

# A review of blended learning research at home and abroad

Binglin Liu<sup>1</sup>

<sup>1</sup>School of Geographic Science and Planning, Nanning Normal University, Nanning, Guangxi  
530001, China

**ABSTRACT:** Based on literature review and literature statistics, review the current status of research on the application of blended learning theory in education and teaching at home and abroad from the aspects of research quantity, research objects, researchers, research institutions and research content, and study the characteristics of current research results. Think and analyze the trends and existing problems and look forward to future research directions.

**Keywords :** blended learning; research review ; evaluation

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## I. Core concepts and theoretical basis

### 1.1 Blended Learning Concept

Blended learning is a new term emerging in the field of education. It is a learning method that combines online learning and face-to-face teaching<sup>[1]</sup>. In essence, it is a new learning method or learning concept. It refers to a learning method that appropriately combines traditional learning methods and online learning methods in E-learning and corporate training based on the perspective of systems theory and performance methods. Its goal is to make learning easier and more convenient, so as to achieve the best learning effect. It is based on the learning performance indicators of enterprises and organizations<sup>[2]</sup>.

Currently commonly used English expressions of blended learning include: Blend learning, Hybrid learning, Flexible learning, etc. , while the corresponding translations in China are blended learning, blended learning, knock-on learning or blended learning, etc.<sup>[3]</sup>. Since 2001 , what is Blend learning has become an important area of research and practical exploration in the international educational technology community. There are many definitions in the world. A typical definition is: the core of blended learning is to use “appropriate” learning technology for “appropriate” people at the “ appropriate” time and deliver it to suit the “ appropriate ” learning style . appropriate ” skills to optimize academic achievement aligned with learning goals<sup>[4]</sup>.

### 1.2 \_ Theoretical basis

Domestic blended learning was first proposed by Professor He Kekang at the 20th Global Chinese Computer Education Application Conference on December 9 , 2003. He believed that the so-called blended learning combines the advantages of traditional learning methods with the advantages of online learning<sup>[5]</sup>; that is to say, it is necessary to not only give play to the leading role of teachers in guiding, developing and monitoring the teaching process, but also to reflect the initiative, enthusiasm and creativity of students as the subject of the learning process. Only by combining the two and making their advantages complementary can the best learning effect be obtained<sup>[6]</sup>. Later, experts and scholars such as Nan Guonong, Fu Gangshan, Zhu Zhiting, Li Kedong, and Huang Ronghuai also defined blended learning. A comprehensive analysis of the definitions of domestic and foreign experts shows that the forms of blended learning are diverse: a blend of multiple learning theories (cognitivist learning theory, behaviorist learning theory, constructivist learning theory, etc.); a blend of multiple learning methods ( Such as face-to-face learning, online learning, independent learning, collaborative learning, project-based learning, etc.); the blending of multiple teaching models (teaching is the best and learning is the must); the blending of multiple teaching media (traditional teaching media, digital teaching) media) etc. From the above analysis, it can be seen that domestic and foreign researchers’ understanding of blended learning is multi-dimensional. This study agrees with Curtis Bunker ’s definition of missed learning within the scope of “ the combination of face-to-face teaching and online learning ” , of course based on the definition, the forms of blended learning can be diversified.

## II. Current research status at home and abroad

### 2.1 Current status of foreign research

We used well-known foreign databases such as Springer Link, Elsevier Science Direct and Google Scholar as sources of literature research samples, selected 2000-2016 as the search time range, and searched using the keywords Blend learning, Hybrid learning, and Flexible learning respectively, and eliminated irrelevant samples. Thus, research literature related to online learning published in authoritative journals was obtained.

Through the analysis of the retrieved relevant foreign literature on blended learning, it can be seen that foreign research on online learning was conducted earlier and more in-depth than domestic research. Currently, foreign research on blended learning is in the stage of theoretical exploration and application practice. combined research phases. Through the analysis, induction and summary of the relevant literature research content, it can be seen that there are many foreign research topics on blended learning, mainly in the following aspects: ① The concept, definition and connotation of blended learning. In 2000, blended learning was first proposed. In order to obtain mixed activities, in preschool they combine play with work elements. Although the study by Conney et al. is not blended learning, it is still important to apply the idea of blended learning<sup>[7]</sup>. Black<sup>[8]</sup> and Graham<sup>[9]</sup> and others believe that blended learning combines face-to-face learning with network-based learning to create a learning environment that is beneficial to learners. Graham summarized the overview of GAI learning, including its background, definition, trends, hybrid types, challenges and future development directions<sup>[10]</sup>. ② Theoretical basis of blended learning. The theories of blended learning are diverse, such as component display theory and instructional processing theory, motivation theory, constructivist learning theory, Gagne's nine-stage teaching method, Bloom's teaching goal classification theory, performance support technology, etc.<sup>[11]</sup>. ③ Blended learning mode. There are many studies on hybrid learning application models abroad, and they are gradually becoming mature. They have moved from the early theoretical exploration stage to the practical application stage, paying equal attention to both theory and empirical evidence, such as the Bamum and Paarmann model<sup>[12]</sup>, PCR project model, and JMC model.<sup>[13]</sup> etc. ④ Research on mixed elements. Georgsen believes that blended learning is a widely used term, usually used to describe many different concepts or situations<sup>[14]</sup>. In summary, the term is used in four typical ways: based on a combination of different network technologies to achieve teaching or educational goals; combining different teaching methods to achieve the best learning results (whether using ICT or not); any kind of teaching technology with teachers Combining face-to-face communication and interaction; combining teaching technology with real work tasks to achieve a balance between learning and work. ⑤ Research on blended learning applications. Foreign applied research on blended learning mainly focuses on corporate training and online distance education. For example, Thomson Company applies blended learning to corporate training and explores research on the effects of blended learning. Through the analysis of hundreds of blended learning cases, a report on "Research on Factors Affecting Thomson's Work Performance" was obtained. There are also companies such as NET, IBM, General Electric and other companies that use hybrid learning (face-to-face classroom + online learning) for employee or manager training<sup>[15][16]</sup>. In addition to corporate training, there are also many cases of the application of blended learning in foreign universities. For example, the National Open University of South Korea has adopted blended tutoring since 2005 to help freshmen better enter the new environment and learning state; the University of Florida Business School in the United States The studies for the master's degree in management and the Ph.D. degree in on-the-job pharmacy have adopted a blended learning approach. □□

### 2.2 Domestic research status

This article uses academic journal articles retrieved from China National Knowledge Infrastructure (CNKI) as research sources. Due to the complexity of the name evolution and expression of blended learning, this article determines the search terms as "blended learning", "blended learning", "Blended Learning", "Blending Learning", and "Hybrid Learning". Blended learning first appeared in China in 1990, so the search starting time is 1990, the search date is from January 1, 1990 to December 1, 2016, the search term is determined as "keyword", and the matching method is "Accurate", while eliminating irrelevant samples such as policy propaganda, news advertisements, leadership speeches, notices, prefaces, master's and doctoral theses, and duplicate content. After searching, a total of 1247 valid samples were obtained. Since the term "blended learning" can be expressed in various ways, such as "blended learning", "blended learning", "Blended Learning", "Blending Learning" and "Hybrid Learning", this study uses blended learning to express it uniformly. Through domestic literature search and analysis, it was found that domestic research focuses on four aspects: theoretical research, design and development research, application research and evaluation research.

### 2.1.1 Theoretical research

Research on blended learning theory mainly involves the basic connotation, basic theory and application value of blended learning. Regarding the discussion of the basic connotation of blended learning, there is currently no unified understanding in the country. Different experts and scholars have defined blended learning. Professor He Kekang believes that blended learning is to combine the advantages of traditional learning methods with the advantages of digital or networked learning. In combination, that is to say, it is necessary to give full play to the role of teachers in guiding, inspiring, and monitoring in the teaching process, and to fully reflect the main role of students' initiative, enthusiasm, and creativity in the learning process<sup>[17]</sup>. At the same time, it is pointed out that the new meaning of blended learning and its widespread recognition indicate that the educational ideas in the international educational technology community are undergoing another profound change, and are also a sign of the further development of educational technology theory. Li Kedong believes that the main idea of blended learning is to organically integrate the two learning modes of face-to-face teaching and online learning to achieve a teaching method that reduces costs and improves efficiency. While determining the basic connotation of blended learning, he further elaborates on the theory of blended learning. Issues such as foundation, basic principles, process design and application models were discussed<sup>[18]</sup>. Chen Weidong analyzed the essence of blended learning from the four dimensions of people, technology, environment and methods. He believed that the key to the successful implementation of blended learning is to focus on the integration of the four elements and serve the needs of human development and cognitive, skill and emotional learning.<sup>[19]</sup> With the deepening of research, researchers' horizons have gradually broadened, and some researchers have further explored the connotation of blended learning from an interdisciplinary perspective, reflecting the diversity of research perspectives. Based on the perspective of dissipative structure theory, Chen Ni explained the connotation of blended learning from a systemic perspective, and analyzed the characteristics and operating mechanism of the blended learning system. Finally, in view of the problems that arise in the courses in higher education in China, she proposed ways to promote the formation of dissipative learning systems. Methods and strategies for dispersing structures<sup>[20]</sup>. On the basis of elaborating the basic connotation of the disruptive innovation theory, Li Wen analyzed the attributes and characteristics of blended learning from four aspects: starting point, development path, performance, and development trend of blended learning based on the disruptive innovation theory, and finally proposed hybrid learning in T universities. Implementation strategies of traditional learning<sup>[21]</sup>. Zeng Maolin proposed to examine blended learning from the perspective of the subject's ingestion of knowledge<sup>[22]</sup>.

### 2.2.2 Design and development research aspects

The design and development research of blended learning mainly involves the design and implementation of blended learning systems and resource platforms. Because the construction of blended learning systems and resource platforms can effectively promote the integration of online learning and offline learning, thereby improving learners' learning effects, relevant research focuses on the guiding role of blended learning in education and teaching reform, using relevant technologies Build a system and resource platform that adapts to blended learning needs. Through the analysis of the literature, it can be found that some researchers specialize in the design and development of hybrid learning systems and resource platforms. For example, Cai Xin proposed the idea of designing a hybrid teaching management system with class as the core, constructed a process management model and system functional framework for hybrid teaching design, and provided a practical hybrid teaching management method and platform for modern teaching<sup>[23]</sup>; Zeng Fang introduced the hybrid learning theory on the basis of research and revealed the problems existing in the current teaching support system. Through the analysis and design of the system, she chose to adopt the integrated technology of network system and desktop system development based on rich Internet applications to achieve In order to solve the problem of how to effectively realize the practical teaching function of virtual learning community, Chen Liting proposed to use the educational virtual community as a platform to build a new online learning model to assist traditional teaching and apply it in higher vocational education<sup>[24]</sup>. To maximize the use of existing open source resources, more researchers are adapting open source platforms or social software so that existing system platforms can meet learners' needs for blended learning. For example, Kong Weihong and others introduced and analyzed mobile platforms and blended learning, and combined teaching practice to discuss and practice blended learning based on mobile platforms from the aspects of learning resources, learning activities, learning evaluation, etc. The results show that mobile platforms can Effective implementation of blended learning provides new means to improve teaching quality and efficiency<sup>[26]</sup>. Niang Ling and others chose Windows Live group as the application research platform, and took the modern educational technology course as an example to carry out application research on the hybrid learning course platform<sup>[27]</sup>. □

### 2.2.3 Applied research

The application research of blended learning mainly focuses on the model research and teaching application of blended teaching and learning. Research on blended teaching and learning models is an important foundation for the development and promotion of blended learning, and blended course design is an important guarantee for the success of blended learning. Through the analysis of the literature research content, it is found that researchers mainly use open source platforms as hybrid learning systems or resource platforms. Based on a certain theoretical basis, they construct models through theoretical induction and deduction. Most researchers build based on a course or learning theme. Corresponding empirical research and analysis have been carried out, and based on the empirical research and analysis, the validity and scientificity of the model have been further demonstrated. By understanding the current status of biology teaching in junior high schools and the application of information technology, Li Hui constructed a teaching model for junior high school biology courses based on blended learning, and based on this model, designed learning cases for blended learning in junior high school biology courses. And conducted application research and effect evaluation on the case <sup>[ 28]</sup>; Qiao Yang selected junior high school physics courses to carry out teaching design research and design of teaching cases for blended learning based on mobile platforms, selected 80 eighth grade students as the research subjects, and conducted relevant experiments Implementation and result analysis, testing the effectiveness of the model by measuring learners' learning interest, independent learning ability and changes in learning performance <sup>[ 29]</sup>; Liu Chao 's analysis of various related theories supporting blended learning and the connotation of blended learning Conducted research, and based on the analysis and reference to the systematic method model of Dick and Carey's teaching design, combined with the characteristics of the "College Computer Fundamentals" course, a corresponding blended learning teaching design model was constructed, and the design was strictly in accordance with this model Developed a blended learning plan for the "College Computer Fundamentals" course, applied it to actual teaching, and used actual teaching effects to verify the correctness of this topic <sup>[ 30]</sup>; Zhang Bijuan investigated the research status of bilingual teaching and based on the relevant research on blended learning This paper theoretically analyzes the advantages of blended learning in bilingual teaching, conducts a case study on the bilingual program of the Educational Technology Major of Central China Normal University, and then summarizes the experience and existing problems based on the effectiveness of the course implementation, and proposes improvements from the perspectives of teachers and schools. Countermeasures and suggestions for teaching effectiveness <sup>[ 31]</sup>. Current research on the application of blended learning is mainly in school education, corporate training, teacher professional ability improvement, and adult education. Among them, the application in school education accounts for the largest proportion. Researchers mainly focus on the application and promotion of hybrid teaching and learning models in higher education to provide support for the realization of higher education reform. Based on the blended learning theory, Liang Qi and others explored a set of teacher informatization methods that organically combine short-term centralized training supported by three-dimensional training resources, school-based training supported by network platforms, independent learning supported by online learning platforms, and expert tour guidance. Teaching can be based on the hybrid training model, and after two years of practical verification, it is believed that hybrid teacher training effectively promotes changes in teachers' attitudes toward information technology applications and the improvement of basic information technology literacy and information-based teaching practical abilities <sup>[ 32]</sup>. □

### 2.2.4 Evaluation research aspects

Evaluation research on blended learning mainly involves research on the effectiveness of blended learning models and strategies, evaluation systems, and teaching and learning effects. Zhang Sheng carried out theoretical and practical research on formative evaluation based on learning activities in the Haihe learning environment. He believes that in a blended learning environment, the formative evaluation system based on learning activities can effectively ensure students' high-quality learning. With participation, improve students' learning and promote the improvement of students' teachers' educational technical abilities, thereby ensuring the quality of training projects, achieving training goals, and promoting their healthy development <sup>[ 33]</sup>; Gao Chuannan, based on the theory of effective teaching, Taking the information technology ability training of teachers in Zhabei District as an entry point, we try to study effective teaching based on the blended learning model <sup>[ 34]</sup>; the purpose of the research is to obtain a rational and regular understanding of the micro-study field in effective teaching based on blended learning , enrich the theoretical connotation of effective teaching. Wu Jinxiu aimed to explore the student satisfaction of English blended learning, deeply analyze its influencing factors and construct a factor model of student satisfaction in English blended learning. The finally established model revealed the influencing factors and their correlations of English blended learning student satisfaction, and provided Research on the influencing factors of student satisfaction in English blended learning provides more evidence <sup>[ 35]</sup>. □ □

### III. Development directions and research trends

#### 3.1 Research Trends and Related Research Analysis

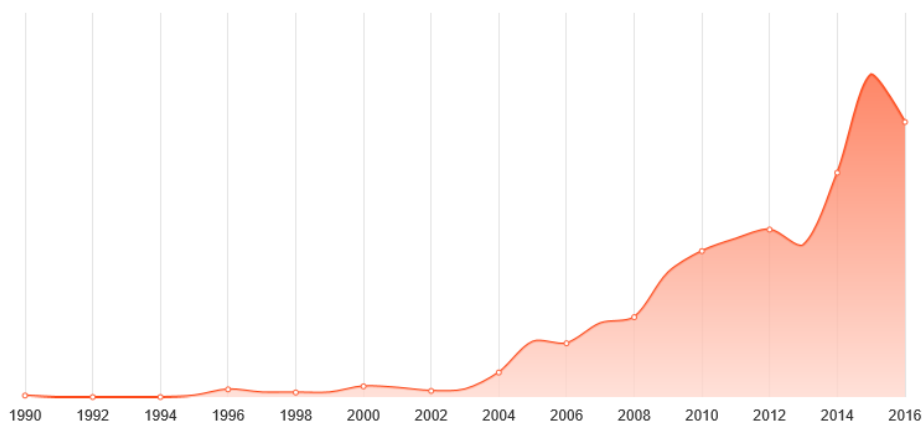


Figure 1 Blended Learning Research Trend  
Fig.1 Trend of blended learning research

Through a search of China National Knowledge Infrastructure (CNKI), it was found that the paper on blended learning in China first appeared in 1990. The research trends and related research statistics of blended learning are shown in Figures 1 and 2 . As can be seen from the figure, from 1990 to 2002 , the average number of papers per year did not exceed 20. During these three years, the number of papers was limited. This is also consistent with the development trajectory of blended learning in China: In 2003, Zhu Zhiting introduced the concept of blended learning into the country for the first time. In the following three years, blended learning was basically in the theoretical research stage, mainly exploring and explaining basic theories and concepts, with few practical applications. For example, Tian Shisheng (2004), Li Kedong (2004), He Kekang (2004), etc. have conducted preliminary explorations on the basic concepts, basic principles, and basic application models of blended learning. From 2003 to 2012 , the number of published articles on blended learning increased dramatically, reaching its first peak in 2012 ( 109 articles ) . Research on blended learning technology occupies an important position at this stage. Research during this period focuses on network-dependent learning and research on network resources and blended learning support services, including the exploration of mobile learning, distributed learning, and blended learning methods. Construction of resource environment, research based on Moodle, etc. From 201 2 to 201 3 , the growth rate of hybrid learning publications slowed down. During this period, research on the rational reflection of blended learning and the effectiveness of blended learning gradually received attention, and the disciplines and applications became more extensive and diverse. From 2013 to 2015, the number of hybrid learning articles continued to grow and reached its second peak in 2015 (210 articles). Generally speaking, from 2003 to 201 6 , blended learning has shown an obvious growth trend, especially in the application research supported by blended learning technology, the innovation and depth have been enhanced.

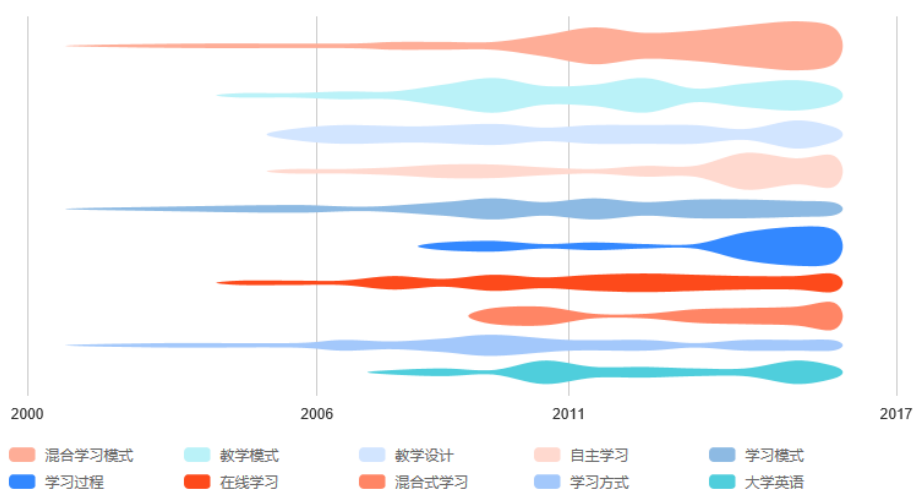


Figure 2 Blended learning correlation research  
Fig.2 Study on the association of Blended Learning



### 3.2 Research group analysis

The analysis of the institutions to which the authors of the paper belong helps us clearly understand the current overview of blended learning research in different fields. This study conducted quantitative statistics on the institutions affiliated to the first authors who published hybrid learning research results, and organized the ten institutions with the largest number of results into a graph, as shown in Figure 3. Most of the authors of blended learning papers are from institutions of higher learning, which shows that institutions of higher learning are the backbone of blended learning research in China's distance education. This is inseparable from the advantages of institutions of higher learning. On the one hand, research on blended learning in colleges and universities can be supported by special funds and related technologies; on the other hand, many experts and scholars and the rich academic foundation of colleges and universities can provide support for research on blended learning. In contrast, vocational colleges and middle schools each account for only one place among institutions with high publication volume, indicating that blended learning has received certain attention in the country, but the attention is not enough. Basic education in primary and secondary schools, vocational and technical education, adult continuing education, and corporate training are important research and application areas of blended learning. The current research foundation is weak and there are few results. The above data shows that blended learning research is not yet mature. Although its value and significance have been affirmed, it is far from receiving widespread attention and has not reached the level of popularization and application. In particular, research in the fields of vocational education and corporate training should receive focus, including the application of blended learning in corporate training, blended learning in the workplace, and the establishment of diversified training models, especially in modern enterprises with fast pace, poor synchronization, and personnel hierarchies. The existence of phenomena such as complexity and "difficult to agree with others" provides opportunities for the development of blended learning in corporate training.

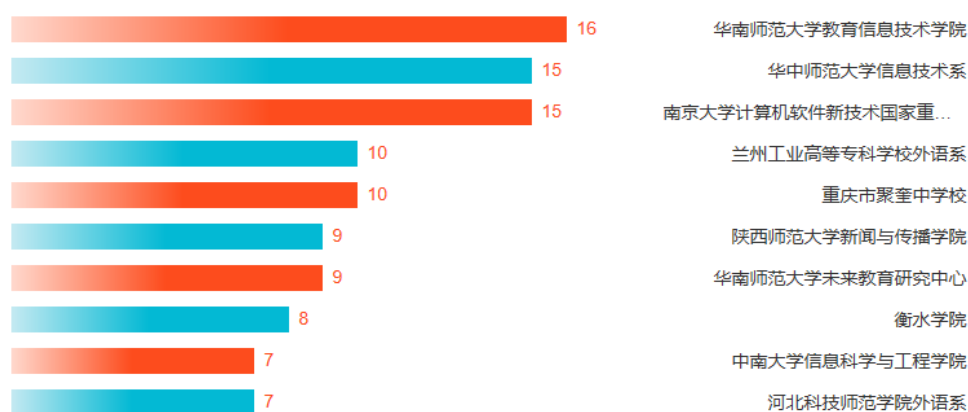


Figure 3 Highly published institutions in the field of blended learning  
Fig.3 High risk text organization in the field of hybrid learning

### 3.3 Current status of blended learning research

1. From the existing mixed theory research, we can see that there are an overwhelming number of articles discussing various blended learning theories. Behind the seeming prosperity is the mutual divergence between blended learning researchers and users. Domestic researchers should devote more energy to exploring the application effects of blended learning in practice and promote the development of blended learning theory through empirical research.

2. At present, researchers on blended learning mainly focus on colleges and universities, and teachers in primary and secondary schools rarely participate in research. The research objects based on blended learning are mainly universities, and little attention has been paid to the application of blended learning in primary and secondary classrooms. The implementers of blended learning theory are not only university researchers, but also primary and secondary school teachers. All theoretical and model research is to guide practice and application, and cannot be separated from the fact that it will ultimately be tested in practice. If blended learning research has become a self-entertainment for universities and colleges, then university research seems to have become a mirage, a rainbow hanging in the sky, which is beyond the reach of primary and secondary school teachers.

3. Research on blended learning mainly includes theoretical research, school teaching applications, online education applications, student learning applications and teacher training. There are no articles on the application of blended learning in corporate training. Although China has begun to pay attention to the training application of blended learning in enterprises, research in this area is still insufficient and an application model has not been formed. In fact, companies can effectively apply the cutting-edge theoretical results of learning science in education and training to win greater benefits and performance at a lower cost and faster speed.

### 3.4 Countermeasures and suggestions for improving blended learning research

#### 3.4.1 Pay attention to the application effects of blended learning

The research on blended learning is not actually about "what elements are mixed in blended learning", but "the application effect of blended learning in colleges and universities, primary and secondary schools, online education and corporate training, and how to make blended learning more effective and what kind of "Methods and strategies to improve and promote learning in mixed environments" [36], however, its application effect in primary and secondary schools and corporate training needs further study by researchers.

#### 3.4.2 Pay attention to subject teaching design

Currently, blended learning is used in China's school education more frequently than before. How to effectively apply blended learning theory in subject teaching has become an urgent problem to be solved. Applying blended learning theory to design teaching plans for each subject can promote the application of blended learning theory and enable primary and secondary school teachers to experience the application effects of blended learning, so that they can conduct collaborative research with university researchers.

#### 3.4.3 Integration with corporate training

Blended learning provides a new idea for corporate training. Because there are very few teachers responsible for delivering knowledge and learning guidance in enterprises, the application of blended learning in enterprises can be based on self-paced online learning, and students can choose learning content according to their own needs. During the learning process, there will be a lot of self-questioning and self-reflection activities, and then there will be a lot of computer real-time feedback. At the same time, face-to-face traditional teaching makes up for the shortcomings of online learning, which is also the advantage of blended learning.

#### 3.4.4 Implement effective teacher training

The current teacher training system does not do enough to train teachers who will implement blended teaching. Only through effective training can teachers understand the connotation and implementation methods of blended learning, and then it is possible for them to use blended learning for teaching innovation. During training, teachers should not only tell teachers the theory of blended learning, but more importantly, show them various blended learning cases and examples, and tell them various problems and solutions they may encounter. Teachers are confused about blended learning and don't know how to get started because their concepts lack concrete examples and previous experience.

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