to 2021 (Figure 2). The highest point occurred in 2021, when 90 documents were generated on the topic of blended learning and collaboration. The number decreased after 2021, indicating that publications from the preceding year had a higher prevalence of online learning activities during the Covid-19 pandemic period.

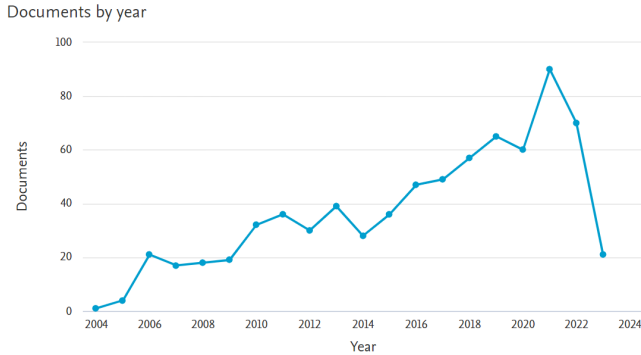


Fig. 2. Documents by year.

The documents that emerged based on subject areas included Social Science (36.7%), Computer Science (27.1%), and engineering (10.7%), which constituted the largest proportion of research on blended learning and collaboration. Other fields, such as Psychology, Arts and Humanities, Mathematics, and Medicine, which have relatively few research studies on blended learning and collaboration, are presumed to require more profound interactions with other human beings (Figure 3).

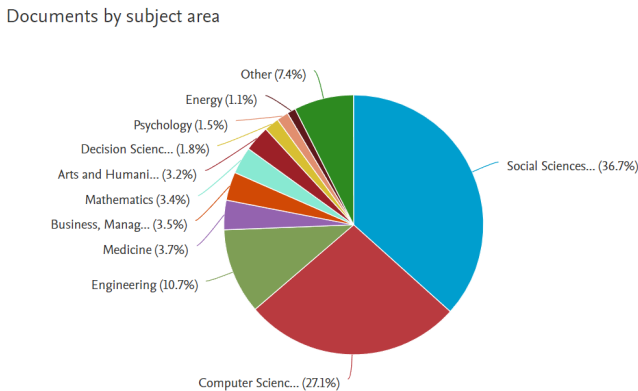


Fig. 3. Documents by subject area.

Research on blended learning and collaboration is generally more prevalent in the United States and Europe. Among the top 10 countries, there are two Asian countries: China and Indonesia. China ranks 6th, contributing 29, followed by Indonesia in 8th place with 27 documents related to the search segment of blended learning and collaboration (Figure 4).

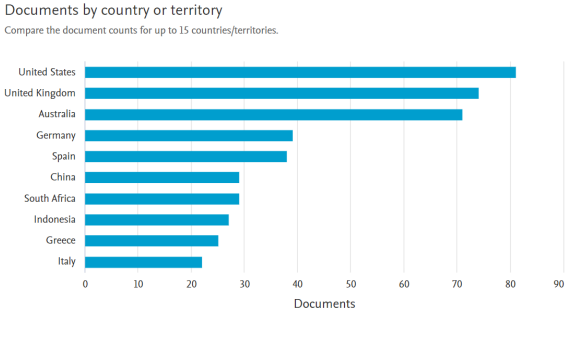


Fig. 4. Documents by country.

The subsequent selection process yielded 16 papers that were analyzed based on their topic, research methodology, contributions and implementations, and collaborative aspects as follows:

3.1 Paper’s Topic

Paper [11] examined the utilization of blended support for interdisciplinary team-based research among undergraduate students. The present study investigated the inclinations towards blended support through a survey and interviews conducted with both students and supervisors. Paper [12] examined the difficulties encountered by both higher education students and institutions in India in the wake of the COVID-19 pandemic. Paper [13] discusses the use of Flipped Learning in higher education before and during the COVID-19 pandemic and analyzes its effectiveness in developing competencies in the 21st century. Paper [14] addresses the difficulty of providing an interactive learning environment for large class sizes of students was highlighted in this presentation, as well as the need to leverage cutting-edge web and cloud-based technology to address the concerns of distance between students and instructors.

In paper [15], it was explored how, in a design studio setting, shared experiences, collaborations, and interactions help to build tacit knowledge. The ability of online and virtual platforms to expand the learning boundaries of the social sphere is also explored. Paper [16] discussed the effectiveness of hybrid teaching, which combines online and face-to-face teaching, in delivering equivalent learning to higher education students in the UK. Paper [17] discusses the importance of developing a multifaceted skill set to adapt to the challenges of the gig economy as the labor market becomes more uncertain due to the online technological revolution. Paper [18] discovered that while digital tools are helpful in promoting communication and collaboration, teachers' approaches to supporting their students in these activities vary.

In paper [19], student interactions in a collaborative learning environment were examined, and the effects of visual tools on student satisfaction and academic success in blended learning courses with an employment focus were evaluated. By outlining the variables that affect academic success and student satisfaction, the study's conclusion

offers support for educational institutions' decisions about individual courses and overall curricula. A new course on forest bio-economics was designed and implemented in higher education, according to Paper [20], which was influenced by the framework of 21st century skills, cross-boundary teamwork, collaborative problem-solving, and online and blended learning. To understand how students' experiences in the course were reflected in their collaborative problem-solving in cross-border teams in blended or online learning contexts, the study evaluates their experiences. The COVID-19 pandemic's effects on higher education institutions were examined in paper [21], as well as the move to online instruction and digital learning tools. The authors aim to investigate how instructors and students felt about long-term adjustments to the educational system. Paper [22] explored the difficulties that developments in design education have created and looked at student comments from courses in advertising design that used blended learning strategies. Paper [23] used empirical research from a blended urban design studio experiment undertaken during the COVID-19 program in the UK to examine the potential and difficulties of learning and teaching urban design through studio pedagogy. The difficulties design educators challenge in implementing technologically driven changes in online teaching and learning settings are discussed in Paper [24]. The importance for a medium ground between conventional studio-based education and online education is made clear by this.

3.2 Contribution and Implications

Paper [11] examined the efficacy of blended learning in facilitating undergraduate interdisciplinary research by providing valuable insights into its potential benefits. This text underscores the importance of providing guidance to students in the intricate process of interdisciplinary research. Paper [12] examined the effects of the COVID-19 pandemic on international student travel and exchanges, as well as the necessity for alternative modes of engagement. This highlights the significance of incorporating technology as a fundamental aspect of daily existence in the forthcoming educational era. In paper [13], the usefulness of flipped learning for the development of 21st-century competences was examined from the perspective of university students. The findings revealed that students generally agreed on the advantages or effectiveness of flipped classroom learning designs for the development of skills that will be helpful for their futures both personally and professionally.

Reporting on direct student experiences of blended learning through involvement with unique digital learning objects in undergraduate and postgraduate courses is one of the contributions of paper [14]. The effectiveness of mixed learning modes and their impact on student satisfaction and engagement are discussed in this study. Insights into how tacit knowledge is created through shared experiences, teamwork, and interactions in the design studio environment were offered by Paper [15]. It investigates how virtual and online learning environments might expand the limits of social learning. Drawing on previous research and evidence, Paper [16] offers insight on the efficiency of hybrid teaching in higher education. This emphasizes the requirement for additional assessments of hybrid teaching and its effects on student learning. In general, this study contributes to the continuing discussion about the application of hybrid teaching in higher

education. The practical implication of this study [17] is that educators should consider adopting an interdisciplinary approach to teaching that emphasizes thematic links across subjects, co-construction, and creativity. This approach provides opportunities for learners to develop the competencies needed to adapt to the new millennium and significantly deepen their learning experience.

With the topic of computer-supported collaborative learning (CSCL) and communication in advanced technological classroom settings where students and teachers share a physical learning space and use digital technologies as a natural part of their daily teaching and learning processes, Paper [18] makes a significant contribution to the literature. This essay explores the use of digital technology by primary school teachers to promote communication and group learning in blended learning settings. In a blended study that focused on employment, Paper [19] offered empirical proof of the value of visual tools in improving academic achievement and satisfaction with learning. The paper [20] provides knowledge about how to create and perform courses in higher education that support the development of 21st-century skills through cross-cultural problem-solving in blended or online learning environments. This study offers implications for course development in future design-based research cycles and offers insights into students' experiences with such courses. The purpose of this paper [21] is to contribute by analyzing how students and teachers feel about long-term changes in the educational system, particularly the move toward remote learning and digital learning tools in European higher education institutions. This study gives insight into the pandemic's potential long-term effects on colleges and universities as well as the evolution of the educational system.

Three blended learning strategies—timely and meaningful feedback, involvement with real-world projects, and help from expert tutors—were highlighted in Paper [22] as being helpful for meaningful learning in advertising design courses. This paper talks about the difficulties and expected contrast to implementing education in blended technological environments. Insights into the creation and delivery of blended studio-based modules for urban design education are provided in Paper [23]. It emphasizes the usefulness of policy review, small group reading discussions, and formative feedback opportunities as fundamental components of urban design studio pedagogy, as well as the significance of using cities as real-world urban design laboratories. The paper [24] offers insight into the difficulties design educators faced while implementing technological developments in online teaching and learning settings. This study has significance for practice since it provides insight into the difficulties and potential solutions associated with online design education.

3.3 Collaboration Aspects

In accordance with paper [11], blended support for undergraduate multidisciplinary research combines in-person sessions with technology-mediated mentoring. Collaboration took place in a variety of ways, such as feedback meetings with the supervisor, where students and supervisors collaborated to write and generate ideas on how to approach the research. Different advantages for student learning are offered by online and

blended learning environments, such as enabling deep learning and promoting self-regulation. Overall, this study demonstrates that a blended framework that involves in-person engagement and technology-mediated support can assist students in becoming independent cross-disciplinary researchers. Paper [12] discussed the need for collaboration in the development of high-quality digitized e-content and the importance of working with experts to tailor-stitch lecture delivery mechanisms. However, this study does not provide specific details on how collaboration is carried out in this context. In Paper [13], the use of flipped learning in higher education is discussed, and its usefulness in helping students build 21st-century skills is examined. According to the study, students are highly in agreement on the advantages of flipped learning and how well it helps them acquire skills for their futures both personally and professionally. The features of collaboration that take place in this study are not, however, thoroughly discussed in this paper. Paper [14] did not provide information on collaboration among authors or other researchers. Therefore, no collaboration was conducted in this study. A studio-based interpretative study was done in various studio settings within the Environment and Interior Design Department of the School of Design at Hong Kong Polytechnic University to carry out the collaborative portion of the study described in the paper [15]. This study emphasizes the value of social interactions and teamwork in the design studio setting, which may be applied to guide the creation of both real-world and virtual environments that foster social learning.

The paper [16] did not provide detailed information on the collaborative aspects of the study. Paper [17] also did not provide specific details on how collaboration is carried out in practice. A small-scale case study at a Norwegian elementary school served as the setting for the collaboration component of the paper [18]. In blended learning environments, this study explores pupil-pupil and teacher-pupil communication and collaboration methods. The results of this study offer insights into how digital technology might be added to regular classroom routines to improve student collaboration and communication. The collaboration component in paper [19] was carried out by establishing a learning community for financial studies in which students were invited to participate as users and makers of visual information. The community was created to enable involvement and collaboration with undergraduate students from various backgrounds who are geographically dispersed. This study evaluated the effects of visual tools on academic achievement and student satisfaction as well as student relationships within a collaborative learning community. Overall, the study's cooperation component emphasizes the significance of developing a nurturing and cooperative learning environment to improve students' academic performance and employability.

Cross-boundary teaming, which involves students from various institutions and universities of applied sciences working together on a shared development challenge connected to forest bio economics, was used to carry out the collaborative part of paper [20]. The students work together in mixed or online learning environments using a variety of tools and platforms, including video conferencing, online forums, and WhatsApp discussion threads. The concepts of collaborative problem-solving and knowledge construction, which are based on the framework of 21st century skills, act as the foundation for collaboration. Paper [21] did not provide information on how the collaboration was carried out. Aspects of collaboration were not specifically discussed

in paper [22]. This study focuses on blended learning approaches for advertising design studies and how design instructors can change with the times to stay current with technology. The collaborative parts of the research were not specifically covered in Paper [23]. In the context of design studio pedagogy, it does, however, refer to the significance of community engagement, implying that working in partnership with regional communities and stakeholders may be a step in the research process. Paper [24] did not provide specific information on how collaboration is conducted in blended learning. However, it highlights the challenges of finding ways to facilitate collaboration and interaction among students and between students and instructors.

4 Conclusion

The Flipped Classroom method has emerged as a promising approach that can be implemented in post-Covid-19 higher education by combining online materials and face-to-face interactions in an on-site setting. When managing online materials, it is essential to curate the content that provides a high level of comfort, ease of use, and student engagement. The application of blended learning in design education can facilitate the exploration of tacit knowledge through a social constructivist strategy, encompassing both online and onsite learning environments. Collaboration and cooperation represent crucial 21st-century skills within the realm of working methodologies. However, only 4 of the 16 analyzed papers addressed the aspect of collaboration in blended learning. Generally, collaboration can be conducted online using specific digital tools; however, for certain aspects, such as the transfer of tacit knowledge, a more effective understanding of body language necessitates face-to-face interactions in an onsite setting. Thus, the appropriate implementation of blended learning strategies is presumed to enhance the effectiveness of collaborative aspects of education. The limitations of this study include the utilization of a review approach that focuses on papers related to blended learning and collaboration obtained from scopus.com as the data source. Further exploration using additional sources will enhance the comprehensiveness of the analysis conducted in this study. However, this can serve as a starting point to emphasize the importance of collaboration, particularly in relation to the social constructivist paradigm, by fostering collaboration among students and between teachers and students.

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