Blended Learning Adoption and Implementation in Higher Education: A Theoretical and Systematic Review

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Abstract

Technological innovations such as blended learning (BL) are rapidly changing teaching and learning in higher education, where BL integrates face to face teaching with web based learning. Thus, as polices related to BL increases, it is required to explore the theoretical foundation of BL studies and how BL were adopted and implemented in relation to students, lecturers and administration. However, only fewer studies have focused on exploring the constructs and factors related to BL adoption by considering the students, lecturers and administration concurrently. Likewise, prior research neglects to explore what practices are involved for BL implementation. Accordingly, this study systematically reviews, synthesizes, and provides meta-analysis of 94 BL research articles published from 2004 to 2020 to present the theoretical foundation of BL adoption and implementation in higher education. The main findings of this study present the constructs and factors that influence students, lecturers and administration towards adopting BL in higher education. Moreover, findings suggest that the BL practices to be implemented comprises of face-to-face, activities, information, resources, assessment, and feedback for students and technology, pedagogy, content, and knowledge for lecturers. Besides, the review reveals that the ad hoc, technology acceptance model, information system success model, the unified theory of acceptance and use of technology, and lastly diffusion of innovations theories are the mostly employed theories employed by prior studies to explore BL adoption. Findings from this study has implications for student, lecturers and administrators by providing insights into the theoretical foundation of BL adoption and implementation in higher education.

Keywords Teaching and learning in digital environments · Blended learning adoption and implementation · Students' attitude · Students' perspective · Higher education

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1 Introduction

Blended learning (BL) has increasingly been utilized in higher education as it has the advantages of both traditional and online teaching approaches (Poon 2014). Findings from prior studies Edward et al. (2018); Ghazal et al. (2018) indicated that BL approach enhances students' learning engagement and experience as it creates a significant influence on students' awareness of the teaching mode and learning background. BL moves the emphasis from teaching to learning, thus enabling students to become more involved in the learning process and more enthused and, consequently, improves their perseverance and commitment (Ismail et al. 2018a). Poon (2014) concluded that BL is likely to be developed as the leading teaching approach for the future as one of the top ten educational trends to occur in the twentyfirst century. Poon (2014) started that the question is not whether higher education should adopt BL but rather the question should be aligned to the practice that should be included for successfully BL implementation.

The phrase blended learning was previously associated with classroom training to e-learning activities (Graham et al. 2013). Accordingly, BL is the integration of traditional face-to face and e-learning teaching paradigm (Wong et al. 2014). BL employs a combination of online-mediated and face-to-face (F2F) instruction to help lecturers attain pedagogical goals in training students to produce an algorithmic and constructive rational skill, aids to enhance teaching qualities, and achieve social order (Subramaniam and Muniandy 2019). BL entails the combination of different methods of delivery, styles of learning, and types of teaching (Kaur 2013). BL is frequently used with terms such as integrated, flexible, mixed mode, multi-mode or hybrid learning (Garrison and Kanuka 2004; Moskal et al. 2013). BL comprises integration of various initiatives, achieved by combining of 30% F2F interaction with 70% IT mediated learning (Anthony et al. 2019). Similarly, Owston et al. (2019) recommended that a successful BL delivery comprises of 80% high quality online learning integrated with 20% classroom teaching that is linked to online content. Respectively, BL is the combination of different didactic approaches (cooperative learning, discovery learning expository, presentations, etc.) and delivery methods (personal communication, broadcasting, publishing, etc.) (Graham 2013; Klentien and Wannasawade 2016).

Research has found that online systems possess the capability of providing platforms for competent practices in offering alternative to real-life environment, offering students a usable avenue for learning which support students to improve the quality of learning (Wong et al. 2014; Ifenthaler et al. 2015). When prudently and accurately deployed, IT can be deployed to achieve a reliable learning experience with practical relevancy to engage and motivate students (Tulaboev 2013). Thus, BL facilitates students to not only articulate learning but to also test on the knowledge they have attained through the semester (Aguti et al. 2013). Moreover, BL offers flexibility for students and lecturer, improved personalization, improved student outcomes, encourages growth of autonomy and self-directed learning, creates prospects for professional learning, reduced cost proficiencies, increases communication between students and lecturer, and among students (So and Brush 2008; Spring et al 2016). BL emboldens the reformation of pedagogic policies with the prospective to recapture the ideals of universities (Heinze and Procter 2004). BL seeks to produce a harmonious and coherent equilibrium between online access to knowledge and traditional human teaching by considering students' and lecturers' attitudes (Bervell and Umar 2018). BL therefore remains a significant pedagogical concept as its main focus is aligned with providing the most effective teaching and learning experience (Wang et al. 2004).

BL offers access to online resources and information that meet the students' level of knowledge and interest. It supports teaching conditions by offering opportunities for professional collaboration, and also improve time adeptness of lecturers (Guillén-Gámez et al. 2020; Owston et al. 2019). BL proliferates students' interest in their individual learning progression (Chang-Tik 2018), facilitates students to study at their own speed, and further organize students for future by providing real-world skills (Ustunel and Tokel 2018), that assist students to directly apply their academic skills, self-learning abilities, and of course computer know how into the working force (Güzer and Caner 2014; Yeou 2016). As pointed out by Al-shami et al. (2018) BL improves social communication in university' communities, improves students' aptitude and self-reliance, increased learning quality, improve critical thinking in learning setting and incorporate technology as an operative tool to convey course contents to students (Bailey et al. 2015; Baragash and Al-Samarraie 2018a).

Existing studies mainly considered BL in the context of students and lecturers in improving teaching and learning. Prior studies paid attention to BL adoption towards improving the quality of student learning and lecturers teaching. But only fewer studies explored BL implementation process as well explored administrators' who initiate policies related to BL adoption in higher education. To fill this gap in knowledge, this current study aims to systematically reviews and synthesizes prior studies that explored BL adoption and implementation related to students, lecturers and administration based on the following six research questions:

RQ1 What are the research methods, countries, contexts, and publication year of selected BL studies?
RQ2 Which BL studies proposed model related to BL adoption in higher education?
RQ3 Based on RQ2 what are the theories, location, and context of the selected BL studies?
RQ4 Based on RQ3 what are the constructs of the identified theories employed to explore BL adoption in higher education?
RQ5 What are the constructs and factors that influence students, lecturers and administration towards adopting BL?
RQ6 What are the practices involved for BL implementation in higher education?

Therefore, to address the research questions this study review and report on BL adoption model (constructs and factors), BL implementation processes, prior theories employed, and related studies that were mainly focused on BL adoption in relation to students, lecturers, and administrator's perspective. The remainder of the article is organized as follows. Section 2 is the literature review. Section 3 is the methodology and Sect. 4 describes the findings and discussion. Section 5 is the implications and Sect. 6 is the conclusion, limitation, and future works.

2 Literature Review

Learning in higher education refers to process of acquiring new knowledge, skills, intellectual abilities which can be utilized to successfully solve problems. The deployment of technologies in teaching and learning is not a new paradigm in higher education (Poon 2012). Undeniably, in the twentyfirst century students are familiar with digital environments and

therefore lecturers are encouraged to use Information Technology (IT) in teaching to stimulate and employ students' learning (Ifenthaler and Widanapathirana 2014; Edward et al. 2018). Teaching and learning with the aid of BL practices have become a common teaching approach to involve students in learning (Garrison and Kanuka 2004). As such, BL has progressed to incorporate diverse learning strategies and is renowned as one of the foremost trends in higher education (Ramakrisnan et al. 2012). BL provides pedagogical productivity, knowledge access, collective collaborations, personal development, cost efficiency, simplifies corrections and further resolves problems related to attendance (Mustapa et al. 2015). Findings from prior studies (Wai and Seng 2015; Nguyen 2017) suggested that BL offers benefits and is also productive than traditional e-learning.

BL in higher education is a prevailing approach to create a more collaborative and welcoming learning environment to curb students' anxiety and fear of making mistakes (Wong et al. 2014). Adopted in universities in the late 1990s (Edward et al. 2018), it found wider acceptance in the 2000s with many more university courses offered in blended mode (Graham et al. 2013). BL employs a combination of online-mediated and face-to-face instruction to help lecturers attain pedagogical goals in training students to produce algorithmic and constructive rational skills, aids to enhance teaching qualities and achieve social order (Kaur 2013). Some researchers [such as Bowyer and Chambers (2017)] argued that technology integration in teaching promotes learning via discovery. And adds interactivity and more motivation, leading to better feedback, social interactions, and use of course materials (Sun and Qiu 2017).

As seen in Fig. 1, BL implementation usually involves F2F and other corresponding online learning delivery methods. Normally, students attend traditional lecturer-directed F2F classes with computer mediated tools to create a BL environment in gaining experiences and also promote learners' learning success and engagement (Moskal et al. 2013; Baragash and Al-Samarraie 2018b). In fact, Graham (2013); Graham et al. (2013) projected that BL will become the new course delivery model that employs different media resources to strengthen the interaction among students. BL provide motivating and meaningful learning through different asynchronous and synchronous teaching strategies such as forums, social networking, live chats, webinars, blog, etc. that provides more opportunities for reflection and feedback from students (Graham 2013; Moskal et al. 2013; Dakduk et al. 2018).
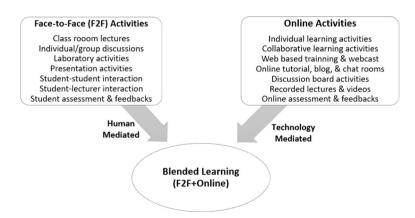

Fig. 1 Key aspects of BL derived from (Graham 2013; Moskal et al. 2013)

BL is facilitated with virtual learning management systems such as Blackboard WebCT, Moodle, and other Web 2.0 platforms which are employed to facilitate collaborative learning between students and lecturers (Edward et al. 2018; Anthony et al. 2019). Accordingly, Aguti et al. (2014) stated that 80 percent of institutions in developed regions dynamically employ BL approach to support teaching and learning, with 97 percent of institutions reported to be deploying one or more forms of IT mediated learning. Figure 1 indicates that BL instructional design and type of delivery includes online activities such as wordbook, reading materials, online writing tool, message board, web links, tutorials, discussion forum, reference material, simulations, quizzes, etc. (Anthony et al. 2019). Conversely, F2F teaching involves lectures, laboratory activities, assessment skill practices, presentation, individual/group, and discussions carried out by the lecturer to examine the learning performance of students (Sun and Qiu 2017).

There has been rapid development in BL adoption focused on improving teaching and learning outcome, thus prior studies assessed the effectiveness of BL by comparing the traditional teaching and online teaching (Van Laer and Elen 2020). However, there are limited studies that investigated the theoretical foundation of BL adoption and implementation for teaching and learning (Wai and Seng 2015), and very limited studies focused on investigating administrative adoption related to BL. To this end, Garrison and Kanuka (2004) mentioned that it is important to examine BL adoption from the lens of institutions administrators. Researchers such as Wong et al. (2014) argued that while there are studies in BL, research that focused on BL adoption and implementation are limited, and that this is a gap to be addressed. Given the above insights, it is felt that more BL based research is needed to guide policy makers to strategically adopt BL in higher education towards improving learning and teaching. Therefore, this study systematically reviews and synthesizes prior studies that explored students, lecturers and administration adoption and implementation of BL.

3 Methodology

It is important to carry out an extensive literature review before starting any research investigation (Anthony et al. 2017a). Literature review finds research gaps that exists and reveals areas where prior studies has not fully explored (Anthony et al. 2017b). Likewise, a systematic literature review is a review that is based on unambiguous research questions, defines and explores pertinent studies, and lastly assesses the quality of the studies based on specified criteria (Al-Emran et al. 2018). Accordingly, this study followed the recommendation postulated by Kitchenham and Charters's (2007) in reporting a systematic review. Therefore, the research design for this study comprises of five phases which includes the specification of inclusion and exclusion criteria, presenting of search strategies and data sources, quality assessment, and data coding and analysis, and lastly findings. The research design of this review study is shown in Fig. 2.

Figure 2 depicts the research design for this study, where each phase is presented in the subsequent sub-sections.

3.1 Inclusion and Exclusion Criteria

The inclusion and exclusion criteria (Table 1) and quality assessment criteria (see Table 2) are employed as the sampling/selection methods used to select the articles involved in this study. The inclusion and exclusion criteria are defined in Table 1.
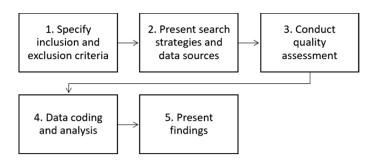
Fig. 2 Research design for SLR

3.2 Search Strategies and Data Sources

The articles involved in this study were retrieved through a comprehensive search of prior studies via online databases which included Google Scholar, ScienceDirect, Emerald, IEEE, Sage, Taylor & Francis, Inderscience, Springer, and Wiley. The search was undertaken in December 2018 and March 2020. The search terms comprise the keywords (("blended learning practices" OR "blended learning variables" OR "blended learning factors" OR "blended learning constructs") AND ("implementation" OR

Table 1 Inclusion and exclusion criteria

Inclusion	Exclusion
Should involve BL implementation practice or adoption constructs/variables and factors	Studies that do not present BL implementation practice or adoption constructs/variables and factors
Should employ a model, framework or theory for investigation related to BL	Models, frameworks or theories used in contexts other than BL
Should be written in English and published between 2004 and 2020	Studies that use languages other than English
Studies that involved BL teaching and learning in relation to students, lecturers and administrators	BL studies that do not involve students, lecturers and administrators

Table 2 Quality assessment criteria

#	Questions
1	Is the research aims plainly stated?
2	Are any BL practices considered in the study?
3	Are the constructs and factors considered in the study?
4	Is the study context visibly specified?
5	Does the article develop a model/framework or based on existing theory?
6	Are the data collection methods sufficiently detailed?
7	Does the article explain the reliability and validity of the variables?
8	Are statistical approaches employed to analyze the data?
9	Are the results clearly discussed?
10	Are the implications of the study clearly presented?

"adoption" OR "approach" OR "model" OR "framework" OR "theory")) AND ("components" OR "elements")). The mixture of the keywords is a crucial step in any systematic review as it defines articles that will be retrieved.

Figure 3 depicts the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) flowchart which was employed for searching and refining of the articles as previously utilized by Al-Emran et al. (2018). The search output presented 388 articles using the above stated keywords. 93 articles were establish as duplicates, as such were removed. Therefore, resulted to 302 articles. The authors checked the articles against the inclusion and exclusion criteria and added 12 new articles based on snowballing techniques which was used to get more articles from the references of 82 studies. Accordingly, 94 research articles meet the inclusion criteria and were included in the review process. Additionally, four studies (Kitchenham and Charters 2007; Anthony et al. 2017, b; Al-Emran et al. 2018) were included in the reference since they discuss SLR process.
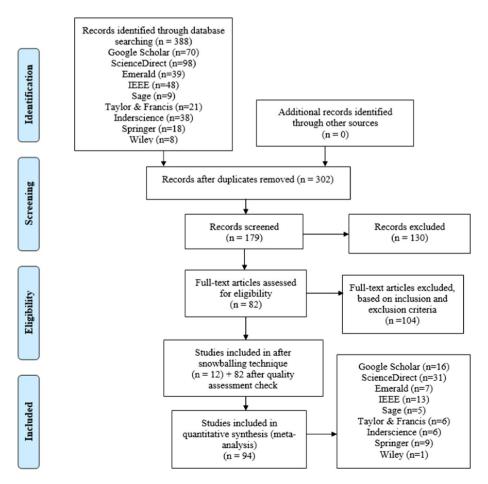

Fig. 3 PRISMA flowchart for the selected articles

3.3 Quality Assessment

One of the vital determinants that are required to be checked along with the inclusion and exclusion criteria is the quality assessment. To this end, a quality assessment checklist which comprises of "10" criteria was designed and employed as a means for evaluating the quality of the studies selected (n = 94) (see Fig. 3). The quality assessment checklist is shown in Table 2. The checklist was adapted from recommendation from (Kitchenham and Charters 2007). Accordingly, the question was measured based on a 3-point scale which ranges from, 1 point being assigned for "Yes", 0 point for "No", and 0.5 point for "Partially". Hence, each article score ranges from 0 to 10, where a study that attains higher total score, possess the capability to provide addresses the specified research questions. Table 11 in appendix shows the quality assessment results for all the 94 studies. Respectively, it is apparent that the selected studies have passed the quality assessment, which indicates that all the articles are eligible to be utilized for further meta-analysis.

3.4 Data Coding and Analysis

The characteristics related to the research methodology outcome were coded to include purpose of research, (BL adoption constructs and factors or BL implementation practice), research approach (e.g., literature review, conceptual, survey questionnaire, case study interviews, or experimental), country, context (e.g., student, lecturer and/or administrator), and model/framework or theory employed (e.g., Technology Acceptance Model (TAM), information system success model, the Unified Theory of Acceptance and Use of Technology (UTAUT), Diffusion of Innovations theory (DoI), Adhoc, etc.). In between the data analysis procedure, the articles that did not directly describe BL adoption model variables and implementation practices were excluded from the synthesis.

4 Findings and Discussion

Based on the selected 94 studies published in regard to BL adoption and implementation from 2004 to 2020, this review reports the findings of this systematic review in relation to the specified six research questions.

4.1 RQ1: What are the Research Methods, Countries, Contexts, and Publication Year of Selected BL Studies?

With regard to the first research question, the findings for distribution of studies related to BL adoption and implementation in higher education based on year of publication is presented in Fig. 4. As shown, the studies are ranged from 2004 to 2020. Findings from Fig. 4 indicate that there seems to be an increase in studies on BL over the last few years as seen from 2004 to 2020, with 2018 being the highest with publications on BL adoption and implementation with 17 studies published. It is evident that the frequency of these publications in 2018 could be accredited to the fact that the intensity of BL implementation in 2018 across higher education has improved mainly in developed and developing countries across the world.
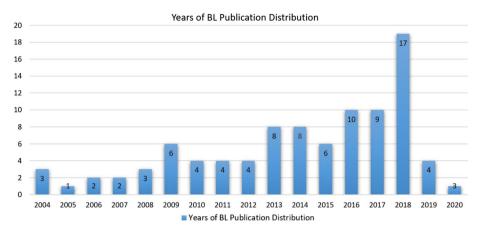
Fig. 4 Distribution of selected BL studies in terms of years

Considering the research methodology applied in the 94 BL studies, findings from Fig. 5 show that questionnaire survey is the most employed method for data collection (N=49, 62%), followed by studies that were conceptual by design with (N=14, 16%). Next, is studies that adopted mixed method both survey and interview with (N=11, 13%) and studies that are qualitative in nature as case study/interview with (N=8, 9%). For the remaining studies (N=5, 5%) employed experimental using LMS dataset, (N=4, 4%) conducted literature review, and lastly only (N=1, 1%) study deployed a mixed experimental and survey approach. These findings are analogous with the prior review studies conducted by (Holton
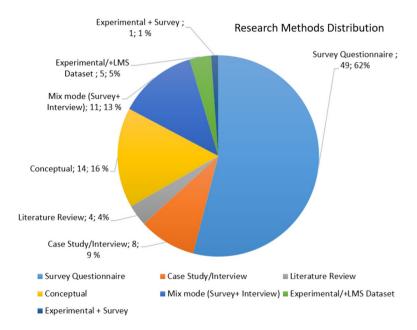

Fig. 5 Distribution of selected BL studies in terms of research methods

III et al. 2006; Kumara and Pande 2017) who discussed that quantitative studies were the main approach employed in prior BL studies. Furthermore, this finding is consistent with the fact that surveys are considered as the most suitable tool to collect data in validating constructs/factors in developed BL adoption model in investigating students and lecturers' perceptions towards BL practice in higher education (Ghazali et al. 2018; Ismail et al. 2018b).

With regard to the 94 BL studies country distribution, findings from Fig. 6 shows research related to BL adoption in higher education. Accordingly, most of the studies are conducted in Malaysia (N=28), this is based on the fact that the Malaysia ministry of education initiated an educational blueprint for all higher education to adopt BL from 2015 to 2022. Therefore, there were several studies that proposed models to examine BL adoption in universities in Malaysia context. Next, research articles related to BL adoption was carried out in United States of America with (N=11), and Australia (N=10) and United Kingdom with (N=7), followed by Turkey with (N=4), Canada, Indonesia, and Spain with (N=3) respectively. Additionally, Fig. 6 indicates that (N=2) studies were conducted in Norway, Dubai, UAE, India, Singapore, Saudi Arabia, and Taiwan. Lastly, (N=1) study was each conducted in Greece, Germany, Philippines, South Korea, The Netherlands, Thailand, Vietnam, Belgium, Bulgaria, China, Poland, Israel, Morocco, Colombia, Sri Lanka, and Ghana. This finding also suggest that most of the first researchers of BL adoption such as Garrison and Kanuka (2004), Graham et al. (2013), Poon (2014) and Porter and Graham (2016) are from USA, Canada, Australia and UK who are one of the most cited researchers in BL practice in higher education as compared to other regions.
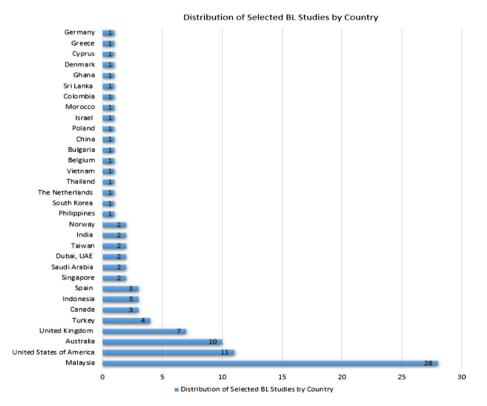

Fig. 6 Distribution of selected BL studies in terms of countries

Considering the selected studies context distribution of BL adoption in higher education findings from Fig. 7 indicate that (N = 59, 62%) studies mainly examined BL adoption by considering students perspective. This finding is consistent with results from prior studies (Wai and Seng 2013; Rahman et al. 2015) which advocated for the need for developing a model of measuring student satisfaction, perception (So and Brush 2008), commitment (Wong et al. 2014), effectiveness (Wai and Seng 2015) in the BL. In addition, findings from Fig. 7 reveal that (N = 9, 10%) studies mainly examined BL adoption by considering lecturers perspective. This finding is very consistent with results from the literature (Wong et al. 2014; Zhu et al. 2016), where the authors mentioned the need for a study to investigate the current level of adoption of BL among the academicians to identify the factors that influence BL adoption.

Furthermore, the findings suggest that (N = 7, 8%) studies mainly examined BL adoption by considering administrative perspective. Similarly, this finding is analogous with results from qualitative studies conducted by prior researchers (Koohang, 2008; Graham et al. 2013; Porter et al. 2016; Bokolo Jr et al. 2020) which revealed that there are limited studies that explored policy and governance issues related BL adoption. Additionally, findings from Fig. 7 show that (N = 10, 10%) studies that concurrently examined BL in the context of students and lecturers, this aligns with findings presented by Brahim and Mohamad (2018); Edward et al. (2018) where the authors called for the need for empirical evidence on BL implementation to improve academic activities. Lastly, (N = 9, 10%) studies investigated BL in the context of student, lecturer, and administrators. This finding suggests that there are limited studies that examine students, lectures and administrators simultaneously as mentioned by (Machado 2007; Wong et al. 2014; Bokolo Jr et al. 2020). Accordingly, this review presents the constructs and factors that influence BL adoption from the perspective of students, lecturers, and administrators in higher education.

4.2 RQ2: Which BL Studies Proposed Model Related to BL Adoption in Higher Education?

Several studies have been carried out directed towards investigating the adoption of BL in higher education. Thus, Table 3 shows that out of the selected 94 studies only 51 studies developed models to examine BL where each study is compared based on the authors, contribution, purpose and identified factors/attributes and methods.
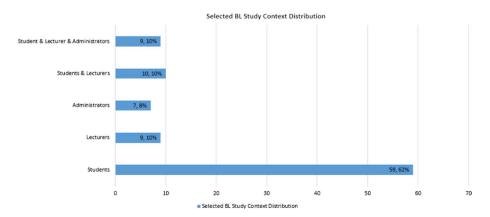
Fig. 7 Distribution of selected BL studies context

Based on the selected 51 BL studies that develop a research model to examine BL adoption in higher education, the review indicates that none of the studies is concerned with BL practices to be implemented in higher education, they are mainly concerned about BL adoption factors/attributes. As seen in Fig. 8 out of the reviewed 51 BL studies that developed models to examine BL adoption. The results suggest that survey questionnaire was most employed, whereas experimental and survey was least employed to validate the developed models. Also, Fig. 9 presents the clustered of issues addressed in the reviewed 51 BL studies. The identified factors/attributes derived from the reviewed 51 BL studies are presented in Fig. 10 and further discussed in Tables 6, 7 and 8.

4.3 RQ3: Based on RQ2 What are the Theories, Location, and Context of the Selected BL Studies?

Among the selected 51 BL studies, this sub-section presents prior theories that have been utilized to examine BL adoption in higher education. Moreover, the location and BL context of the 51 BL studies are presented as seen in Table 4.

Findings from Table 4 and Fig. 11 indicate that out of the reviewed 51 BL studies, (N=37, 72%) studies investigated BL by considering the students context similar to previous studies Tuparova and Tuparov (2011); Roszak et al. (2014), while (N=2, 4%) studies examined BL by considering only lecturers' context. Besides, (N=4, 8%) studies only examined administration context analogous with prior study Mercado (2008), while another (N=6, 12%) studies examined BL by considering the students and lecturers context similar to prior studies Maulan and Ibrahim (2012); Mohd et al. (2016). Lastly, (N=2, 4%) studies examined BL by considering the students, lecturers and administration context analogous to research conducted by Mercado (2008); Anthony et al. (2019). Hence, it is evident that there are fewer studies that investigated BL adoption by concurrently exploring students, lecturers and administration viewpoint. Thus, this review aims to address this limitation by reviewing theoretical foundation of BL adoption and implementation in the lens of students, lecturers and administration.

4.4 RQ4: Based on RQ3 What are the Constructs of the Identified Theories Employed to Explore BL Adoption in Higher Education?

This sub-section reviews the constructs of theories employed by the selected 51 BL studies in developing their model as seen in Table 5.

Based on Tables 4 and 5, Fig. 12 depicts the frequency of how many times each theory has been employed by prior BL studies. Findings from theories employed show that ad hoc is the most employed approach with (N=23, 42%) studies, followed by TAM with (N=7, 13%) studies, IS success model and UTAUT with (N=4, 7%) studies individually, and DoI with (N=3, 5%) studies, whereas the other theories were adopted by (N=1, 2%) study respectively.

4.5 RQ5: What are the Constructs and Factors that Influence Students, Lecturers and Administration towards Adopting BL?

The constructs and factors related to the adoption of BL by students, lecturers and administrators are shown in Fig. 13 and described in Table 6.

Table 3 Prior models developed to examine BL adoption in higher education

Authors & contribution	Purpose	Identified factors/attributes	Method(s)
Bokolo Jr et al. 2020 investigated managerial perspective on institutions' administration intention to diffuse BL	Aimed to specify constructs and related factors that impact administration to diffuse BL	Management strategies, institutional structure, technology infrastructure, ethical considerations, and resource support	Survey questionnaire
Guillén-Gámez et al. (2020) explored actual deployment of digital aptitude	Aimed to explore the use of web applications in the education training of lecturers	Level of attitude, use towards ICT in the classroom, the level of digital competence, and motivation to use ICT	Experimental
Van Laer and Elen (2020) examined adults' self-regulatory on behaviour profiles in BL environments	Focused to identify students' self-regulatory behaviour profiles in BL domain and relate them to designs of BL program	Learning environments, self-regulatory, learners' self-regulatory behaviour, and learners' behaviour	Experimental
Anthony et al. (2019) examined the role of BL for learning and teaching effectiveness in institutions	Aimed to support institution in their decision making to evaluate students learning and lecturers teaching	University management, learners, academic staff, BL initiatives, practice, teaching and learning effectiveness	Survey questionnaire
Subramaniam and Muniandy (2019) investigated the effect of flipped classroom on learners' engagement	Aimed to utilize flipped classroom method to gauge learning efficacy on institution students	Emotional engagement, behavioral, cognitive, and agentic	Experimental
Alhabeeba and Rowley (2018) explored the factors that lead to successful e-learning in universities, through a comparative study of academic staff and students	Focused to explore effectiveness of e-learning, and on the differences in perspectives of different groups of stakeholders in e-learning	Student characteristics, instructor characteristics, support and training, technology infrastructure, e-learning systems and online learning resources	Questionnaire
Al-shami et al. (2018) examined the adoption of MOOC utilization among undergraduate students	Aimed to investigate the factors that influence the adoption of MOOCs application among undergraduates	Performance expectancy, the expectancy, the expectancy from the social, motivations circumstances, and behavioral intention	Survey
Al-Rahmi et al. (2018) examined university students' intention to utilize e-learning	Aimed to investigate students' adoption process	Self-efficacy content of e-learning, students' satisfaction, perceived usefulness, intention to use e-learning	Questionnaire
Baragash and Hosam Al-Samarraie (2018b) examined the effects of students' engagement in learning delivery modes based on their learning experience and performance	Focused on assessing student's perception of face-to-face, learning management system, and web-based learning	LMS, F2F, WBL, LMS access, time, LMS tools, self-learning Time, web tools, and students' performance	Questionnaire
Bowyer and Chambers (2017) developed a framework to measure BL program	Aimed to present factors to consider when adopting BL programme	Situation, course organization, and outcomes	Literature review

Table 3 (continued)

Authors & contribution	Purpose	Identified factors/attributes	Method(s)
Dakduk et al. (2018) examined the factors the influence the acceptance of BL in executive education	Aimed to understand the factors that influence the intention to adopt BL in a group not typically considered in higher education research	Hedonic motivation, habit, performance and effort expectancy, social influence, facilitating conditions, behavioral intention, age, gender, and experience	Questionnaire
Edward et al. (2018) examined the effect of BL and learners' characteristics on students' competence in teaching and learning	Aimed to investigate the effect of BL and learners' characteristics on students' competence and investigate the effectiveness of BL in teaching	BL (digital contents, technology), learners' characteristics (motivation, interaction, attitude, flexibility, time spent), and students' competence	Experimental and survey
Fisher et al. (2018) researched on the significant relationship between flipped BL and student performance, satisfaction and engagement	Aimed to present the correlation between flipped BL pedagogies and impact of student satisfaction, performance, and engagement	Time efficiency, personal convenience, blended learning benefits, perceived performance, engagement with flipped learning, overall satisfaction	Survey questionnaire
Ghazal et al. (2018) examined the effects of critical success factors on students' experience and satisfaction with LMS in a BL setting	Aimed to provide insights as to how universities can enhance students' experiences and satisfaction of LMS in order to support the BL approach	Students, instructors, system, classmates, course design, and organization	Questionnaire
Ismail et al. (2018a) presented the main factors to that influence student learning outcome in BL	Reviewed the important factors that have a higher influence the academic performance of students	Characteristics of the student, use of technology, characteristics of the class, the interaction process	Literature review
Ismail et al. (2018b) investigated the acceptance of MOOC among students in higher education	Aimed to enhance the quality of teaching and learning for technical & vocational education and training students in higher education	Perceived of usefulness, perceived ease of use, user attitude toward use, and actual system use	Questionnaires
Prasad et al. (2018) enquired into learners' behavioral intentions towards the use of a BL program designed for post-graduate international IT students	Motivated to develop a testing mechanism to measure the extent to which international students have built up digital capital	Economic, social and cultural social influence (behavioral intention), performance and effort expectancy (attitude), and facilitating conditions (ease and usefulness)	Questionnaire

Table 3 (continued)

Authors & contribution	Purpose	Identified factors/attributes	Method(s)
Savara and Parahoo (2018) unraveled the determinants of quality in BL and also assessed if there is gender-based differences among students	Aimed to identify the factors influencing the quality of learning experiences of students in BL environments in higher education sector in relation to gender	Technology infrastructure quality, learner engagement, faculty technology competence, learner interaction, quality of course design, and student learning experience	Survey questionnaire
Ustunel and Tokel (2018) designed a pedagogical approach that offers a technology-enhanced-learning domain	Aimed to explore the micro context dimension to analyze interactions between student, learning tool, and teacher	Teacher, student, and technological tool	Qualitative groups
Ekawati et al. (2017) examined if gender influence the student satisfaction on BL in higher education	Aimed to explore the influence of genders on the satisfaction level of students towards improving BL design to provide better learning teaching experience for the students	General learning process, online learning, interactivity	Questionnaires
Elyakim et al. (2017) studied the awareness of transactional distance in BL using location-based mobile devices	Aimed to show how BL using location-based mobile learning experiences can be improved when student preparation is enhanced	Technological environment, learning contents communication with the teacher, communication between students, whole program	Survey questionnaire
Ghazal et al. (2017) investigated the important factors for LMS acceptance and satisfaction in a BL environment	Aimed to provide a comprehensive examination of the factors that affect students' acceptance and satisfaction of LMS usage in a BL environment	Technology experiences, service quality, system quality, information quality, student satisfaction, and student acceptance (perceived ease of use and perceived usefulness)	Survey questionnaire
Kumara and Pande (2017) analyzed the conceptual and contextual relevance of BL for working professionals	Developed a learning paradigm relevant to working professionals and operationalizes the learning paradigm through an integrative framework for BL ecosystem	Institutional, faculty-related, student-specific and pedagogical as variables for effective BL experience	Literature review
San Pedro et al. (2017) developed an integrated view for learning and college engagement in digital environments	Aimed to deploy interaction-based data-mined evaluation of learner's behavior, lecturers' emotions and knowledge from college online learning environment	Learning experience, interest, self-efficacy, and choice	Survey questionnaire

Table 3 (continued)

Authors & contribution	Purpose	Identified factors/attributes	Method(s)
Sun and Qiu (2017) developed a BL model in an English foreign language class	Aimed to outline an approach of BL model in college English teaching class environment	Mode, model of integration, distribution of learning content and objectives, language teaching methods, involvement of students, tutors, and location	Survey and focus group interview
Fesol and Salam (2016) identified the students' readiness towards MOOC technical courses based on BL approach	Aimed to understand student's readiness and critical success factors for implementing successful MOOC by higher learning institutions	Learning flexibility, online learning, study management, technology, online interaction, classroom learning, BL adaptability, and readiness	Survey questionnaire
Klentien and Wannasawade (2016) developed a BL model for virtual science laboratory	Aimed to enhance the analytical thinking skills and evaluation of ability in conducting science projects for students	Student, instructor, BL, virtual laboratory and assessment	Questionnaire
Sari and Karsen (2016) conducted a study on BL to improve quality of learning in higher education	Focused to evaluate BL implemented at a private university towards improving the quality of BL	Learning effectiveness, institutional commitment, user satisfaction (lecturer and student satisfaction), facility and access (facilities)	Questionnaires
Porter et al. (2016) examined institutional drivers and barriers to BL adoption in higher education	Determined the degree to which institutional strategy, structure, and support measures facilitate or impede BL adoption among higher education decision makers	Institutional strategy, structure, and support measures	Interview
Yeou (2016) designed a structural model to explore students' acceptance of Moodle in a BL environment	Aimed to examine university student's attitudes towards the utilization of Moodle	Perceived usefulness, perceived ease of use, computer self-efficacy, attitude, intention to use, frequency of use	Survey questionnaire
Isa et al. (2015) examined the adoption of BL a case of mobile learning	Centered in exploring the relationship of the factors that motivate m-learning adoption among self-directed learners	Perceived near-term usefulness, perceived ease of use, personal innovativeness, and perceived long-term usefulness	Survey questionnaire
Rahman et al. (2015) studied the factors that influence students' satisfaction on BL adoption in a public higher education institution	Aimed to examine the relationship between factors and students' satisfaction on BL and also assess the link between situational factors and students' satisfaction on BL	Perceived ease of use, perceived value, learning climate, student- instructor interaction, and satisfaction on BL	Survey questionnaire

Table 3 (continued)

Authors & contribution	Purpose	Identified factors/attributes	Method(s)
Wai and Seng (2015) measured the effectiveness of BL environment	Aimed to explore the perception of blended learning, attitude towards technology, effectiveness and efficiency of BL	Use of BL tools in teaching, use of BL tools in learning, effectiveness of BL, and efficiency of BL	Survey
Aguti et al. (2014) investigated the factors that impact on the effectiveness of blended e-learning within universities	Described a methodological model consisting of factors necessary for assessing the effectiveness of e-learning within universities	E-learning readiness, e-learning course delivery strategies, quality e-learning systems, and effects of blended e-learning	Survey
Wong et al. (2014) proposed a framework for investigating BL effectiveness	Aimed to assess the readiness, intensity of adoption and impact on BL offerings	Students' attitude, quality of teaching, assessment, workload	Survey
Machado (2007) developed an e-readiness model for examining e-learning in higher education	Focused in revealing the primary model of e-readiness for the specific context of higher education	Feedback, technological, economic, social, internal policies, institutional strategies	Focus group interview
Poon (2014) compared the use of BL in property education courses in different countries	Aimed to gain deeper insight into the successful factors and challenges in the use of BL	Administrative support, online support, equipment, staff time, relevant specialist software, better virtual platform, financial support	Questionnaire and interview
Güzer and Caner (2014) reviewed BL based on the past, present and future	Aimed to review and analyze studies carried out on BL through reflecting on prior studies	Supportive, useful, motivation, enjoyable, supportive, flexible	Literature review
Graham (2013) explored emerging research and practice in BL research	Focused to examined issues related to BL definition	Blended constituents, seat time, quantity of e-learning, and BL quality factors	Literature review
Graham et al. (2013) framework for institutional adoption and implementation of BL in higher education	Aimed to investigate six cases of institutional adoption of BL to examine the key issues that can guide university administrators interested in this endeavor	Strategy (purpose, advocacy, implementation, definition, policy), structure (governance, models, scheduling, evaluation), support (technical, pedagogical, incentives)	Interview
Moskal et al. (2013) suggested that BL program requires alignment of student, faculty, and institutional goals	Aimed to inform stakeholders and effect policy to enhance BL structures and development	Robust and reliable technology and continuous evaluation	Survey questionnaire

Table 3 (continued)

Authors & contribution	Purpose	Identified factors/attributes	Method(s)
Padilla-Meléndez et al. (2013) re-examined determinant of technology acceptance and use and perceived playfulness in the context of a BL setting based on gender	Provided evidence that there exist gender differences in the effect of playfulness in the student attitude toward a technology and the intention to use it	Perceived usefulness, perceived playfulness, Perceived ease of use, attitude, intention to use	Questionnaire
Tahar et al. (2013) examined students' satisfaction on BL	Focused on exploring the critical factors that affecting students' satisfaction in BL based on the relevant constructs	Service quality, system quality, intention of use, information quality, user satisfaction, and net benefit	Questionnaires
Tulaboev (2013) explored technology acceptance of web 2.0 tools in BL class setting	Described the acceptability and potential use of web 2.0 as an aid to learning and teaching	Actual use, barriers, behavioral intention, performance expectance, effort expectancy, social influence, facilitating conditions, user experience, and voluntariness of use	Questionnaire
Lin and Wang (2012) proposed a model to investigate the relation between perceived fit and system factors that motivate learners in continuing utilizing BL instruction	Focused at investigating the critical features the e-learning system can provide in assisting learning	Information quality, knowledge quality, system quality, task-technology fit, confirmation of system acceptance, perceived usefulness, system satisfaction, continuance to use intentions	Survey and focus group interview
Mirabolghasemi et al. (2011) explored the relationships among the indicators of the Community of Inquiry (COI) model in BL	Aimed to offer an opportunity to find out the relationships among presences in COI model in a BL environment	Teaching presence, cognitive presence, social presence, and learning experience	Questionnaires
Ahmed (2010) explored hybrid e-learning acceptance model in relation to learner perceptions	Aimed to investigate the drivers of learners' acceptance of hybrid e-learning	Instructor characteristics, information technology infrastructure, and organizational and technical support, and hybrid e-learning acceptance	Survey
Chong et al. (2010) examined the perceptions of student teachers in a BL environment	Aimed to evaluates students' perception of their experience in a BL environment	ICT usage, tutor support, interaction and collaboration, theory-practice link, student autonomy, enjoyment, asynchronous learning	Survey

Table 3 (continued)

Authors & contribution	Purpose	Identified factors/attributes	Method(s)
Koohang (2008) proposed a learner-centered model for BL design	Aimed to balance activities between face-to-face and online learning and also discussed the elements of successful BL	The design of learning activities, learning assessment, instructor's roles	Interview
Holton III et al. (2006) investigated blended delivery initiatives for competency-based teaching	Focused in describing BL within the sphere of learning theories and offers suggestions for best practice	Input (self-directedness, computer self-efficacy, learning goal level), process (external support, design, and instructional strategy design), output (learning outcome)	Literature review
Lai et al. (2005) researched on a study to measure satisfaction in BL	Aimed to examine the effect of learning behavior and technology quality on learning satisfaction towards a BL course	Relative advantage of e-learning, student learning, satisfaction with courses, whole satisfaction, participation, motivation, quality of accessing web-based courses, quality of information system	Questionnaire

Fig. 8 Distribution of the reviewed 51 BL studies that developed BL adoption models

Fig. 9 Clustering of issues addressed in the reviewed BL adoption studies

Tables 6, 7 and 8 describes the derived constructs for students, lecturers, and administration related to BL adoption in higher education. BL adoption cannot be attained by only integrating online and face-to-face teaching modes (Azizan 2010). Thus, there is need to identify the constructs that influence students, lecturer, and administration in adopting BL practices to be implemented that play an important role in ensuring successful BL

Fig. 10 Identified factors/attributes derived in the reviewed BL adoption studies

experience in higher education (Graham 2013; Güzer and Caner 2014). On this note, academicians such as Machado (2007); Wong et al. (2014); Kumara and Pande (2017); Bokolo Jr et al. (2020) highlighted that successful implementation of BL initiatives requires an alignment between administrative, lecturers, students' educational goals. According to Dakduk et al. (2018); Anthony et al. (2019) it is importance to examine constructs related to human computer interaction to assess which constructs contributes to realizing the desired teaching and learning objectives while engaging the lecturers and students. Therefore, this study explores the BL practices to be implemented by students and lecturers in higher education as seen in Figs. 14 and 15.

4.6 RQ6: What are the Practices Involved for BL Implementation in Higher Education?

The practice to be carried out by students for implementing BL in higher education is shown in Fig. 14.

Figure 14 depicts BL practice implementation for students in higher education. According to Kaur and Ahmed (2006); Kaur (2013) the recommended balance of BL activities for successful delivery is 80% online learning (activities, information, resources, assessment and feedback) followed by 20% classroom instruction (face to face) that is aligned to the online teaching content. Similarly, Ginns and Ellis (2007)

Table 4 Adopted theories, location and context of prior BL models

Authors	Theories	Location(s)	BL Context
Bokolo Jr et al. (2020)	DoI theory and Institutional BL adoption framework	Malaysia	Administrators
Anthony Jr et al. (2019)	Innovation adoption framework for institutional BL and Course redesign outcome framework	Malaysia	Students, Lecturer Administrators
Al-Rahmi et al. (2018)	TAM	Malaysia	Students
Al-shami et al. (2018)	UTAUT	Malaysia	Students
Alhabeeba and Rowley (2018)	Adhoc approach	Saudi Arabia	Students, Lecturer
Baragash and Hosam Al-Samarraie (2018b)	The activity theory	Malaysia	Students
Bowyer and Chambers (2017)	Hexagonal E-Learning Assessment Model (HELAM), e-Learning framework, and TAM	UK	Students, Lecturer
Fisher et al. (2018)	Ad hoc approach	Australia	Students
Ghazal et al. (2018)	IS success model and TAM	Yemen	Students
Ismail et al. (2018a)	Literature review	Malaysia	Students
Dakduk et al. (2018)	UTAUT2	Colombia	Administrators
Prasad et al. (2018)	The Unified Theory of Acceptance and Use of Technology (UTAUT)	Australia	Students
Savara and Parahoo (2018)	Ad hoc approach	UAE and UK	Students
Ismail et al. (2018b)	TAM	Malaysia	Students
Edward et al. (2018)	Ad hoc approach	Sri Lanka	Students
Subramaniam and Muniandy (2019)	Ad hoc approach	Malaysia	Students
Van Laer and Elen (2020)	Ad hoc approach	Denmark	Students
Ustunel and Tokel (2018)	Ad hoc approach	Turkey	Students, Lecturer
Guillén-Gámez et al. (2020)	Ad hoc approach	Spain	Lecturer
Ekawati et al. (2017)	Adhoc approach	Indonesia	Students
Elyakim et al. (2017)	Theory of Mediated Learning Experience (MLE)	Israel	Students
Ghazal et al. (2017)	IS success model	Yemen	Students
Sun and Qiu (2017)	Adhoc approach	China	Students
Kumara and Pande (2017)	Adhoc approach	India	Students

Table 4 (continued)

Authors	Theories	Location(s)	BL Context
San Pedro et al. (2017)	Social cognitive career theory (SCCT)	USA	Students
Klentien and Wannasawade (2016)	Project-based learning	Thailand	Students
Porter et al. (2016)	Diffusion of innovations (DoI) theory	USA	Administrators
Sari and Karsen (2016)	Adhoc approach	Indonesia	Students
Fesol and Salam (2016)	Ad hoc approach	Malaysia	Students
Yeou (2016)	TAM	Morocco	Students
Isa et al. (2015)	Ad hoc approach	Malaysia	Students
Rahman et al. (2015)	Ad hoc approach	Malaysia	Students
Wai and Seng (2015)	Ad hoc approach	Malaysia	Students
Aguti et al. (2014)	Adhoc approach	Europe, Africa and Asia	Students
Poon (2014)	Adhoc approach	Australia and UK	Students, Lecturer
Güzer and Caner (2014)	Ad hoc approach	Cyprus	Students, Lecturer
Wong et al. (2014)	OECD model of readiness, intensity and impact	Australia	Students
Graham et al. (2013)	DoI theory	USA	Administrators
Graham (2013)	Ad hoc approach	USA	Students, Lecturer
Moskal et al. (2013)	Ad hoc approach	USA	Students
Padilla-Meléndez et al. (2013)	The Technology Acceptance Model (TAM)	Spain	Students
Tahar et al. (2013)	IS success model	Malaysia	Students
Tulaboev (2013)	UTAUT	Malaysia	Students
Lin and Wang (2012)	Task-technology fit, information system (IS) success model and contingency theory	Taiwan	Students
Mirabolghasemi et al. (2011)	Community of Inquiry (COI) model	Malaysia	Students
Chong et al. (2010)	Adhoc approach	Singapore	Students
Ahmed (2010)	Ad hoc approach	UAE	Students
Koohang (2008)	Constructivism learning theory	USA	Students
Machado (2007)	E-readiness approach	Belgium	Students, Lecturer Administrators

Table 4 (continued)

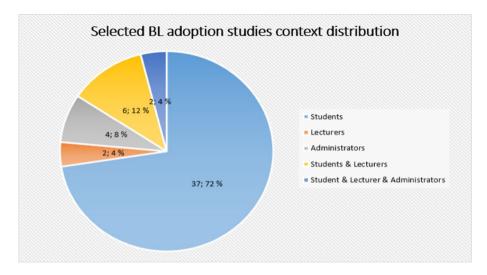| Authors	Theories	Location(s)	BL Context
Holton III et al. (2006)	Ad hoc approach	USA	Lecturer
Lai et al. (2005)	Adhoc approach	Taiwan	Students

Fig. 11 Selected BL adoption studies context distribution

argued that for an effective BL initiative it is required to achieve a blend of 29–30% face to face and 79–80% on-line teaching delivery. This is in line with findings from previous studies (Graham et al. 2013; Bokolo Jr et al. 2020), which states that there is need for policies showing clear decrease of face to face classroom hours and increasing online learning as a strategy to enhance BL implementation in higher education (Park et al. 2016). Further description of BL implementation for students is discussed in Table 9.

Figure 15 depicts BL practice implementation for lecturers in higher education. The BL practice is based on the Technology, Pedagogy, and Content Knowledge (TPACK) framework proposed by Koehler and Mishra (2009). TPACK aimed address issues faced by how lecturers can integrate technology into their current teaching (Wang et al. 2004; Sahin 2011). Thus, TPACK offers a method that indulgences teaching as collaboration between what lecturers know and how they teach and apply what they already know uniquely through BL implementation in the contexts of physical and online classes (Graham et al. 2009; Koehler and Mishra 2009). Further description of TPACK the components in relation to BL implementation is discussed in Table 10.

5 Implications for Theory, Methodology and Pedagogical Practice

Findings from this study offer implications for theory, methodology and pedagogical practice for higher education towards adopting BL.

5.1 Implications for Theory

Theoretically, this study identifies the factors that influence students, lecturers and administrators' towards adopting BL. Our findings provide insight by revealing factors for higher education to better recognize how BL can be delivered towards the development of students' learning effectiveness and also offering in-depth understanding of BL

Table 5 Theories, description and constructs of prior BL models

Theories	Description, Constructs	Sources
The organization for economic co-operation and development (OECD) theory	OECD theory constructs encompasses readiness, intensity and impact to examine the adoption and use of e-technologies. Thus, e-readiness assesses the readiness of institutions to adopt BL, whereas intensity is the level of adoption and use of BL, and lastly, impact is the derived value that is possibly created from adopting BL	Wong et al. (2014)
E-readiness theory	E-readiness theory is presented as a resource to be adopted in institutions and it comprises of defining the procedures through which an institution makes use of its staff, information, network, financial, and physical resources in its university operation. It assesses whether deploying e-technologies would enhance the efficiency and effectiveness of these processes. Lastly, it evaluates if the institution has the resources to migrate to electronic operation such as BL	Machado (2007)
The activity theory (AT)	AT was coined in Soviet Russia from the study of Vygotsky and Leont'ev on psychology and Rubenstein on studies linked to neuropsychological. AT elucidate that human thought processes are not based on the individual, but in the broader perspective of the individual's communications within the community through factors, and precisely in conditions where learning activities such as BL is being carried. The theory comprises of technology, identity, community and learning as constructs	Baragash and Hosam Al-Samarraie (2018b)
The unified theory of acceptance and use of technology (UTAUT)	UTAUT was proposed by Venkatesh, Morris, Davis & Davis and has been considered a valuable model and has been recognized to be a reliable measure of the key constructs. UTAUT is valuable in investigative the factors that influence students, lecturers' intention towards adopting BL practice. UTAUT comprises of performance expectancy, effort expectancy, effort expectancy, social influence, behavior intention, and use intention. UTAUT also entails the age, gender, experience and voluntariness of use	Dakduk et al. (2018) and Prasad et al. (2018)

Table 5 (continued)

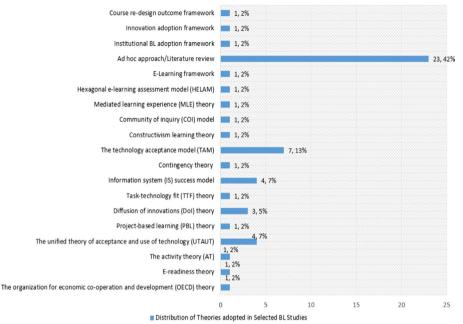| Theories	Description, Constructs	Sources
Project-based learning (PBL) theory	PBL refers to a student-based pedagogy that entails a self-motivated classroom method where students learn through dynamic study of real-world issues. In this theory students acquire knowledge about an area by studying for an extensive period of time to explore and resolve challenge posed. Hence, PBL is a style of inquiry-oriented learning that presents facts or depicts an easy path to knowledge. It comprises of project time, personalized learning time, mentor and community time, and expeditions	Klentien and Wannasawade (2016)
Diffusion of innovations (DoI) theory	DoI theory was proposed by Rogers to offers detailed explanations of how novel innovations such as BL are adopted, and how BL adoption decisions are affected by perceptions of the technology itself as well as the characteristics of the adopting institutions and its environment. DoI theory is a descriptive theory that comprises of five attributes of innovations which includes relative advantage, compatibility, complexity, trial-ability, and observability	Graham et al. (2013), Porter et al. (2016) and Bokolo Jr et al. (2020)
Task-technology fit (TTF) theory	TTF theory was founded by Goodhue and Thompson who argued that IT usage is more possible to yield a positive effect on the individual performance and be deployed if the proficiencies of IT infrastructure are linked with the tasks that the end user must carry out. TTF theory consists of task characteristics, technology characteristics, performance impact, utilization, and task-technology fit	Lin and Wang (2012)
Information system (IS) success model	IS success model was developed by William H. DeLone and Ephraim R. McLean in 1992 and it aims to provide a complete understanding of IS success by describing, recognizing, and clarifying the interactions among 6 vital constructs need for the successful adoption of IS. The IS model constructs comprise of information quality, system quality, service quality, system use/usage intentions, user satisfaction, and net system benefits	Tahar et al. (2013) and Ghazal et al. (2018)

Table 5 (continued)

Theories	Description, Constructs	Sources
Contingency theory	Contingency theory is grounded on how the fit between environment and strategy can influence institutions performance. In the context BL, the constructs included inter-institutional factors such as learning beliefs that match together, learning beliefs of improved performers, learning beliefs that are common and environmental likelihoods that may affect institutional learning	Lin and Wang (2012)
The technology acceptance model (TAM)	TAM model is grounded on the theory of reasoned action. TAM explicates the issue of how end-users accept and utilize a particular technology such as BL. TAM constructs comprises of perceived ease of use, attitude toward using, perceived usefulness, and use	Haron et al. (2012) and Ismail et al. (2018b)
Constructivism learning theory	Constructivism learning theory is centered on the argument that learning exists if new knowledge is formed. Thus, the construction of new knowledge is aligned upon a number of constructs which includes the design of learning activities, learning assessment, and instructor's roles	Koohang (2008)
Community of inquiry (COI) model	COI model was suggested by Garrison, Anderson, and Archer in 2000 as an investigative instrument in BL. It is based on the self-motivated magnitude of learning and has been useful in exploring studies in higher education. The COI model constructs comprises of teaching presence, social presence, and cognitive presence	Mirabolghasemi et al. (2011)
Mediated learning experience (MLE) theory	MLE was founded by Reuven Feuerstein as an organized method to learning, appropriate for any age groups. It integrates the influence of a facilitated agent which is often a teacher or family member involved in the student's life, which changes and organizes stimuli knowledge in the student's environment. MLE supports students to improve and adapt their learning through structured knowledge to which they attain new experiences. MLE constructs comprises of Intentionality and reciprocity, meaning, transcendence, feeling of complete and regulation of behavior	Elyakim et al. (2017)

Table 5 (continued)

Theories	Description, Constructs	Sources
Hexagonal e-learning assessment model (HELAM)	HELAM is a conceptual multidimensional model for assessing LMS in terms of perceived student's satisfaction. The model constructs consist of social issues (supportive factors, learner perspective, instructor attitudes), and technical issues (service quality, information quality, system quality)	Bowyer and Chambers (2017)
E-Learning framework	The e-Learning framework was developed by Khan to offer direction in the plan, deployment, and assessment of e-learning environments. The model comprises of pedagogical, technological, interface design, evaluation, management, resource support, ethical, and institutional	Bowyer and Chambers (2017)
Social cognitive career theory (SCCT)	SCCT asserts that career and academic choices are formed throughout middle and high school by environmental barriers and supports, as well as the students' interest's self-efficacy, goals, outcome, and expectations. SCCT theorizes that higher levels of interest develop in contexts where students have higher outcome and expectations. This means that learning activities that contribute to higher self-efficacy and positive experiences help increase learning engagement and interests	San Pedro et al. (2017)
Institutional BL adoption framework	Institutional BL adoption framework in higher education was proposed by Graham et al. (2013) based on the growth or mature implementation stage grounded on institutional support, institutional structure, and institutional strategy as the main constructs to investigate institutional BL adoption	Bokolo Jr et al. (2020)
Innovation adoption framework for institutional BL	The innovation adoption framework for institutional BL adoption proposed by Graham et al. (2013) is organized in three stages which includes awareness or exploration, early or adoption implementation, and lastly mature outcome implementation. The framework provides an approach for institutions to strategically adopt BL and also examines how students, lecturers, and administrators effectively institutionalization BL	Anthony et al. (2019)

Table 5 (continued)

Theories	Description, Constructs	Sources
Course redesign outcome framework	The course redesign outcome framework was developed to support academic staffs in implementing BL practice and it comprises of curriculum design, technology integration, and teaching strategies aimed at facilitating BL adoption for teaching efficiency	Anthony et al. (2019)
Ad hoc approach/ Literature review	This approach is based on studies that develop their research model on BL adoption based on constructs derived from prior studies. Thus, this approach is termed as employed ad hoc activity or approach as suggested by Park et al. (2016)	Park et al. (2016)

Distribution of Theories adopted in Selected BL Studies

Theory	Value
Course re-design outcome framework	1, 2%
Innovation adoption framework	1, 2%
Institutional BL adoption framework	1, 2%
Ad hoc approach/Literature review	23, 42%
E-Learning framework	1, 2%
Hexagonal e-learning assessment model (HELAM)	1, 2%
Mediated learning experience (MLE) theory	1, 2%
Community of inquiry (COI) model	1, 2%
Constructivism learning theory	1, 2%
The technology acceptance model (TAM)	7, 13%
Contingency theory	1, 2%
Information system (IS) success model	4, 7%
Task-technology fit (TTF) theory	1, 2%
Diffusion of innovations (DoI) theory	3, 5%
Project-based learning (PBL) theory	1, 2%
The unified theory of acceptance and use of technology (UTAUT)	4, 7%
The activity theory (AT)	1, 2%
E-readiness theory	1, 2%
The organization for economic co-operation and development (OECD) theory	1, 2%

■ Distribution of Theories adopted in Selected BL Studies

Fig. 12 Distribution of BL studies in terms of adopted theories

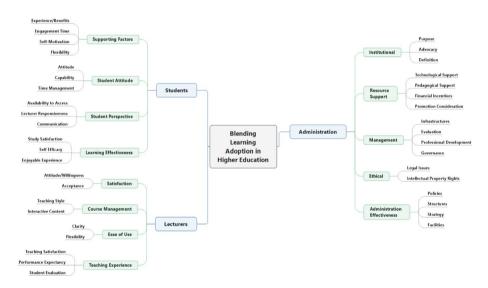**Fig. 13** Constructs and factors related to BL adoption in higher education

Table 6 BL adoption constructs and factors for students

Level	Constructs/Factors
Students	Supportive factors
Refers to learners or scholars that are enrolled to learn. These students are influences by their behaviors towards attaining learning goals	This variable is influenced by the communication and interaction between students and among the lecture based on the *experience/benefit, engagement time, self-motivation, and flexibility* of the students towards BL adoption
	In education domain *experience* refers to the student's prior knowledge of technological innovations, as well as the skills acquired by the student from such experience (Machado 2007). The degree of experience in IT can encourage or discourage students from adopting BL. As a result, students' prior know-how may impact their ability to towards BL (Baragash and Al-Samarraie 2018b), apparently due to the need for them to reflect upon the learning process
	Student *engagement* in learning refers to the time and effort student devote in BL activities, where student engagement relates to student's willingness, passion and interest to learn (Barnard et al. 2009)
	For *self-motivation,* if students have interest in what they are studying, they are more likely to concentrate in the learning process (Poon 2014; Ghazal et al. 2018)
	It also involves the *flexibility* of the learning environment and the capability to manage learning pace which is aligned to the ease with which students can respond to BL (Ozkan and Koseler 2009; Padilla-Meléndez et al. 2013)
	Student Attitude
	Attitude is involves the feeling and perception of the students towards BL in relation to the predictable advantages that can be acquired by the student from BL environment. This construct comprises of *attitude, capability, and time management*
	In BL the *attitude* of students is determined based on their impression of interaction and engagement in F2F and online activities (Lin and Wang 2012; Poon 2014). Students who have positive attitudes toward IT usage are more enthusiastic to changes in learning environment (Machado 2007)
	As the concept of BL is relatively new to students, the *capability* of the students in using IT in today's classroom where IT skills are needed to achieve an improved learning experience to ensure that the students are capable of learning with technology effectively (Baragash and Al-Samarraie 2018b)
	Students are faced with issues related to proper *time management* especially in a BL approach where online tasks are necessary to be completed alongside F2F classes (Lin and Wang 2012), thus students should be prepared to dedicate extra time in BL (Anthony et al. 2019)

Table 6 (continued)

Level	Constructs/Factors
	Student Perspective
	Student's perspective of BL is determined by the level of ***lecturer responsiveness***, ***communication and availability to access***
	For effective BL adoption, there should be ***available*** internet connections provided for educational use, while instantaneously providing 24/7 learning resources to students (Prasad et al. 2018). Students should be able to easily gain access, view and download course module information during classes (Anthony et al. 2019)
	Student rates lecturer teaching in BL based on his/her online ***responsiveness*** which refers to the lecturer's prompt answer to online requests and problems. Lecturer's feedback is an important factor in promoting positive BL experience (Ghazal et al. 2018)
	Communication provides feedback that may arise from the interaction between classmates in BL environment that offers opportunities for students to improve their learning outcome (Padilla-Meléndez et al. 2013)
	Learning Effectiveness
	This is the outcome expectation that describes the extent to which BL has enhanced students' learning. The learning effectiveness is measured based on ***study satisfaction, self-efficacy, and enjoyable experience***
	Satisfaction refers to the student's perceptions of the degree to which BL meets their learning expectations and needs (Dakduk et al. 2018). Student satisfaction is an essential factor to measure the quality of BL because of its relation to rates of completion and student success (Anthony et al. 2019)
	Self-efficacy refers to the student's judgments of his/her capabilities to execute and organize activities required to achieve improved learning performances. Self-efficacy is an important factor in examining the satisfaction of students towards the belief that he or she can attain enhanced learning (Prasad et al. 2018)
	Enjoyable experience is the magnitude to which learning activity of adopting BL is observed to be entertaining in improving BL performance (Poon 2014). Moreover, enjoyable experience relates to students' emotional feedbacks in relation to BL

Table 7 BL adoption constructs and factors for lecturers

Level	Constructs/Factors
Lecturers	*a. Satisfaction*
Refers to academic staffs, teachers, trainers or instructors that disseminate knowledge to students	Lecturer satisfaction is a significant key to teaching. Lecturers' satisfaction measures the happiness of the academic staffs in adopting BL for teaching purpose (Dakduk et al. 2018). Thus, the lecturers' satisfaction is measured based on their ***attitude*** and ***acceptance*** of BL
	The lecturers' ***attitude*** is an important factor for BL adoption because it entails not only the understanding, knowledge, and significance of BL, but also their aptitude to adapt the theory related-models for teaching (Sun and Qiu 2017)
	The acceptance of BL by lecturers is a key factor for BL adoption (Poon 2014). Hence, lecturers' uncertainty or certainty in adopting BL strategies in achieving educational goals defines to a larger extent, their acceptance (Dakduk et al. 2018)
	b. Course Management
	Involves employing ***interactive BL courses content*** to aid teaching to simplify the ***teaching style***
	Teaching style refers to the pattern of teaching behaviors and beliefs demonstrated by lecturer in BL environment (Carbonell et al. 2013). Thus, lecturers with an interactive teaching style may efficiently impact students' participation and involvement in BL environments (Barnard et al. 2009)
	BL can create ***interactive tools*** that increase students' learning interest. Thus, through BL lecturers can create interesting learning initiatives to improve learning effectiveness (Anthony et al. 2019). Arguably, students are more interested in BL initiatives that offer compelling contents in form of games, visual presentations, and simulations (Dakduk et al. 2018)
	c. Ease of Use
	The ease of use of BL means the easiness extent to which the lecturers anticipate the target of BL is of without much effort (Carbonell et al. 2013). It involves how easy it is for the lecturers to provide enthusiastic teaching and assistance to students (Dakduk et al. 2018). It is measured based on ***clarity and flexibility***
	BL approach with ***clarity*** will help lecturers to be more competent and efficient in their teaching abilities (Barnard et al. 2009; Sun and Qiu 2017). Therefore, it is important that the BL approaches to be employed by lecturers possesses clarity for easy usage and not much technological complex (Anthony et al. 2019)
	Flexibility of use refers to the degree to which BL adoption will require less skills and effort for the lecturer. Flexibility is based on the easiness of actual adoption of BL as perceived by less-experienced lecturers (Baragash and Al-Samarraie 2018a). Also, flexible accessibility operation of course modules anytime and anywhere for lecturers in order to achieve clarity for successful adoption of BL

Table 7 (continued)

Level	Constructs/Factors
	d. Teaching Effectiveness
	Teaching effectiveness focus on how the lecturer can improve student learning impact in BL. Teaching effectiveness is measured based on the ***teaching satisfaction, performance expectancy, and student evaluation***
	Teaching satisfaction can be measured based on the lecturers' level of fulfillment in relation to the design of methods and curriculum, presentation of course objectives, course delivery and students' performance (Dakduk et al. 2018). Teaching satisfaction is dependent on lecturers' pedagogy and strategy of teaching (Anthony et al. 2019)
	Performance expectancy refers to academic development outcome of the student based on the information and knowledge disseminated by the lecturer during the semester (Anthony et al. 2019)
	Baragash and Al-Samarraie (2018a) suggested that there is need to ***evaluate*** the quality of BL course based on students' perceptions of BL ease of use and usefulness in improving learning outcome. Evaluation can help lecturer to assess students understand and knowledge of course contents (Lin and Wang 2012)

and its efficiency in order to improve students' competence. The identified factors can be employed by institutions to assess students, lecturers and administrators' perception towards BL and can be used to inform government policy making regarding BL development. Besides, this study also indicates that the lecturer's attitude, teaching style, and acceptance toward BL are important in motivating the students to adopt BL. The lecturer's attitude toward students and his/her level of responsiveness and communication are important factors that motivate students in BL environment. The findings emphasized the importance of administrative commitment towards BL adoption, showing that the purpose, advocacy and definition initiated towards BL have a strong impact on both learning and teaching effectiveness. The findings provide theoretical support to determine the relationship among the constructs and factors of BL adoption for students, lecturers and administrators (see Fig. 13) towards F2F and online learning.

5.2 Implications for Methodology

Based on the TPACK framework, this study provides lecturers with understanding of students' perspective on BL in helping them to reflect on their role in improving their current pedagogy, technological infusion, and syllabus design to enhance student learning and teaching outcome. Decision makers in higher education can utilize findings from this study to improve their understanding of the factors that impacts students, lecturers and administrators' perception towards BL adoption. Respectively, given the different perspectives of students, lecturers and administrators it is mandatory for policy makers in higher education involved in the implementation of BL to deliberate on the perspectives of all stakeholders. Respectively, findings from this study significantly provide an outline for Ministry of

Table 8 BL adoption constructs and factors for administrators

Level	Constructs/Factors
Administrators	*a. Institutional*
These are the management that set policies and strategies towards the accreditation, adoption and recognition of BL activities. They help to actualize BL policies into implementation	This construct includes issues concerning the complete design of BL in relation to ***purpose*** of BL policies, methods of ***advocacy***, ***definition*** of BL adoption
	In terms of ***purpose***, institutions adopting BL should specify the goals they intend to attain. Institutional policies towards BL should encourage lecturers to utilize innovative forms of teaching and learning formats (Porter et al. 2016; Porter and Graham, 2016)
	Administrators' ***advocates*** provide enthusiasm and cooperation that supports BL adoption to provide the needed structural resource supports for teaching and learning (Dakduk et al. 2018)
	Administrators should align their objectives with BL ***definition*** in relation to the institution's capacity (Machado 2007). Creating a definition of BL can ease in achieving learning objectives for scheduling lectures (Bokolo Jr et al. 2020), providing students with reliable and clear prospects regarding BL approach, and developing suitable support initiatives (Poon 2014)
	b. Resource Support
	This construct aims to provide resource support to encourage lecturers to become dynamically involved and completely aware of BL initiatives. It comprises ***technological support, pedagogical support, financial incentives, and promotion consideration***
	Technological support consists of infrastructure such as wireless, wired network access, other hardware equipment and software components used to ensure that BL can support teaching and learning (Basir et al. 2010)
	Administrators need deploy ***pedagogical support*** by providing experts that provide guide to lecturers in designing blended course content (Dakduk et al. 2018). Moreover, these experts also help review the designed course and further provide feedback on how lecturers can improve their pedagogies
	Administrators can provide ***financial incentives*** such as workload reward to encourage lecturers to adopt BL. Moreover, BL adoption remunerations, or funding for BL can be provided to show universities support for BL (Basir et al. 2010)
	Equally, ***tenure and promotion plans*** should be reviewed to inspire and compensate lecturers adopting BL (Bokolo Jr et al. 2020)
	c. Management

Table 8 (continued)

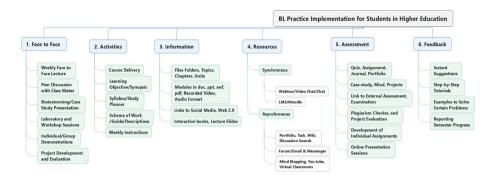| Level	Constructs/Factors
	This construct specifies initiatives to be considered to achieve sustainable, effective use of BL towards supporting institutions realize their established goals in addressing issues relates to ***infrastructure, professional development, evaluation, and governance***
	In terms of ***infrastructure,*** deployment of required technological infrastructure is essential for effective BL adoption. Thus, institutions seeking to adopt BL must offer the central technological infrastructure necessary for an effective BL adoption for lecturers and students (Porter et al. 2016; Porter and Graham 2016)
	As suggested by Bokolo Jr et al. 2020 BL adoption needs to be periodically ***evaluated*** to ascertain the strength and weakness. The evaluation procedure measures students learning experiences and lecturers teaching satisfaction towards BL as quality assurance initiative that provides continuous feedback for BL improvement
	Professional development is an important factor that promote BL adoption. Hence, administrators should organize workshops to enhance lecturers' development of pedagogical strategies in fostering BL teaching in improving technology-mediated-teaching of students (Porter and Graham 2016)
	Administrators should have a ***governance*** procedure to help determine who approves BL courses to be taught in the institution such as the ration of 20–80, 30–70, or 40–60 for F2F and e-learning (Porter et al. 2016)
	d. Ethical
	This construct encompasses ***legal*** matters related ***to intellectual property (IP) right***. Thus, BL policies initiated should clearly state regulation and rules relating to ownership of course materials, editing and rights privileges, circulation of learning materials designed by lecturers (Bokolo Jr et al. 2020)
	e. Administration Effectiveness
	BL is effective when institutions are committed to improve the quality of the student learning and lecturers teaching experience in a cost-effective manner (Porter et al. 2016). Thus, administration should provide ***clear policies, better structure, accessible facilities*** and a more organized ***strategies*** for the planning of BL implementation. Thus, it is a required for administration to initiate agenda to meet the strategic goal of redesigning BL courses (Porter and Graham 2016)

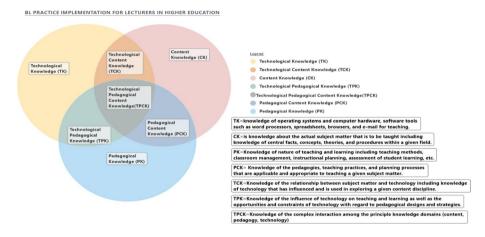**Fig. 14** BL practice implementation for students in higher education

Fig. 15 BL practice implementation for lecturers in higher education

Education across the world towards fostering BL as a teaching and learning approach for academic staffs in higher education. The BL practices for students (see Fig. 14) and strategies to be implemented by lecturers (see Fig. 15) can be integrated to the existing pedagogical polices to improve the significance of BL as one of the methods in learning and teaching. For universities and academicians, findings from this study suggest that BL serves as a substitute to learning and teaching from the traditional perspective to enhance the quality of teaching and learning of students in achieving better performance.

5.3 Implications for Pedagogical Practice

This study contributes to the acknowledgment of BL as a medium to support teaching and learning approach. The findings describing how BL practice can be implemented by students as seen in Sect. 4.6 (Fig. 14). Practically, findings from this study can be useful in the preparation of the best practice to support lecturers in teaching and implementing inventive approaches that promotes BL to enhance teaching and learning outcomes to be used as the reference for the arranging methodologies to embrace BL in higher education. Findings from

Table 9 Description of BL learning practice implementation for students in higher education

BL practice	Description
Face to face	This is the offline learning which comprises of discussions and physical skill practices initiated by the lecturer to examine the learning quality of the students based on class lectures (Akkoyunlu and Yılmaz-Soylu 2008; Sun and Qiu 2017), individual and group discussion, lab sessions, presentation activities, and evaluations (Baragash and Al-Samarraie 2018a; Ghazal et al. 2018)
Activities	This phase refers to group of features in an LMS that provides a platform for student to interact with the lecture and other students based on forum, assignments, chat, external tools, glossary, lessons, workshop, survey, wiki, etc. (Kaur 2013; Park et al. 2016)
Information	In BL information refers to an item that lecturers can add to online course platform such as LMS to provide extra information or links to support learning (Machado 2007; Lin and Wang 2012). It ranges from timetable schedule, course overview, course description, course status, latest course news, upcoming events, online users, recent activities, collective activities, etc. (Padilla-Meléndez et al. 2013)
Resources	This is an item that a lecturer can utilize to facilitate learning such as a link or file. LMS such as Moodle offers a several resource types which enables lecturers to add courses, such as a page, study file, folder, and URL (Edward et al. 2018). Moreover, resources comprise of synchronous and asynchronous, where synchronously, can be in a group chat, whereas asynchronous could be in a forum to which students post responses (Lin and Wang 2012; Baragash and Al-Samarraie 2018b)
Assessment	Generally, refers to a systematic means for measuring development and learning of students. In BL assessments can either be summative or formative, where formative assessments are conducted once students finish reading the course chapter, whereas summative assessments are conducted at the end of semester (Koohang 2008). Results from assessments help students in actualizing personal goals and making decisions for improvement (Sun and Qiu 2017)
Feedback	Refers to the qualitative view or comment from both students and lecturers based on course content and student's performance (Ginns and Ellis 2007; Sun and Qiu 2017). It supports students' development in learning and provides opportunity to reduce the gap between present and preferred performance. Besides. lecturers offer feedback on students' performance and provide answers to queries or problems from students (Padilla-Meléndez et al. 2013)

this study indicate that BL practices derived from the literature which comprises of face-to-face, activities, information, resources, assessment, and feedback to be deployed by educators to design suitable learning policies in order to support students towards improving learning. These findings provide guidelines on the design and implementation of BL practice. This study suggests that for BL practice to be successfully implemented the decision of lecturers are determined by the ease with which online course services are managed. Thus, the availability of computer hardware and software resources, pedagogical support, financial support, and promotion consideration should be provided by institutions management. For administrators this study provides a policy roadmap to adopt BL in higher education.

6 Conclusion, Limitations, and Future Works

Review of prior studies on BL offer valuable insight regarding research related to BL practice in higher education. Nonetheless, these review studies ignored examining BL adoption and implementation in regard to students, lecturers and administrators simultaneously. Accordingly, this study conducted a systematic literature review for prior BL adoption model proposed related to theories employed in the model to investigate BL adoption in higher education. This study also identified the constructs and factors that influence students, lecturers

Table 10 Description of BL teaching practice implementation for lecturers in higher education

BL Practice	Description
Technology Knowledge (TK)	In relation to BL, TK includes the lecturers' knowledge of operating systems, software, and hardware, and the capability to utilize teaching software applications such as Microsoft word, PowerPoint, Excel spreadsheets, creating of documents, use of browsers, and e-mail for teaching (Graham et al. 2009; Koehler and Mishra 2009; Schmidt et al. 2009)
Pedagogical Knowledge (PK)	PK involves knowledge about the practices or procedures of teaching and learning and how it links to educational aims and objectives (Wang et al. 2004). Thus, PK involved issues related to student learning, managing classroom, developing and implementing lesson plan. It also entails knowledge steps to be followed in the classroom based on the type of students and strategies for assessing student learning (Koehler and Mishra 2009)
Content Knowledge (CK)	CK is knowledge relating to fundamental theories, concepts, facts, and procedures of the actual subject matter that is to be taught or learned (Sahin 2011). Thus, it includes knowledge of how to organize and connect course content ideas for BL (Koehler and Mishra 2009)
Pedagogical Content Knowledge (PCK)	PCK entails the intersection of pedagogy and content. Therefore, it represents the integration of pedagogy and content by the lecturer into an understanding of how the subject matter are prearranged, adapted, and represented for teaching students in a BL environment (Koehler and Mishra 2009; Schmidt et al. 2009)
Technological Content Knowledge (TCK)	TCK is knowledge relating to the method in which content and technology for teaching are equally related (Koehler and Mishra 2009). In BL, TCK entails how technology is used by lectures to representation course contents to students (Graham et al. 2009)
Technological Pedagogical Knowledge (TPK)	TPK is lecturers' knowledge of the current modules, and capabilities of different technologies that can be deployed for BL teaching (Wang et al. 2004). It also involves lecturers' knowing how teaching with a particular technology might change the learning outcome (Koehler and Mishra 2009)
Technological Pedagogical Content Knowledge (TPCK)	TPACK is the combination of good teaching with technology that involves lecturer's having knowledge of the course theories using technologies and pedagogical methods (Koehler and Mishra 2009). Thus, it involves the usage of technologies in a productive way to teach course content in BL environment (Wang et al. 2004)

and administration towards adopting BL studies and lastly derived the practices involved for BL implementation for students and lecturers in higher education with the aim of providing meta-analysis of the current studies and to present the implications from the review. Respectively, this paper extends the body of knowledge in BL studies by presenting 7 new findings. First, the review reveal that ad hoc approach is the most employed method by prior studies in developing research model to investigate BL adoption in higher education, followed by TAM, and then IS success model, then is UTAUT, and lastly DoI theory.

Secondly, findings show that questionnaire surveys were the most employed research methods for data collection utilized by prior BL studies in higher education. Third, the findings reveal that BL model adoption studies were carry out in Malaysia and USA, this is followed by Australia, UK, Canada, respectively among the other countries. Fourth, most of the BL studies were recurrently conducted towards examining BL in students' context, followed by lecturers' context, correspondingly among the other contexts. Fifth, with regard to publication year, BL studies have experienced vast attraction over the years (2016 to 2019) from many academicians who contributed to investigating BL adoption and implementation in higher educational context, where our findings observed an increase of 19 publications in 2018 (see Fig. 4) representing the highest frequency of the total studies. Sixth, this review also presents 51 prior studies that developed model relating to the adoption of BL in higher educational domain and further identify the constructs/factors that influence the perception of students, lecturers, and administration readiness towards BL adoption. Seventh, findings from this review present the BL practice to be implemented by students and lecturers in higher education. To that end, the identified constructs/factors that influence BL adoption and the derived BL practices implementation can be used to conceptualize and develop a model to examine student, lecturers, and administrators concurrently towards BL adoption and implementation in higher education.

Despite the aforementioned contributions, this study has a few limitations. First, the reviewed BL studies comprises of studies related to BL adoption and implementation approaches, models, and frameworks. BL readiness and effectiveness were not investigated in this current study. Secondly, this study mainly focused on popular online databases for collecting articles (i.e., ScienceDirect, Sage, Emerald, Inderscience, Wiley, Google Scholar, Springer, Taylor & Francis, and IEEE). Given that, the databases may not provide all relevant studies published on BL adoption and implementation. Thirdly, no theoretical model was proposed with hypotheses for further validation. Future studies could examine BL readiness and effectiveness from student, lecturers, and administrator's perspective by developing a research model with hypotheses. The model will be evaluated using survey questionnaire since it's the most widely employed methodology as seen in Fig. 5 and 8. Further research could also extent this study by including more BL studies from other online libraries which includes Web of Science, Scopus, etc. to investigate BL in its broad sense and how it affects students, lecturers and administration in a particular country or region.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Appendix

See Table 11.

Table 11 Results of quality assessment

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Percentage (%)
S1	1	1	1	1	1	0	0	0	0.5	1	70
S2	1	0	1	1	1	1	1	0	1	1	80
S3	1	1	1	1	1	0	0	0	0.5	0.5	60
S4	1	0	1	1	1	1	1	1	1	0.5	85
S5	1	0	1	1	1	1	1	1	1	1	90
S6	1	0	1	1	1	0	0	0	0.5	1	55
S7	1	1	1	1	0	1	0	1	1	1	80
S8	1	0	1	1	1	1	0	1	1	1	80
S9	1	0	1	1	0.5	1	0	1	0.5	0.5	65
S10	1	0	1	1	0.5	0.5	0	1	0.5	0.5	60
S11	1	0	1	1	0	1	0	1	1	0.5	65
S12	1	1	1	1	1	0	0	0	0.5	1	65
S13	1	0	1	1	1	1	1	1	1	1	90
S14	1	0	1	1	1	1	1	1	1	0.5	85
S15	1	1	0	1	1	1	1	1	1	0.5	85
S16	1	0	1	1	1	1	1	1	1	0	80
S17	1	0	1	1	1	0	0	0	1	1	60
S18	1	1	0	1	1	0	0	0	1	1	60
S19	1	1	0	1	1	1	1	1	1	0.5	85
S20	1	0	1	1	1	1	1	1	1	1	90
S21	1	0	1	1	1	1	1	1	1	0.5	85
S22	1	1	1	1	1	0	0	0	1	1	70
S23	1	1	0	1	1	1	1	1	1	0.5	85
S24	1	0	1	1	1	0	0	0	1	1	60
S25	1	1	0	1	1	0	0	0	1	1	60
S26	1	0	1	1	1	1	1	1	1	0.5	85
S27	1	1	1	1	1	1	1	1	1	0.5	95
S28	1	0	1	1	1	1	1	1	1	0.5	85
S29	1	1	1	1	1	1	1	1	1	0.5	95
S30	1	1	0	1	1	1	1	1	1	0.5	85
S31	1	1	1	1	1	0	0	0	1	1	70
S32	1	0	1	1	1	0	0	0	1	1	60
S33	1	0.5	1	1	1	1	1	1	1	1	95
S34	1	0	1	1	1	1	1	1	1	0.5	85
S35	1	0	1	1	1	1	1	1	1	0.5	85
S36	1	0	1	1	1	1	1	1	1	0.5	85
S37	1	1	0	1	1	1	1	1	1	0	80
S38	1	0	1	1	1	1	1	1	1	0	80
S39	1	1	0.5	1	1	0	0	0	0	0.5	50
S40	1	1	0	1	1	1	1	1	0.5	0	75
S41	1	1	1	1	1	0	0	0	0	0.5	55
S42	1	1	0	1	1	1	1	1	1	0.5	85
S43	1	0.5	1	1	1	1	1	1	1	0	85
S44	1	0.5	1	1	1	1	1	1	1	0	85

Table 11 (continued)

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Percentage (%)
S45	1	0.5	0.5	1	1	1	1	1	1	0	80
S46	1	0.5	0.5	1	1	1	1	1	1	1	90
S47	1	0.5	1	1	1	1	1	1	1	1	95
S48	1	1	0.5	1	1	0	0	0	0	0.5	50
S49	1	0	1	1	1	1	1	1	0.5	0.5	80
S50	1	0	1	1	1	1	1	1	0.5	0	75
S51	1	0.5	0.5	1	1	1	1	1	0.5	0.5	80
S52	1	0.5	0	1	1	1	1	1	0.5	0	70
S53	1	0	1	1	1	1	1	1	1	0	80
S54	1	0	1	1	1	1	1	1	1	1	90
S55	1	0	1	1	1	1	1	1	1	0	80
S56	1	0	1	1	1	1	1	1	1	1	90
S57	1	0	1	1	1	1	1	1	1	0	80
S58	1	0	1	1	1	1	1	1	1	0	80
S59	1	0	1	1	1	1	1	1	1	0	80
S60	1	0	1	1	1	1	1	1	1	0	80
S61	1	1	1	1	1	0	0	0	0	0	50
S62	1	0	1	1	1	1	1	1	0.5	0	75
S63	1	0.5	1	1	1	1	1	1	1	0.5	90
S64	1	1	0.5	1	1	1	1	1	1	1	95
S65	1	1	0.5	1	1	0	0	0	0.5	0.5	55
S66	1	0	1	1	1	1	1	1	1	0	80
S67	1	1	1	1	1	0.5	0.5	0.5	0.5	0	70
S68	1	0	1	1	1	1	1	1	1	0	80
S69	1	0	1	1	1	1	1	1	1	0.5	85
S70	1	1	1	1	1	0	0	0	0.5	0	55
S71	1	0	1	1	1	1	1	1	1	0	80
S72	1	0	1	1	1	1	1	1	1	1	90
S73	1	1	0	1	1	1	1	1	1	0	80
S74	1	1	1	1	1	1	1	1	1	0	90
S75	1	1	1	1	1	1	1	1	1	0.5	95
S76	1	0.5	0.5	1	1	1	1	1	1	0	80
S77	1	1	0	1	1	1	1	1	1	0	80
S78	1	0	1	1	1	1	1	1	1	0	80
S79	1	1	0	1	1	1	1	1	1	0	80
S80	1	1	0	1	1	0	0	0	1	0	50
S81	1	1	0	1	1	1	1	1	1	0	80
S82	1	1	0	1	1	1	1	1	1	0	80
S83	1	1	0	1	1	1	1	1	1	0	80
S84	1	0	1	1	1	1	1	1	1	1	90
S85	1	0	1	1	1	1	1	1	1	0.5	85
S86	1	1	1	1	1	1	1	1	1	0.5	95
S87	1	0	1	1	1	1	1	1	1	0.5	85
S88	1	1	1	1	1	1	1	1	1	0.5	95

Table 11 (continued)

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Percentage (%)
S89	1	1	0	1	1	1	1	1	1	0.5	85
S90	1	1	1	1	1	0	0	0	1	1	70
S91	1	0	1	1	1	0.5	0	0.5	1	1	70
S92	1	0.5	1	1	1	1	1	1	1	0.5	90
S93	1	1	0.5	1	1	1	1	1	1	1	95
S94	1	0.5	1	1	1	1	1	1	1	0.5	90

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