

Blended Learning as an Optimal Strategy for Teacher's Professional Development: Systematic Literature Review

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	Abstract
<p>Article History</p> <p>Article Submission 30 October 2022</p> <p>Revised Submission 08 December 2022</p> <p>Article Accepted 10 February 2023</p>	<p>The impact of blended learning (BL) is growing in teacher education, and more and more teacher professional development activities are using BL strategies. A systematic review of research on blended teacher-professional development (BTPD) can enable us to develop better teacher-professional development (TPD) programs. This systematic literature review takes 90 papers from 2015 to 2021 retrieved from four databases in April 2022 as the analysis objects. to analyze the status and trends of BL strategy used in TPD programs. The review covers the dimensions of the research background, research methods, and research findings. Findings show that the number of studies on BTPD increases year by year. The research mostly focused on BL for the professional development of K-12 and pre-service teachers, particularly their learning in information, communication, and technology (ICT). The research topics of the reviewed papers pay more attention to instructional design and learning effect analysis. Most studies believe that BL is an effective strategy for TPD. The review also found that BL strategies have some potential to promote education for sustainable development and educational equity. However, the limitation of BTPD strategies is that they require the cooperation of multiple organizational structures to work optimally.</p> <p>Keywords: Teacher Professional Development; Blended Learning; ICT; Research Trends; Prospects</p>

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Introduction

Blended learning (BL) is a learning strategy that emerges from people's reflections on traditional education and emerging e-learning practices. After entering the 21st century, the international educational technology community has gradually recognized the idea of "blended learning" and introduced the strategy into school education and teacher education. In general, BL combines face-to-face instruction with computer-mediated instruction (Bonk & Graham, 2006, P. 4). In this paper, we use the term blended teacher professional development (BTPD) to refer to teacher professional development (TPD) courses or programs that apply related theories and models of BL.

There was abundant research on BL. Educational researchers have studied the situation, course organization, individual perspective, and learning results using different research methods and obtained diversified research consequences. Drysdale et al. (2013) and Halverson et al. (2014) conducted a thematic analysis of dissertations, highly cited journal articles and book chapters. Their research shows that BL researchers have conducted extensive discussions on instructional design, individual perspective, exploration, learner outcomes, and the topics of comparison, technology, and interaction in BL. However, most of these studies on BL are in the context of higher education, and less attention is given to BTPD. While this situation will be discussed in more detail in the results section. There have been few works of literature on BTPD found through the SLR study. Among them, three papers reviewed blended learning models related to teacher education, aiming to explore new models and pathways for teacher education (Eaton et al., 2015; Atmacasoy & Aksu, 2018; Perry et al., 2021). Other literature reviews of BL related to teachers' specialty mostly discuss TPD aimed at developing teachers' ability to implement BL (or blended teaching). For example, Philipsen et al. (2019) conducted a systematic meta-aggregative review for improving TPD for online and blended learning. Portillo and De La Serna (2021) and An (2021) contributed to the literature from the perspective of the situation of education in COVID-19 emergencies. All of these studies suggested that teachers' professional development should be prepared for online and blended learning.

BL has become an essential trend in the reform of higher education, primary and secondary education, and a new norm for teacher learning and professional development (Graham, 2013; Fannakhosrow & Nourabadi, 2020). In the context of the trend towards digital learning, we believe it is of enormous significance to explore the trend of BL for teachers, whether it is the learning needs of school students or the professional development needs of teachers. However, few studies have systematically reviewed research related to BTPD, making it difficult for readers to understand it comprehensively. This review aimed to investigate the current state of BTPD through a systematic literature review and explore the positive or negative factors to develop better BTPD programs. Therefore, demographic trends, methodological trends, and topical trends were analyzed for literature that met the criteria for the review. Interest in the substantive content of BTPD was investigated through the following questions: (1) What are the trends in the distribution of BTPD research? (2) What is the distribution trend of research topics of BTPD? and (3) What are the affordances and limitations of BTPD strategies?

Methodology

Overview

A literature review is a crucial endeavor for any academic program (Webster & Watson, 2002), it provides a meaningful context for the ongoing research (Levy & Ellis, 2006) To fully understand the topics and trends of BL for teachers, this review investigates relevant literature from the last seven years as the primary source for answering the above research questions. That is, the analysis of this review focuses on papers published between January 1, 2015, and December 31, 2021, which is the date when this review set off.

Research Method

Based on the primary paradigm of humanities and social science research, the research methods used in the literature we reviewed include quantitative research, qualitative research, and

mixed research methods. However, there are also four studies without clear research methods, which are generally non-empirical studies, usually proposing, expanding, or applying strategies and theories.

Research Topic Coding

The research topics were coded regarding the coding system proposed by Halverson et al. (2014) and the BL evaluation topic proposed by Bowyer and Chambers (2017). In the first step, research topics were preliminarily divided. The second step discussed research topics that did not fit the original coding system and classified them as new subtopics. In the latest step, open coding data were reviewed and readjusted.

Methodological Trends

Regarding the trend of the research methods in BTPD research, there was no significant difference in the number of quantitative, qualitative, and mixed research, accounting for 32, 27, and 27. The average sample sizes of the three methods were 15474,40 and 276. If an abnormally large sample is removed from all three research methods, the average sample size is 225,31 and 148. These empirical researches mainly analyze the background and investigation of BTPD. Only 4 are non-empirical researches, which focus on theories or models of BL for teachers. For example, Marques and Escudeiro (2016) propose the concept of blended professional learning for teacher-graduate students with a flexible choice of units of study. Wittmann and Olivier (2021) propose a synthesis of BL models for the teaching environment in South Africa.

Literature Search Process

Database and search terms

This review gathered the literature from the Web of Science, Google Scholar, Scopus, and ERIC databases. Because these four databases contain more high-quality educational research journals, they have relatively high citation counts. Moreover, the articles in these educational journals have important implications for the development of educational research. The selected articles should better address the research questions. This review applied a number of several inclusion and exclusion criteria in the literature search. The inclusion criteria used to determine articles suitable for review and analysis are that all research papers were published during the time frame mentioned above, the papers focus on BTPD, the papers are within the scope of social sciences, the research results are journal papers, the papers are open access, and the papers are written in English. To ensure that the papers are related to BTPD, the search keywords used are ("blended teacher professional development", "blended teacher training", or "teachers blended learning"). In addition, due to limitations in resource reliability, the following exclusion criteria have been added: literature from books or chapters in the book, papers containing reviews or letters, review papers, and papers written in languages other than English. Figure 1 presents the flowchart for the selection of the reviewed papers.

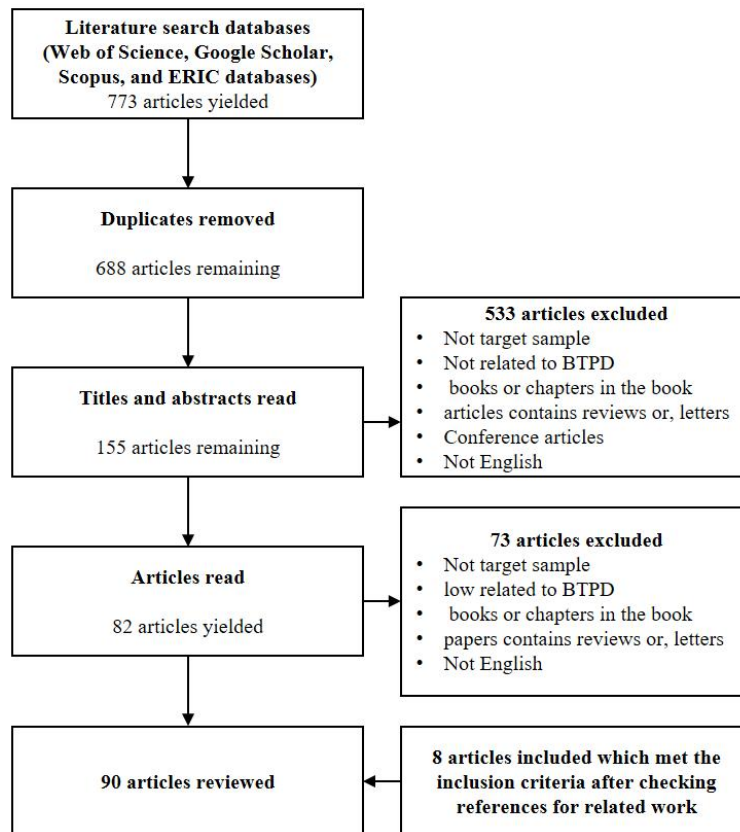


Figure 1. A diagrammatic representation of the literature selection process

Literature Analysis

The literature analysis for this review includes research quantity distribution, research methods, and research topics. To address the research questions, this review used thematic analysis techniques. Thematic analysis can provide a rich and detailed description of the data (Braun & Clarke, 2006). Following Braun and Clarke's (2006) approach to thematic analysis, this review proceeded in the following steps: (1) familiarising with the data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, defining and naming themes, (5) and producing the report.

Distribution Trend of the Number of Research

This review analyzes the distribution trend of the reviewed research from three aspects: the change in the number of research, the background of the research, and the organizational level of BL (Table 1). The change in the study numbers describes the trend of the research papers' numbers on BL for teachers from 2015 to 2021. The research background is about the learner type of BL research implementation: pre-service teachers, K-12 teachers, college teachers, and others. The organizational level refers to the basic units of a BL organization: institutions, programs, courses, activities, or others (Graham, 2006).

Table 1. Research background and organization level of BL

Category	Description
Learner type	
Pre-service teacher	Participants are Pre-service teachers
K-12	Participants are K-12 teachers
Higher education	Participants are higher education teachers
Teacher Education	Participants are teacher educators or instructors
Inclusive education	Participants are Inclusive education teachers
Others	Participants are other types of teachers
Organizational level	
Institution	BL occurs at the group or institution level

Category	Description
Program	BL occurs at the program level
Course	BL occurs at the course level
Activity	BL occurs at the activity level
Others	No organization is specified.

Demographic Trends

The 90 review papers covered 48 countries in the Americas, Africa, Europe, and Asia. Indonesia led the way with fifteen papers, followed by the United States with five, and Spain, South Africa, and India with four each.

From the perspective of literature quantity, the number of teachers' mixed learning studies has been on the rise since 2015 (Figure 2). Only (8) articles were found to be published in 2015 through the screening process. This number increased slowly except in 2017. In 2020, due to the emergency of COVID-19, the number of literature published on BTPD spiked as the number of research papers reached (20). It is because the importance of distance education is again highlighted by the movement control order that took place all over the world (Şentürk, 2021). Researchers and policymakers began to consider ways to train teachers once life returned to normal. As a result, BL models are receiving more attention.

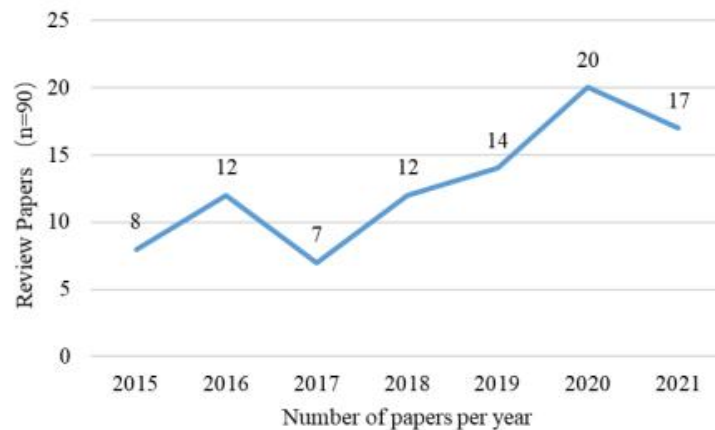


Figure 2. Trends in the number of BTPD research papers

Research Background

In the literature for BTPD, the research objects mainly focus on K-12 teachers and pre-service teachers (Figure 3). There are relatively few related researches on the professional development of teacher trainers and counselors and higher education teachers. Only (2.2%) of research focuses on special and inclusive education. (15.6%) of the papers did not specify the education field of the research object. It indicates that the research fields of BTPD and non-BTPD learning are different, and the field of higher education far exceeds other fields in the research of BL. In other words, colleges and universities use a BL strategy more than any other field of informal on-campus education. Regarding teacher training, the research on the training of K-12 and pre-service teachers is much higher than that of higher education and special education. In addition, there are more studies on teacher training in English, mathematics, science, and information technology subjects among the studies with specific training subjects. The training content is more interested in teachers' teaching professional ability and ICT ability.

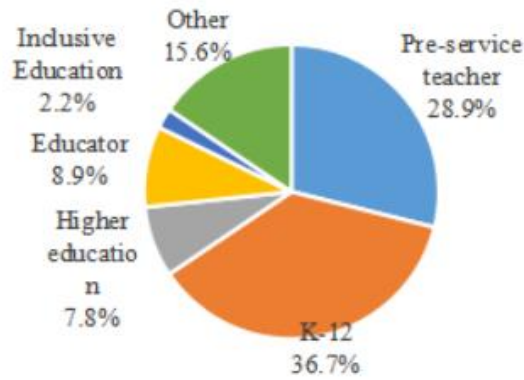


Figure 3. The research background of BTPD

Organizational Level of BTPD

BTPD is mainly organized in program and course levels, accounting for (53.3%) and (37.8%) (Figure 4). The institutional or regional level accounted for (4.4%), and the activity level was the least, with only one paper and three papers that did not specify the organizational level. It indicates that when hen using BL strategies to train teachers, most of them are organized in the program and course level. Pre-service teacher training is mainly organized at the course level, while in-service training is organized at the program level. Four papers examine BL policies, frameworks, or models for teachers from an institutional or regional level. For example, University College Zealand developed an adaptive MOOC design framework for primary school teachers in some Danish cities. They supplemented the MOOC format with BL and explored the factors affecting the design's actual implementation, rationality, and effectiveness (Gynther, 2016).

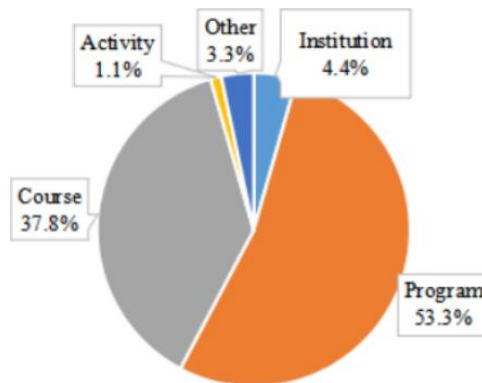


Figure 4. organizational level of BTPD

Results

Distribution Trend of Topics and Sub-topics

This review is coded according to the specific research questions and objectives of the selected papers, and the research topics are divided into five. Each topic is divided into several sub-topics (Table 2). Some researches contain more than one topic, so the sum of all topics will exceed 100%.

Table 2. The Proportion of research topics and sub-topics

Topic	#	%	Sub-topic
Instructional design	66	72.2%	Design processes, applications, strategies and practices, models/patterns, environments, and tools/techniques
Learning effect	55	61.1%	Participants' reactions, participants' learning, participants' behavior, learning outcomes
Other surveys and statistic	31	34.4%	Surveys and analysis

Topic	#	%	Sub-topic
Adoption intention	33	36.3%	Learner's intention, teacher educator's intention
Exploration	26	28.9%	Advantages and challenges, trends and expectations

Instructional Design

Among the papers reviewed, studies on instructional design accounted for (72.2%) of the total, the highest proportion among the five topics. The instructional design consists of five sub-topics: design process, application, strategy, and practice, model/pattern, environment, and tool/technology. The proportion of each sub-topic is shown in Table 3.

Table 3. Subtopics of instructional design

Subtopic	Design Process	Application	Strategy/ Practice	Model/Pattern	Environment and Tool/Technology
Numbers	30	28	26	16	9
Percentage	33.30%	31.10%	28.90%	17.80%	10%

As for the instructional design process of BTPD, there are ADDIE Model-based (Ridwan et al., 2020) and teaching syllabus-based (Ardiyani & Wijayati, 2020). Generally speaking, these studies apply the BL theoretical framework to the design of teacher training courses. Its application ranges from special education teachers to K-12 teachers and college teachers. Its primary purpose is to improve teachers' professional ability through BL strategies. Among them, the most researched is to improve teachers' ICT ability. Blended MOOC is also a popular BTPD model. Other models include school-based training mode and highly autonomous online learning mode. The blended approach in most studies was to take two or more of the four learning approaches: face-to-face, synchronous online and/or video conference, asynchronous online, and learning materials prerecorded (King, 2008).

MOOC platforms are mainly involved in technical support platforms for BTPD. Other learning management platforms with more applications include Moodle, Edmodo, Facebook, Google Classroom, and Canvas. There is the use of ePortfolio as a tool and method to support BTPD (Ginesti & Impedovo, 2020; Korhonen et al., 2020). They chose WordPress, Blogger, or Wix as their e-learning environment to share learning tasks and resources to promote teachers' professional development.

According to the current research, the organizational ways of BTPD are diversified, but the implementation mode is not as standardized as the BL mode of formal school education. Many researchers pay more attention to the online learning component and ignore the integration of online and face-to-face.

Learning Effect

In the samples selected by this review, the proportion of research on the effects of BTPD is 61.1% (Table 2). That means more than half of the studies have discussed the effect of BTPD from different levels. This review classified the research into sub-topics based on Kirkpatrick's assessment of training effectiveness (Reio et al., 2017). The reaction level mainly evaluates participants' feelings about the whole training process, usually using the satisfaction questionnaire. Learning level assessment mainly evaluates the learning gains of participants in a training course, usually using survey stationery, academic tests, or formative documents. The behavior level mainly evaluates whether participants apply what they learn in the training course to practical work and whether they have the opportunity to apply. The data collection methods are generally interviews, observations, or generative data. The learning outcome level mainly evaluates whether participants contribute to organizational performance after the training, usually through interviews, document analysis, and student academic performance tests. Table 4 shows the proportion and examples of the four sub-topics.

Table 4. Sub-topics of learning effect

Subtopic	Participants' reactions	Participants' learning	Participants' behavior	Learning outcomes
Numbers	38	38	26	9
Percentage	42.20%	42.20%	28.90%	10%

Regarding the proportion of each sub-topic, more than half of the (55) studies on learning effects involve participant response and learning, and (26) papers have paid attention to participants' attitudes and behavior changes after learning. Only (9) papers investigated the impact of BTPD on the organization or students. For example, Al-Eraky et al. (2015) evaluated teachers' satisfaction, learning gains, and behavior in a blended teacher professional program in Arabia to determine whether the program form is worth promoting. Of all the review papers, only (5) dealt with all four levels of training program evaluation. For example, Marcial and Habalo (2017) assessed the success of teacher educators in the Philippines in a six-month BL program based on the Kirkpatrick model. Although some scholars have advocated collecting and evaluating teachers' learning process data, the actual operation is sometimes difficult. Some studies can only collect some trace data of teachers' activities from the learning platform for analysis. There is a general lack of attention to how BTPD affects students. It is detrimental to developing effective teacher education policies, programs, and practices (Perry et al., 2021). Therefore, this study believes that future research on TPD should not only focus on design and model but also on teacher practice and student development.

Other Surveys and Statistic

Other aspects of BTPD were investigated and analyzed in 34.4% of the studies. For example, teachers' learning needs. Including understanding ICT and gaining better practical knowledge and skills (Akarawang Kidrakran & Nuangchalerm, 2015); and the ability to implement blended instruction (Vaishnav & Singh, 2019). From the reviewed literature, it is evident that the learning needs of teachers, especially in developing countries, for ICT are relatively high. In addition, some literature has investigated the factors influencing BTPD. These factors include course content relevance, technical effectiveness, perceived usefulness, incentives, self-education capacity, self-management capacity, effectiveness evaluation, and financial support (King, Luan & Lopes, 2018; Engelbrecht et al., 2020). There is also literature comparing online/BL with traditional learning models, and they argue that BL models have a more positive impact on TPD (Şentürk, 2021). Studies have also investigated learners' perceptions of online learning platforms (Ndlovu, & Mostert, 2018) and the opinions and experiences of training consultants and learners on BL types, models, teachers, and technological tools (Wong & Estudillo, 2021). Some investigations have been conducted to explore and discover the background, current situation, and problems of BTPD from different perspectives to find more suitable learning methods and paths for teachers' professional development.

Adoption Intention

The adoption intention is to understand and accept BL methods from the perspective of educators and learners. (36.3%) of studies examined the intention of teachers and educators to adopt the BL strategy (Table 2), (28.90%) from the perspective of learners, and (12.20%) from the perspective of educators (Table 5).

Table 5. Sub-topics of adoption intention

Subtopic	Learner's intention	Educator's intention
Numbers	26	11
Percentage	28.90%	12.20%

In a survey of 336 teachers, a third of them tried to use online (or hybrid) teaching in the

future. However, during the outbreak lockdown, teachers tended to use technology to reproduce traditional teaching processes, which simplified technology-enhanced learning. It cannot fully meet the needs of learners (Giovannella Marcello & Donatella, 2020). Therefore, an increasing number of educators advocate that ICT and digital pedagogy be incorporated into teacher training curricula. Training should be conducted in a BL approach to improve training efficiency (Pynoo et al., 2018). And support teacher preparation and ongoing professional development (Baris, 2015; King et al., 2018; Ardiyani & Wijayati, 2020; Hartle, 2020; Şentürk, 2021; Wong & Estudillo, 2021). With the development of mobile communication technology, mobile devices will become the basic element of e-learning, the environment supporting lifelong learning, and BL will expand. It is essential to create an e-learning space that meets the needs of learners (Baris, 2015). In addition, using digital methods to expand TPD plays a positive role in enabling migrant populations to access quality education (Kennedy & Laurillard, 2019).

Studies have found that teachers trained in BL environments are more successful academically than those trained in traditional learning environments. BL training significantly affects trainee teachers' positive perception of ICT use in teaching (Qasem & Viswanathappa, 2016). A survey in Thailand also shows that about 70% of teachers prefer blended training. The advantage is that teachers can learn new knowledge and skills according to logical steps or modules in their spare time (Akarawang et al., 2015). Most of the learners in the study have a positive attitude toward BL (Richter, 2016; Jeong & Gonzalez - Gomez, 2018; Taghizadeh & Hajhosseini, 2020). Especially in the last three years, more and more teachers are aware of their lack of technology, so they tend to receive training through BL. (Giovannella et al., 2020; Şentürk, 2021; Saboowala & Manghirmalani Mishra, 2021). Therefore, most learners have a positive attitude toward BL. They choose this strategy to develop their professional ability based on cost reduction, time flexibility, and learning effectiveness. Other regions or departments choose this technology-enhanced learning strategy based on future technology and education development trends. It is expected to enable teachers to learn and experience in context and improve teachers' technical and application capabilities for future education.

Exploration

There (28.9%) of the research explored teachers' BL orientation (Table 2). Among them, (18.9%) discussed advantages and challenges, and (13.3%) discussed trends and expectations (Table 6).

Table 6. Sub-topics of exploration

Subtopic	Advantages and challenges	Trends and expectations
Numbers	17	12
Percentage	18.90%	13.30%

From 17 papers about the advantages and challenges of BTPD, this review concludes that the implementation of BL in TPD has many advantages. Such as optimizing learners' time, reducing costs, making and accessing learning resources flexibly, providing multiple interaction modes, adopting flexible teaching methods, and establishing flexible learning communities (Akarawang et al., 2015; Richter, 2016; Akarawang Kidrakran & Nuangchalerm, 2016; Byrka, 2017; Al Mashikhi & Soliman, 2018; Maher, 2021); Supporting teachers' development of teaching knowledge and skills (Marcial & Habalo, 2017; Oversby et al., 2019; Fannakhosrow & Nourabadi, 2020); providing more and better professional development opportunities for teachers in remote areas (Kannan & Narayanan, 2015; Byrka, 2017; Ndlovu & Mostert, 2018; Pohan Daulay, & Sahrir, 2021). In addition, in the process of BL, the use of a variety of tools for learning also reflects the superiority of technology-enhanced learning (Edannur & Marie, 2017; Giovannella et al., 2020; Boubih et al., 2020) and promotes the development of teachers' numerical ability (Langset, Jacobsen & Haugsbakken, 2018; Buluma & Walimbwa, 2021).

At the same time, the implementation of BL strategies in teacher training also faces some

challenges, including technology, organization, and instructional design. For example, it requires the support of Internet infrastructure (Marcial & Habalo, 2017; Goos et al., 2020). It also requires a sound teaching model, course development system, digital environment, and assessment mechanism (Byrka, 2017; King et al., 2018; Langset et al., 2018; Arifani et al., 2020). For BL organizers and educators, their challenges include correct orientation strategies, integrating various elements, and necessary ICT skills (Marcial & Habalo, 2017; Alvarez Jr, 2020). Learners need ICT, self-education, and self-management. (King et al., 2018; Giovannella et al., 2020).

The practice in many countries or regions proves that BL can be used as an innovative application for local teacher training (Fannakhosrow & Nourabadi, 2020). This innovative TPD model has great prospects for promoting teachers' knowledge and ability (Wuryaningsih et al., 2019). As an international trend, research shows that BL plays an essential role in training teachers and students and has a potential for school cooperation and even global collaboration (Pilgrim et al., 2018; Ginesti & Impedovo, 2020). As a technology-enhanced learning strategy, BL allows teachers to play an increasingly essential role in a sustainable society (Chin et al., 2018).

By using these methods, the initial database search showed 773 papers, and 85 of them were removed due to duplication. The balance of 688 papers was then screened further by reading their titles and abstracts. As a result, 533 papers were excluded as they seem to have the exclusion criteria mentioned above. Then, copies of the remaining 155 papers were obtained. However, 36 not teacher learning or training-related papers were excluded through the first reading of the full text. Next, read the review papers for the second time and exclude 37 papers with low relevance to BTPD. Since the references in the paper were related through manual inspection (Baran, 2014, P. 17), eight papers with high relevance were added, and a total of 90 papers were finally investigated.

Discussion

Affordances and Limitations of BTPD Strategies

This section answered the third research question: What are the affordances and limitations of BTPD strategies? This study argues that a detailed and thoughtful design of a program or curriculum is needed when considering the promise of BTPD strategies.

Prospects for BTPD Strategies

From the reviewed literature, most regions or departments adopt BL strategies in teacher training mainly for the following reasons: to solve the problem of teacher shortage; to solve the problem of teacher lack of expertise (concentrated primarily on ICT ability); to support the lifelong development of teachers. The literature also shows that the programs they investigated reached their goals. Most training organizers, implementers, and learners have a positive attitude toward BL methods. They believe that under the current situation of the increasing maturity of ICT, BL can better promote the improvement of learners' knowledge and skills in all aspects and help learners' learning ability, which is a more effective way of learning in the future. In addition, available evidence suggests that BL strategies expand learning opportunities for teachers, especially in remote areas (Pohan et al., 2021), and have clear benefits for promoting collaborative and educational equity (Pilgrim et al., 2018; Ginesti & Impedovo, 2020).

Integration of Online and Offline Learning Activities

From the current studies, BTPD is organized in various ways. A key to designing and implementing a blended learning program (Graham, 2005). However, integrating online and offline elements is insufficient due to the complexity of teachers' learning environments and conditions (Al Mashikhi & Soliman, 2018). Most of the BTPD programs reported in the literature are simply online courses plus face-to-face courses, with no explanation of how the two components are linked. It makes the implementation model of BTPD programs less standardized than the BL model of formal schooling. The literature shows more short-term programs and less attention to the post-training of teachers. In addition to the modes mentioned above, BL for teachers is also undergoing its evolution. One notable feature is that, due to the COVID-19 emergency, the original physical face-to-face part is gradually becoming a face-to-face synchronous online learning mode via video meeting (Hartle, 2020). In addition, more and more commercial institutions are participating in the field of BL. They provide more and more mature

course (learning) management platforms or online live broadcasting platforms and digital learning resources, making BL easier to conduct. However, training providers need to consider how to organize these resources to provide a better BL model for teachers (Marcial et al, 2017). The education sector and schools should be involved in the design and implementation of the program, not just training providers taking it all on independently. Teachers must be effectively supported in their transition through time and space as they engage in BL and teaching practices.

Focus on Student Development

In the current literature, there are several ways to assess the effectiveness of BTPD: online learning data analysis, teacher academic achievement tests, student achievement tests, participant opinion surveys, and a mix of multiple approaches. Almost all studies agree that BL is effective and is worth encouraging and promoting. However, the purpose of teacher learning is to achieve professional development and student growth (Guskey, 2002), and most of the current research still needs to address the impact of teachers' teaching practices on student development after training. From the results of the analysis above, only 10% of the literature focused on student learning when assessing BTPD. It is an issue that should be addressed in all future TPD programs (Erlina, 2022).

Limitation

This review used rich search selection criteria and methods but only consulted four literature sources and extracted open-access papers. Therefore, the results might differ if the review refers to more literature sources such as Science Direct, and DOAJ, or consider dissertations and book chapters. Secondly, the literature of our review was limited to the last six years, which may have overlooked more findings. Another notable disadvantage is that this review only extracts papers written in English, limiting findings on BTPD in more countries. However, this review should represent the current roadmap of BL for teachers, and it has reference significance for future BTPD or BL in other fields.

Conclusion

The continued development of technology provides an increasing number of resources and platforms for teacher professional learning. The research on BTPD is also increasing year by year and mainly focuses on K-12 teachers and pre-service teachers. These BTPD organizations for in-service teachers are generally in the form of programs, while the pre-service or candidate teachers are in courses. From most to least, the research topics are teaching design, learning effect, other investigation and statistics, adoption intention, and exploration research orientation. These studies analyze the current status, prospects, and challenges of BTPD from different perspectives.

Although the BL strategy has many advantages and challenges in TPD, it is undeniably moving towards normalization with a new trend. The potential of BL should be considered to implement a more promising model of TPD (Garbe & Louloudi, 2018). Because blended learning makes the teacher process more responsive and engaging, it provides more educational opportunities while considering the participants' educational needs and abilities. (Krasnova & Shurygin, 2020). However, how to use blended learning strategies more effectively to promote the professional development of different types of teachers and improve student learning has become a topic for our future in-depth research.

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