

## **Strategies for Successful Blended Learning— A Bibliometric Analysis and Reviews**

<https://doi.org/10.3991/ijim.v16i13.30739>

Hassan Abuhassna<sup>1</sup>(✉), Nguyen Thuy Van<sup>1</sup>, Noraffandy Yahaya<sup>1</sup>,  
Megat Aman Zahiri Megat Zakaria<sup>1</sup>, Fareed Awa<sup>2</sup>,  
Diaya Ud Deen Al Zitawi<sup>2</sup>, Kawthar Bayoumi<sup>2</sup>

<sup>1</sup>School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi  
Malaysia (UTM), Johor, Malaysia

<sup>2</sup>Academy of Islamic Civilization, Faculty of Social Sciences and Humanities, Universiti  
Teknologi Malaysia (UTM), Johor, Malaysia  
mahassan@utm.my

**Abstract**—Recently, the term blended learning (BL) emerged as a new trend in teaching models and learning styles with the digital advantages support. This article presents a systematic review of literature that explores the strategies for successful BL in multi-sides to enhance student learning and development outcomes. To reach the objectives, the literature accessed of Scopus and web of science databases covering research published between 2011 and 2021 and 39 items were analysed. The bibliometric analysis identifies the cluster themes based on texting frequency. The vital steps of data classification follow thoughtfully and carefully in the platform of concept, findings, author's reputation, and years published. In the last conclusions of the study, reports explain the past literature and recent outbreak. The results cover three main themes: digital support for student engagement, personalization learning, and instructors of management courses. These findings are expected to benefit stakeholders involved in employing BL in which instructors use integrated technology and online learning materials with traditional face-to-face classroom activities.

**Keywords**—digital support, blended learning, student development, and success

### **1 Introduction**

Since 2020, when the Covid19 pandemic has forced all educational institutions to quickly shift online learning to ensure students continue learning in an urgent situation, the enormous benefits from advanced digital technology in education have been attractive to more advocators. However, after two years of facing the challenges of fully online learning by the Covid19 pandemic, the term BL has widely raised concerns in studies and practices when this concept is considered an approach that combines the advantages afforded by both online learning and Face-to-face settings. Although BL with much discussion today, however, since early 2000, educational organizations have approved different systems of mixing physical classroom instructions with online and other names such as hybrid, blended, and inverted or flipped—to the label of the

integrating online and face-to-face classes [1, 2]. The emphasized of BL advances when this still offers pedagogical richness, flexibility, in addition, to the increase in cost-effectiveness as an online system providing, however, this reduces transactional distance and increases learning engagement, considered valuable for many learners, and enhancing interaction between students and their teachers, students among themselves; and students with their study materials [3–6].

While the shreds of evidence of paybacks from the BL approach in heightening is apparent from countless influential studies, this new norm also was reported with many challenges in previous studies [7, 8]. For example, first, the educational organizations respond in offering the technological system to support BL and the essential guide to both students and educators to certify the effective application of technology, thus, applying the online component successfully [9, 10]. Secondly, teachers are requested to access technological competencies, to implement and manage technology for effective teaching, moreover, to produce and upload teaching materials with transparent sources and copyrights; Lastly, learners are demanded to carry out and handle their studies independently, at their own time and pace, and also using online technology as an alternative to their face-to-face sessions, therefore, they have technological competence and self-directed skills [9, 10] (Attard & Holmes, 2020; Larsen, 2012; Vaughan, 2007). This paper’s structure of digital support in BL to overcome the above-discussed challenges consists of a student engagement, personalization learning, and framework for instructors of management courses.

## 2 Materials and methods

The systematic literature review (S.L.R.) is a framework of meta-analysis and reviews [11]. The PRISMA template clarifies the general research procedure to include and exclude articles in the review. This S.L.R. is restricted to published literature in the BL research area. Two databases were included in this review, Scopus and WoS. The following is the research PRISMA framework.

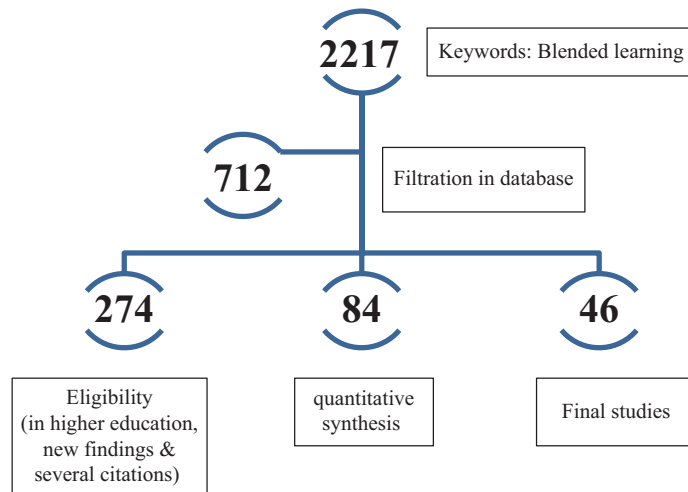


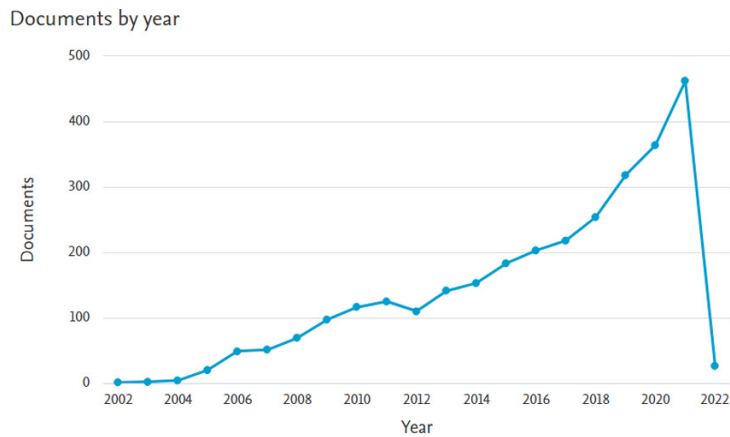
Fig. 1. PRISMA framework

In this review subjects that were selected are, Computer science, Environmental Sciences, Engineering, and Social Sciences. Findings were narrowed down to 712. Further, only published articles were included, English language was chosen in the database. Results have been narrowed down to 274 with limited number of published years and citations. After the removal of irrelevant literature and duplication, 46 studies were included for the review. Figure 1 demonstrates the detailed process of data selection.

### 3 Results

#### 3.1 Descriptive analysis

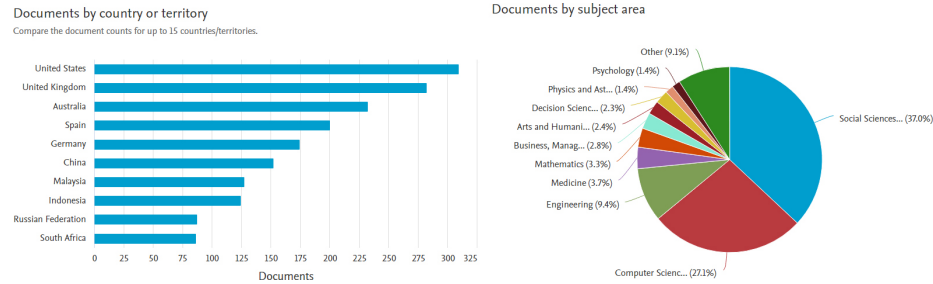
The study focused on BL in higher education with reviews accessed in a digital database.



**Fig. 2.** Number of studies regarding from each year

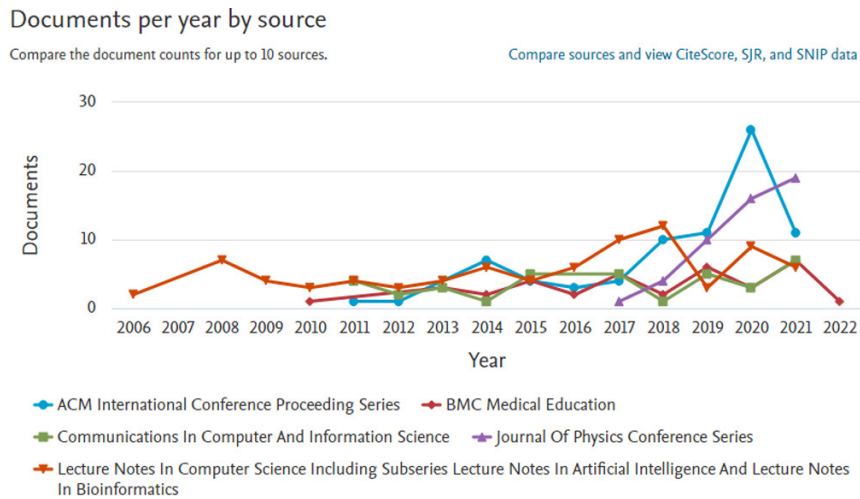
Source: Scopus.com, access in Feb 2022.

Figure 2 shows the significantly growing number of papers from 2018 to 2021 in Scopus databases, such as the year 2021 contributing the highest number with 464, rises of double-time with 254 documents in 2018. And there was a stably increasing number of papers regarding BL published in the years between this period based on the graph of literature, for example, 318 articles in 2019 and 364 papers in 2020. This result shows the witness of BL in higher education has attracted researchers not only since the Covid19 pandemic (2020) but also started in a long time of digital education history.



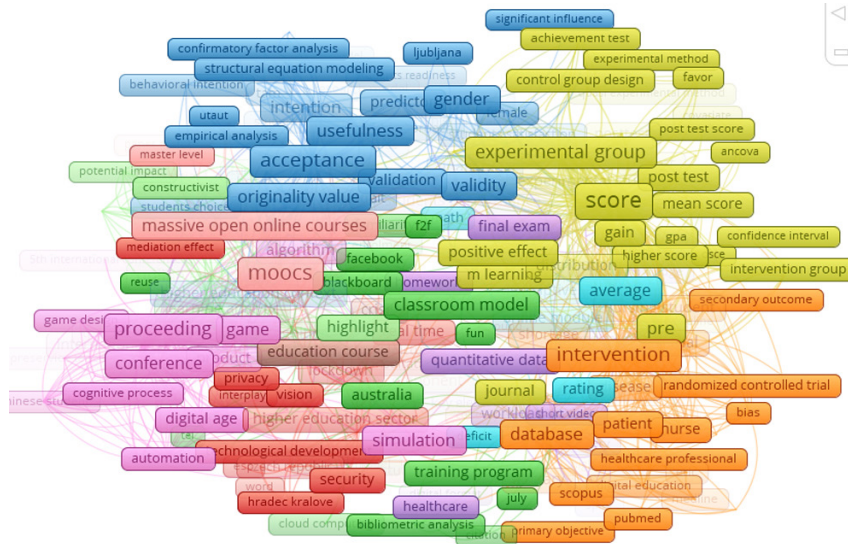
**Fig. 3.** Country and research field base publication

Figure 3 shows the countries and fields base publication. The literature includes three groups of countries with the highest number of published papers. The highest group comprises the United States’ highest studies with 309 articles; the second is the United Kingdom with 282 articles; Australia reached the third high number with 232 articles. The second group includes Spain, Germany, and China with published articles of 200, 174, 152, respectively. Surprisingly, Malaysia and Indonesia are developing countries, arranged at the third group (127, 124); classify of research fields, 02 research areas attracted the majority of papers are social sciences receive highest number 1888 (34,5%) and following is computer science 1383 (23,2%). The findings indicated that investment BLAs the general trends to provide a better digital education environment for student development in developed and developing countries.



**Fig. 4.** Journals base publication per year

Furthermore, the journal base publication analysis is conducted for the current study and finds in a high number of citations; list of 10 Journals selected in this study are ACM International Conference Proceeding Series, BMC Medical Education, Communications in Computer and information sciences, Journal of Physics Conference Series, Lecture Notes in Computer Sciences as illustrated in Figure 4.



**Fig. 5.** Bibliometric analysis with keywords “blended learning in higher education” with 2000 articles in Scopus database, accessed in feb.2022

Figure 5 shows the bibliometric analysis of 2000 articles’ abstracts and titles regarding “blended learning” shows the classification of clusters based on the sequences of keywords. This result indicated that most studies assumed the benefits of blended learning for student learning achievements with the evidence of yellow themes in the map. Such as: “positive, gain, score, high score, achievement test, the experimental group”. The green and blue clutter prefer the BL system structure with the keywords shown on the map, incl using the classroom model, Massive MOOC open online courses, and acceptance model. The themes of cognitive process, digital age, simulation, automation regard to pedagogy in BL. This map results from extensive data analysis for muscularly convincing the themes developed in this review paper.

In the early years of the 21st century, digital technology has emerged impact on education through fast information outbreaks in network technologies and led to fundamental changes in teaching and learning. The review shows a considerable number of studies emphasised the trends of digital education application in “blended learning” when combining online learning and face-to-face to enhance student learning outcomes [12, 13]. However, most of the studies emphasised the benefits of blended learning, such as (1) improved flexible learning and teaching, (2) enhanced student self-directed in the generation of new knowledge and engagement; (3) Promote effective communication between trainers and learners, cooperation between learners and learners; learners and studying materials; (4) an appropriate mix of technologies and learning processes classified in several fields [14, 15] few papers discussed the new modes of instruction how guidance teachers in improving digital skills combine with traditional pedagogies for successful blended learning [16, 17]. This article reviews three crucial clusters of student engagement, personalisation learning, and framework of course management, as the following discussion.

### **3.2 Strategies for successful Blended Learning**

**Student engagement for successful BL.** Student engagement correlates significantly with student learning performance, including academic achievement and satisfaction. Review show a greater weight to studies committed to defining and conceptualizing learner engagement impact to outcomes [18–20]; but lack of studies definitional clarity about student engagement in blended learning, and there was much confusion and debates between facilitators and indicators of engagement during BL [21]. Therefore, in this part, the basic and advanced strategies of student engagement in BL anglicized and discussed to fill the gap and provide the overviews for stakeholders may apply in different goals.

Firstly, it is necessary to realise the facilitator and indicator engagement factors' differences. Facilitators prefer the causal factors which are assumed to impact the student's attention, whereas indicators mention the features inside the construct of engagement proper [22, 23]. In blended learning, [24] suggested the instruments to measure the student engagement in BL need to cover both factors of facilitator and indicator.

Secondly, the student engagement strategies framework in BL needs to be formulated in essential and expanding for participants practices and benefits. In online learning, students usually have isolated feelings covered by the technology environment [25, 26]; therefore, BL without well student engagement and do not bring the exciting feeling for students learning process occurring and achieve new knowledge.

According to [27], effective student engagement involves three support fields: students' cognitive and emotional energy to accomplish a learning task [28, 29]. Generally, students learn new knowledge based on their own experiences and characteristics through study materials. Students will connect with digital learning systems and instructors to support the student during the course in the BL process. The effective instructors in BL are firstly engaging students in the cognitive promotion and emotional expression before students implement learning tasks. The cognitive engagement helps students create the crucial passion of exploring the pathway to achieve new knowledge; this engagement may call mental energy, which leads them to seek study materials they need [26, 30, 31]. However, mental energy is no longer persistent by the rigid structure of complex information from various resources; if there is a lack of emotional energy together, students may drop into procrastination, and poor learning results are hard to avoid. When students have engaged in cognitive and dynamic activities, they would love to gain the grit and willingness to achieve the desired learning outcomes [32, 33].

Several studies have been expanding the model of student engagement in blended learning. Researchers indicated that engaging students focus on setting goals, self-regulation, keep values in cognitive engagement [34, 35]; need help students to identify and belong to the BL system, acceptance and adaption; to have real emotional engagement [36, 37]; especially students who had severe behaviour during the study, such as attendance, participants learning activities; and regularly implement in time management, homework completion and credit accrual, that is successful engagement.

Besides essential factors cognitive and emotional energy together learning tasks completion, the engagement model of [38] add in the task of “Tests personal understandings, limits of the software” and “Interprets software from multiple, personally meaningful perspectives” for own directed and self-interested. [39] preferred the learning skills



engagements as critical strategies. He argued that students should be engaged and trained in online learning skills with the technology environment, practising speedy and deep learning skills; interacting in BL is essential to avoid students dropping into isolated situations. Similarly, “Engagement of the mind” to put more effort, investment in work, also a concern in “strategies for learning effectively” has highlighted to adapt with mastery orientation of complicated system of BL [40]. [41] explains clearly the “intrinsic and extrinsic motivation” and encourage the student in social on-task behaviours to achieve learning goals. In contrast, [42] discussed how weak engagement might negatively affect students, like passivity, giving up, withdrawal, restlessness, inattentiveness, distraction, mental disengagement, burn-out, lack of preparation. These students need to be engaged and assist in academic advising in their context. To sum up, in BL, engagement indicators and facilitators that apply to the contexts of both face-to-face and technology-mediated instruction and the successful engagement outcomes correlated with strength self-learning, high interest an excited, motivation and willingness, and desirable pursuit to achieve learning outcomes [36, 43, 44].

**Personalization learning for success in BL.** BL creates two instructional components (online components and face-to-face) merged as one. Learners and instructors are routinely relocated to the online settings. Therefore, they are required to correctly manage and self-regulate their duties using technology and at their own time and pace [8, 45]. In blended courses, students must exert a higher level of self-control to overcome learner isolation and less interaction time like the face-to-face class that causes student procrastination. The self-directed learning strategies in blended courses prefer the self-efforts self-control in isolated learning their online component [46]. Expending group peer assistance and awareness as external platforms in developing a system for motivating pupils self-regulation behaviour in a BL environment; self-regulation behavior support systems have focused on offering a learning centered setting by repeating a training process to students and guiding them iteratively [47–50].

Unlike face-to-face classes with study materials usually prepared by lectures, in a BL environment, students must practice self- online help-seeking studying materials effectively, self-control, and avoid getting lost by massively media for entertainment with designing by soft wares attractive the youth eyes. Students in BL requires practice search engines (e.g., Google, Google Scholar, Scopus databased, etc.), reviewing conversations or chats on discussion forums, reading, and studying online posts, watching videos from YouTube, etc. to improve student’s metacognition as a scaffolding for accomplishing in-class assignments, tutorials, quizzes or examinations to get the exemplary achievements as curriculum designing [28, 51–53].

The review indicated that the self-directed study in blended learning stressed the need for improving student technological skill. Mainly learners have problem-solving skills in online peer learning, interfaces incompetency, dealing with different specialized users, technical skills, and help-seeking. Students lacking competence and proficiency in using various software and hardware technologies may well not handle the technological complexity effectively [54–56]. Interestingly, the young generation becomes overly excited and distracted with the technology being employed, particularly the software aspect; The institutions equip the excellent quality of BL system for students always request in every university. [16] stated that in BL, “mastery-based learning allows learners to learn in a customized, self-paced atmosphere, Student-centred

learning is another concept that entails personalisation, based on students becoming independent learners with ownership over their studies and assessments” (p12).

**Framework for instructors of management successful BL courses.** In BL, review represented four categories of learning interactions: (1) physical content interaction, (2) in-person human interaction, technology-mediated, (3) technology-mediated and (4) content interaction human interaction [17, 57]. This complex relationship in BL requires the high skills of instructors in course management and teaching, all using skills from several quadrants for several purposes [58].

[59] develops the model of BL’s pedagogy with three organising themes: motivation strategies, supporting students, and creating a community. Effective support student when indicators implement the support the process of cognitive of difficulty [60]; connecting students for further discussion [61, 62], orient learner provide appreciate scaffolding to meet unique learner needs [63]; The motivation strategies to make the student satisfied when the trainer understand individual and group motivation, friendly behaviours and create the learning environment in encouragement student in self-motivated on [64]; support learner motivation by addressing Maslow hierarchy of needs [65]; motivation student to learn is the most imperative [66]; To avoid the boring or isolated learner maybe lead to procrastination and learner unable to continue learning process, developing a community in BL as an integral approach to creating an active environment for students learning together successfully. The strategies for this theme are to encourage collaboration and interaction among all students [67]; develop supportive school culture [68]; Knows and understands techniques for creating a community among participants [69].

Comparing online learning and blended learning [16] stressed a framework to guide the trainers in managing successful BL courses. The frameworks indicated that instructors in BL need to equip several aspects in professional skills when running BL courses. Instructional design, technology assessment, management, improvement, disposition, and pedagogy. In pedagogy, a personalized and flexible pedagogy emerged to fulfil the diverse learning styles, curriculum choice, scheduling, and sub-categories of pacing [70]. In which mastery-based learning enables learners to learn in a self-paced and a personalised, environment always encouraging. Online discussion facilitation is a specific pedagogical skill in BL; that helps the trainer know students’ responses depth and make all learners accountable for participation [71, 72]. The management course (class) skills in both online and face-to-face aspects are unique to BL trainers. The roof of this competence requests instructors needs to know and well control of what learners are learning in the digital space and build their skills and newly acquired knowledge with support pedagogy strategy [73–75]. The assessment in BL requires the trainer in professional skills of using multiple data resources, including personalisation and mastery-based learning data, system data, and helps teachers “adjust individual student instruction” [76, 77].

In BL, the digital system is designed to allow the trainer’s review learner progress often enough to adjust a learner’s homework, assignments, and schedule. A formative assessment with feedback and corrective instruction also supports learners in improvement and self-assessment [78]. In technology, the learning management system (LMS) used is the top technological skills in BL need adaptable content page options or playlist creation software that the trainer does own design as course requirements [79]. Realizing how these software platforms integrate and operate with the in-class



curriculum is critical to providing a sequential integrated curriculum and assisting students through materials [16, 80]. The instructional design in BL with most trainers uses third-party software. They will work with many latitudes and will be able to be creative to find the best mix of OL and in-person learning activities for the students they teach, an instructional design activity [78]. The next factor in the framework is dispositions in BL. This element refers the respect, growth, mindset, and commitment to institutions' opportunities. This mentions the "entrepreneurial spirit" [81] and particularly useful in new BL educational institutions to have indicators that are excited to experiment with technology and innovate in the BL courses. The factor of improvement in BL emphasises the era of fast-changing technologies, trainers who have skills to adapt to change and improve their classes will be at an advantage. The competencies of improving, evaluating, and reflecting on blended teaching practice in the literature were repeatedly encouraged improvement for professional development and enhancing student learning outcomes.

#### 4 Conclusion

BL is widely viewed as a new trend approach that combines the benefits afforded by online learning and face-to-face components and optimising in merits and benefits for stakeholders. Many scholars as "the new normal". Although this model has received much benefits feedback, such as flexible, freedom knowledgeable access, pedagogical enrichens, cost-effectiveness, etc., this complex instruction raised concerns over the years. Several studies have highlighted the overall challenges of blended learning. Thus, a systematic review of the literature was set to draw strategies for successful blended learning to support stakeholders. Using the PRISMA statement and bibliometric analysis, the study further discusses three main methods for successful blended learning: student engagement, personalisation learning, and a framework for instructors in course management. While the theme of student engagement was analysed in cognitive and emotional engagement with various skills support in facilitator and indicator, personalisation learning was interested in discussing the self-directed study, online seeking, and technological skills in smart-based education. And a framework of pedagogy, management, assessment, technology, instructional design, disposition, and improvement has provided an overview for stakeholders using in their own goals when using BL. The results are especially expected to be useful for preservice teachers in their teacher education course and stakeholders involved in BL, such as students, trainees, and administrators.

#### 5 References

- [1] Effendi, H. (2018). Blended learning effectiveness in improving learning access in higher education. In *5th UPI International Conference on Technical and Vocational Education and Training (ICTVET)* (Vol. 2019, pp. 298–301). <https://doi.org/10.2991/ictvet-18.2019.67>
- [2] Cardoso, T., Pestana, F., & Pina, J. A. (2019). You assess a b-learning teaching approach and students' learning preferences in higher education. In *11th International Conference on Education and New Learning Technologies* (pp. 10007–10012). IATED Academy. <https://doi.org/10.21125/edulearn.2019.2502>

- [3] Abuhassna, H., Busalim, A. H., Mamman, B., Yahaya, N., Megat Zakaria, M. A. Z., Al-Maatouk, Q., & Awae, F. (2022a). From student's experience: Does E-learning course structure influenced by learner's prior experience, background knowledge, autonomy, and dialogue. *Contemporary Educational Technology*, 14(1), ep338. <https://doi.org/10.30935/cedtech/11386>
- [4] Abuhassna, H., Al-Rahmi, W.M., Yahya, N. et al. Development of a new model on utilizing online learning platforms to improve students' academic achievements and satisfaction. *Int J Educ Technol High Educ* 17, 38 (2020a). <https://doi.org/10.1186/s41239-020-00216-z>
- [5] Abuhassna, H., Awae, F., Al Zitawi, D. U. D., Bayoumi, K., & Alsharif, A. H. (2022). Hybrid learning for practical-based courses in higher education organizations: A bibliometric analysis. <https://doi.org/10.6007/IJARPED/v11-i1/12861>
- [6] Bruggeman, B., Tondeur, J., Struyven, K., Pynoo, B., Garone, A., & Vanslambrouck, S. (2021). Experts speaking: Crucial teacher attributes for implementing blended learning in higher education. *The Internet and Higher Education*, 48, 100772. <https://doi.org/10.1016/j.iheduc.2020.100772>
- [7] Liu, W., Gao, X., Han, L., Liu, J., & Feng, F. (2021). Blended teaching practices for active learning in higher pharmacy education. *Indian Journal of Pharmaceutical Education and Research*, 55(3), 655–663. <https://doi.org/10.5530/ijper.55.3.137>
- [8] Rasheed, R. A., Kamsin, A., & Abdullah, N. A. (2020). Challenges in the online component of blended learning: A systematic review. *Computers & Education*, 144, 103701. <https://doi.org/10.1016/j.compedu.2019.103701>
- [9] Attard, C., & Holmes, K. (2020). An exploration of teacher and student perceptions of blended learning in four secondary mathematics classrooms. *Mathematics Education Research Journal*, 1–22. <https://doi.org/10.1007/s13394-020-00359-2>
- [10] Vaughan, N. (2007). Perspectives on blended learning in higher education. *International Journal on E-learning*, 6(1), 81–94.
- [11] McCutcheon, K., O'Halloran, P., & Lohan, M. (2018). Online learning versus blended learning of clinical supervisee skills with pre-registration nursing students: A randomised controlled trial. *International Journal of Nursing Studies*, 82, 30–39. <https://doi.org/10.1016/j.ijnurstu.2018.02.005>
- [12] Jayashanka, R., Hewagamage, K. P., & Hettiarachchi, E. (2018, July). Improving blended learning in higher education through the synergy between learning design and learning analytics. In *2018 IEEE 18th International Conference on Advanced Learning Technologies (ICALT)* (pp. 227–228). IEEE. <https://doi.org/10.1109/ICALT.2018.00120>
- [13] McGEE, E., & Poojary, P. (2020). Exploring blended learning relationships in higher education using a systems-based framework. *Turkish Online Journal of Distance Education*, 21(4), 1–13. <https://doi.org/10.17718/tojde.803343>
- [14] Namysova, G., Tussupbekova, G., Helmer, J., Malone, K., Mir, A., & Jonbekova, D. (2019). Challenges and benefits of blended learning in higher education. 2, 22–31.
- [15] Graham, C. R., Allen, S., & Ure, D. (2005). Benefits and challenges of blended learning environments. In *Encyclopedia of Information Science and Technology, First Edition* (pp. 253–259). IGI Global. <https://doi.org/10.4018/978-1-59140-553-5.ch047>
- [16] Pulham, E., & Graham, C. R. (2018). Comparing K-12 online and blended teaching competencies: A literature review. *Distance Education*, 39(3), 411–432. <https://doi.org/10.1080/01587919.2018.1476840>
- [17] Singh, H. (2021). Building effective blended learning programs. In *Challenges and Opportunities for the Global Implementation of E-Learning Frameworks* (pp. 15–23). IGI Global. <https://doi.org/10.4018/978-1-7998-7607-6.ch002>
- [18] Spring, K., & Graham, C. (2017). Thematic patterns in international blended learning literature, research, practices, and terminology. *Online Learning Journal*, 21(4). <https://doi.org/10.24059/olj.v21i4.998>

- [19] Chiu, T. K. (2021). Digital support for student engagement in blended learning based on self-determination theory. *Computers in Human Behavior*, 124, 106909. <https://doi.org/10.1016/j.chb.2021.106909>
- [20] Heilporn, G., Lakhali, S., & Bélisle, M. (2021). An examination of teachers' strategies to foster student engagement in blended learning in higher education. *International Journal of Educational Technology in Higher Education*, 18(1), 1–25. <https://doi.org/10.1186/s41239-021-00260-3>
- [21] Widjaja, G., & Aslan, A. (2022). Blended learning method in the view of learning and teaching strategy in geography study programs in higher education. *Nazhruna: Jurnal Pendidikan Islam*, 5(1), 22–36. <https://doi.org/10.31538/nzh.v5i1.1852>
- [22] Skinner, E., Furrer, C., Marchand, G., & Kindermann, T. (2008). Engagement and disaffection in the classroom: Part of a larger motivational dynamic? *Journal of Educational Psychology*, 100(4), 765–781. <https://doi.org/10.1037/a0012840>
- [23] Lane, S., Hoang, J. G., Leighton, J. P., & Rissanen, A. (2021). Engagement and satisfaction: Mixed-method analysis of blended learning in the sciences. *Canadian Journal of Science, Mathematics and Technology Education*, 21(1), 100–122. <https://doi.org/10.1007/s42330-021-00139-5>
- [24] Tayebinik, M., & Puteh, M. (2012). Blended learning or e-learning? *International Magazine on Advances in Computer Science and Telecommunications*, 3(1), 103–110.
- [25] de Brito Lima, F., Lautert, S. L., & Gomes, A. S. (2021). Contrasting levels of student engagement in blended and non-blended learning scenarios. *Computers & Education*, 172, 104241. <https://doi.org/10.1016/j.compedu.2021.104241>
- [26] Gao, B. W., Jiang, J., & Tang, Y. (2020). The effect of blended learning platform and engagement on students' satisfaction—the case from the tourism management teaching. *Journal of Hospitality, Leisure, Sport & Tourism Education*, 27, 100272. <https://doi.org/10.1016/j.jhlste.2020.100272>
- [27] Astin, A. W. (1984). Student involvement: A developmental theory for higher education. *Journal of College Student Personnel*, 40(5), 518–529. Retrieved from <https://www.middlesex.mass.edu/tutoringservices/downloads/astininv.pdf>
- [28] Fisher, R., Perényi, Á., & Birdthistle, N. (2021). 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>
- [29] Schunk, D. H., & Mullen, C. A. (2012). Self-efficacy as an engaged learner. In *Handbook of research on student engagement* (pp. 219–235). Springer, Boston, MA. [https://doi.org/10.1007/978-1-4614-2018-7\\_10](https://doi.org/10.1007/978-1-4614-2018-7_10)
- [30] Czaplinski, I., & Fielding, A. L. (2020). Developing a contextualised blended learning framework to enhance medical physics student learning and engagement. *Physica Medica*, 72, 22–29. <https://doi.org/10.1016/j.ejmp.2020.03.010>
- [31] Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *The internet and higher education*, 7(2), 95–105. <https://doi.org/10.1016/j.iheduc.2004.02.001>
- [32] Dwivedi, A., Dwivedi, P., Bobek, S., & Zabukovšek, S. S. (2019). Factors affecting students' engagement with online content in blended learning. *Kybernetes*. <https://doi.org/10.1108/K-10-2018-0559>
- [33] Iqbal, J., Asghar, M. Z., Ashraf, M. A., & Yi, X. (2022). The impacts of emotional intelligence on students' study habits in blended learning environments: The mediating role of cognitive engagement during COVID-19. *Behavioral Sciences*, 12(1), 14. <https://doi.org/10.3390/bs12010014>
- [34] Appleton, K. (2008). Developing science pedagogical content knowledge through mentoring elementary teachers. *Journal of Science Teacher Education*, 19(6), 523–545. <https://doi.org/10.1007/s10972-008-9109-4>

- [35] Fredricks, J. A., Blumenfeld, P., Friedel, J., & Paris, A. (2005). School engagement. In *What do children need to flourish?* (pp. 305–321). Springer, Boston, MA. [https://doi.org/10.1007/0-387-23823-9\\_19](https://doi.org/10.1007/0-387-23823-9_19)
- [36] Halverson, L. R., & Graham, C. R. (2019). Learner engagement in blended learning environments: A conceptual framework. *Online Learning*, 23(2), 145–178. <https://doi.org/10.24059/olj.v23i2.1481>
- [37] McGuinness, C., & Fulton, C. (2019). Digital literacy in higher education: A case study of student engagement with e-tutorials using blended learning. *Journal of Information Technology Education: Innovations in Practice*, 18, 001–028. <https://doi.org/10.28945/4190>
- [38] Bangert-Drowns, R. L., & Pyke, C. (2001). A taxonomy of student engagement with educational software: An exploration of literate thinking with electronic text. *Journal of Educational Computing Research*, 24(3), 213–234. <https://doi.org/10.2190/OCKM-FKTR-0CPF-JLGR>
- [39] Handelsman, M. M., Briggs, W. L., Sullivan, N., & Towler, A. (2005). A measure of college student course engagement. *The Journal of Education*, 98(3), 184–191. Retrieved from <https://doi.org/10.3200/JOER.98.3.184-192>
- [40] Martin, A. J. (2007). Examining a multidimensional model of student motivation and engagement using a construct validation approach. *British Journal of Educational Psychology*, 77(2), 413–440. <https://doi.org/10.1348/000709906X118036>
- [41] Pekrun, R., & Linnenbrink-Garcia, L. (2012). Academic emotions and student engagement. In n S. L. Christenson, A. L., Reschly, & C. Wylie (Eds.), *Handbook of Research on Student Engagement* (pp. 259–282). New York, NY: Springer. <https://doi.org/10.1007/978-1-4614-2018-7>
- [42] Skinner, E., Furrer, C., Marchand, G., & Kindermann, T. (2008). Engagement and disaffection in the classroom: Part of a larger motivational dynamic? *Journal of Educational Psychology*, 100(4), 765–781. <https://doi.org/10.1037/a0012840>
- [43] Chapman, C., Laird, J., & Kewalramani, A. (2011). *Trends in High School Dropout and Completion Rates in the United States: 1972–2008. Population*. Washington, DC.: National Center for Educational Statistics.
- [44] Rumberger, R. W., & Rotermund, S. (2012). The relationship between engagement and high school dropout. In *Handbook of Research on Student Engagement* (pp. 491–513). Springer, Boston, MA. [https://doi.org/10.1007/978-1-4614-2018-7\\_24](https://doi.org/10.1007/978-1-4614-2018-7_24)
- [45] Madou, T., & Iserbyt, P. (2020). Mastery versus self-directed blended learning in essential life support: a randomised controlled trial. *Acta Cardiologica*, 75(8), 760–766. <https://doi.org/10.1080/00015385.2019.1677374>
- [46] Bahri, A., Idris, I. S., Muis, H., Arifuddin, M., Fikri, M., & Nidhal, J. (2021). Blended learning integrated with innovative learning strategy to improve self-regulated learning. *International Journal of Instruction*, 14(1), 779–794. <https://doi.org/10.29333/iji.2021.14147a>
- [47] Lin, Z., Carvalho, B. R., Kahn, E., Lv, R., Rao, R., Terrones, H., ... & Terrones, M. (2016). Defect engineering of two-dimensional transition metal dichalcogenides. *2D Materials*, 3(2), 022002. <https://doi.org/10.1088/2053-1583/3/2/022002>
- [48] Wittmann, G. E., & Olivier, J. (2021). Blended learning as an approach to foster self-directed learning in teacher professional development programs. *The Independent Journal of Teaching and Learning*, 16(2), 71–84.
- [49] Onah, D. F., Pang, E. L., Sinclair, J. E., & Uhomobhi, J. (2021). An innovative MOOC platform: The implications of self-directed learning abilities to improve learning motivation and support self-regulation. *The International Journal of Information and Learning Technology*. <https://doi.org/10.1108/IJILT-03-2020-0040>
- [50] Martínez, S., Guíñez, F., Zamora, R., Bustos, S., & Rodríguez, B. (2020). On the instructional model of a blended learning program for developing mathematical knowledge for teaching. *ZDM*, 52(5), 877–891. <https://doi.org/10.1007/s11858-020-01152-y>

- [51] 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>
- [52] Dakhi, O., Jama, J., & Irfan, D. (2020). Blended learning: A 21st century learning model at college. *International Journal of Multi Science*, 1(08), 50–65.
- [53] Anthonysamy, L., Koo, A. C., & Hew, S. H. (2020). Self-regulated learning strategies and non-academic outcomes in higher education blended learning environments: A one decade review. *Education and Information Technologies*, 25(5), 3677–3704. <https://doi.org/10.1007/s10639-020-10134-2>
- [54] Prasad, P. W. C., Maag, A., Redestowicz, M., & Hoe, L. S. (2018). Unfamiliar technology: Reaction of international students to blended learning. *Computers & Education*, 122, 92–103. <https://doi.org/10.1016/j.compedu.2018.03.016>
- [55] Alamri, H. A., Watson, S., & Watson, W. (2021). Learning technology models that support personalisation within blended learning environments in higher education. *TechTrends*, 65(1), 62–78. <https://doi.org/10.1007/s11528-020-00530-3>
- [56] Jalinus, N. (2021). Developing blended learning model in vocational education based on 21st century integrated learning and industrial revolution 4.0. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, 12(8), 1239–1254.
- [57] Graham, M., Hjorth, I., & Lehdonvirta, V. (2017). Digital labour and development: impacts of global digital labour platforms and the gig economy on worker livelihoods. *Transfer: European review of labour and research*, 23(2), 135–162. <https://doi.org/10.1177/1024258916687250>
- [58] Armellini, A., & Rodriguez, B. C. P. (2021). Active blended learning: Definition, literature review, and a framework for implementation. *Cases on Active Blended Learning in Higher Education*, 1–22. <https://doi.org/10.4018/978-1-7998-7856-8.ch001>
- [59] Attridge-Stirling, J. (2001). Thematic networks: An analytic tool for qualitative research. *Qualitative Research*, 1, 385–405. <https://doi.org/10.1177/146879410100100307>
- [60] Bryan, A., & Volchenkova, K. N. (2016). Blended learning: Definition, models, implications for higher education. *Вестник Южно-Уральского государственного университета. Серия: Образование. Педагогические науки*, 8(2), 24–30. <https://doi.org/10.14529/ped160204>
- [61] DiPietro, M., Ferdig, R. E., Black, E. W., & Preston, M. (2008). Best practices in teaching K-12 online: Lessons learned from Michigan Virtual School teachers. *Journal of Interactive Online Learning*, 7(1), 10–35. Retrieved from <http://www.ncolr.org/jiol>
- [62] Ma, J., Li, Y., Grundish, N. S., Goodenough, J. B., Chen, Y., Guo, L., ... & Wan, L. J. (2021). The 2021 battery technology roadmap. *Journal of Physics D: Applied Physics*, 54(18), 183001. <https://doi.org/10.1088/1361-6463/abd353>
- [63] Graham, C. R. (2006). Blended learning systems. *The Handbook of Blended Learning: Global Perspectives, Local Designs*, 1, 3–21.
- [64] Valiathan, P. (2002). Blended learning models. *Learning Circuits*, 3(8), 50–59.
- [65] Moskal, P., Dziuban, C., & Hartman, J. (2013). Blended learning: A dangerous idea? *The Internet and Higher Education*, 18, 15–23. <https://doi.org/10.1016/j.iheduc.2012.12.001>
- [66] Bakia, M., Anderson, K., Heying, E., Keating, K., & Mislevy, J. (2011). Implementing online learning labs in schools and districts: Lessons from Miami-Dade's first year. Menlo Park, CA: SRI International.
- [67] Fleischmann, K. (2021). Hands-on versus virtual: Reshaping the design classroom with blended learning. *Arts and Humanities in Higher Education*, 20(1), 87–112. <https://doi.org/10.1177/1474022220906393>
- [68] Staker, H. (2011). The Rise of K-12 Blended Learning: Profiles of Emerging Models. *InnoSight Institute*.



- [69] Ellis, R. A., Bliuc, A. M., & Han, F. (2021). Challenges in assessing the nature of effective collaboration in blended university courses. *Australasian Journal of Educational Technology*, 37(1), 1–14. <https://doi.org/10.14742/ajet.5576>
- [70] Sullivan, F. R. (2021). Critical pedagogy and teacher professional development for online and blended learning: The equity imperative in the shift to digital. *Educational Technology Research and Development*, 69(1), 21–24. <https://doi.org/10.1007/s11423-020-09864-4>
- [71] Lozano, J. F. (2012). Educating responsible managers. The role of university ethos. *Journal of Academic Ethics*, 10(3), 213–226. <https://doi.org/10.1007/s10805-012-9166-3>
- [72] Shantini, Y., Hidayat, D., Oktiawanti, L., & Mitsuru, T. (2021). Multilevel design in the implementation of blended learning in nonformal education unit. *Journal of Nonformal Education*, 7(1), 55–64. <https://doi.org/10.15294/jne.v7i1.27544>
- [73] Tucker, B. (2012). The flipped classroom. *Education Next*, 12(1), 82–83.
- [74] Tubagus, M., Muslim, S., & Suriani, S. (2020). Development of learning management system-based blended learning model using caroline in higher education. <https://doi.org/10.3991/ijim.v14i06.13399>
- [75] Alomari, M. M., El-Kanj, H., Alshdaifat, N. I., & Topal, A. (2020). A framework for the impact of human factors on the effectiveness of learning management systems. *IEEE Access*, 8, 23542–23558. <https://doi.org/10.1109/ACCESS.2020.2970278>
- [76] Knoblauch, C. (2022). Combining and balancing project-based and blended learning in education. *International Journal of Advanced Corporate Learning*, 15(1). <https://doi.org/10.3991/ijac.v15i1.27135>
- [77] Högberg, K. (2022). Learning to lead from a distance: Reflexive learning during a pandemic. *International Journal of Advanced Corporate Learning*, 15(1). <https://doi.org/10.3991/ijac.v15i1.27643>
- [78] Oliver, K., & Stallings, D. (2014). Preparing teachers for emerging blended learning environments. *Journal of Technology and Teacher Education*, 22(1), 57–81.
- [79] Mia, R., Zahid, A. H., Nath, B. C. D., & Hoque, A. S. M. L. (2020, December). A conceptual design of virtual internship system to benchmark software development skills in a blended learning environment. In *2020 23rd International Conference on Computer and Information Technology (ICCIT)* (pp. 1–6). IEEE. <https://doi.org/10.1109/ICCIT51783.2020.9392670>
- [80] Arney, L. (2015). *Go blended! A handbook for blending technology in schools*. San Francisco, CA: Jossey-Bass.
- [81] Powell, A., Rabbitt, B., & Kennedy, K. (2014). iNACOL blended learning teacher competency framework. *International Association for K–12 Online Learning*.

## 6 Authors

**Hassan Abuhassna**, School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia (UTM), 81310 Skudai, Johor, Malaysia.

**Nguyen Thuy Van**, School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia (UTM), 81310 Skudai, Johor, Malaysia. E-mail: [thuyvannnguyen@utm.my](mailto:thuyvannnguyen@utm.my)

**Noraffandy Yahaya**, School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia (UTM), 81310 Skudai, Johor, Malaysia. E-mail: [p-afandy@utm.my](mailto:p-afandy@utm.my)

**Megat Aman Zahiri Megat Zakaria**, School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia (UTM), 81310 Skudai, Johor, Malaysia. E-mail: [megataman@utm.my](mailto:megataman@utm.my)



**Fareed Awa**, Academy of Islamic Civilization, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia (UTM), 81310 Skudai, Johor, Malaysia. E-mail: [afareed@utm.my](mailto:afareed@utm.my)

**Diaya Ud Deen Al Zitawi**, Academy of Islamic Civilization, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia (UTM), 81310 Skudai, Johor, Malaysia. E-mail: [diaya@utm.my](mailto:diaya@utm.my)

**Kawthar Bayoumi**, Academy of Islamic Civilization, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia (UTM), 81310 Skudai, Johor, Malaysia. E-mail: [amkawthar@utm.my](mailto:amkawthar@utm.my)

Article submitted 2022-03-08. Resubmitted 2022-04-25. Final acceptance 2022-04-25. Final version published as submitted by the authors.