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Differential Reactions of Urban and Rural Teachers to Blended Learning:
Evidence From Chinese Secondary Schools

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ABSTRACT

The COVID-19 pandemic has provided an opportunity for implementing blended learning in Chinese secondary schools. However, teachers have encountered several problems and challenges with the new pedagogical paradigm. Therefore, this study aims to identify the factors influencing the implementation of blended learning in urban and rural secondary schools from the perspective of secondary school teachers and to examine the teachers' different responses to these factors. Interview data were collected from 13 secondary school teachers in Guangdong Province, China. The findings identify seven factors influencing the implementation of blended learning from the teachers' perspective, including blended learning curriculum design, teaching resources, teaching ability, teacher-student interactive behavior, teacher motivation, students' ability, and workload. The distinct differences between urban and rural teachers' responses to the aforementioned influential factors provide a reference for the government and schools to establish a moderating mechanism for blended learning implementation.

KEYWORDS

Blended Learning, Secondary School Teachers, Students Ability, Teacher Motivation, Workload

INTRODUCTION

Information and communications technology (ICT) is progressively being integrated into every aspect of education and teaching, supporting innovation in secondary school teaching and learning, and driving ongoing changes in school curricula. Furthermore, owing to the COVID-19 pandemic, new educational approaches have been introduced worldwide (Dhawan, 2020). In China, many secondary schools have adopted blended learning (BL) as a teaching model combining classroom teaching and online learning. Secondary schools expect that BL will become the norm in future secondary education reform, as it will change the existing teaching model and resolve the problem of limited personalized learning for students (Cheng & Wu, 2020). BL has demonstrated its significant

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advantages in improving learners' performance, including enhancing interest and satisfaction in learning, optimizing learning outcomes, developing self-directed learning skills, and improving attitudes toward learning (Larmuseau et al., 2018; Serrano et al., 2019; Zhang et al., 2022; Zhao et al., 2020). As an innovative model that can re-integrate learning time, BL will drive the future of education in China (R.H. Huang et al., 2022). However, there are few case studies on the effectiveness of BL practices in Chinese secondary schools (Fu et al., 2021). While teachers' focus on BL is still on the technical level, the significant challenges faced in the practice process must be addressed. Specifically, as implementers of pedagogical theory applications and direct leaders of teaching practice activities, teachers must still summarize and analyze their experiences in BL practices well. It has led to few studies analyzing the problems in BL practices from the teachers' perspectives (Bowyer & Chambers, 2017; Mozelius & Rydel, 2017). Therefore, this study aims to identify the challenges and influential factors in implementing BL in Guangdong, China, from the perspective of secondary school teachers and to understand the perceptions of urban and rural teachers about these dilemmas. For this purpose, this study is the first to compare the BL experiences of rural and urban Chinese secondary school teachers based on their reflections. Therefore, it gives rise to the research question: What are the differential reactions of urban and rural teachers in secondary schools to their experiences of BL implementation? Data were collected primarily through qualitative research. In addition, the descriptive analysis of the survey questions was conducted from the secondary school teachers' perspectives. By identifying the challenges and factors affecting BL implementation in China, this study can serve as a reference for the government, schools, and teachers in their efforts to improve the learning experience and help the teachers adapt to new models of teaching innovation.

The remainder of this paper is organized as follows. Section 2 reviews the relevant literature on BL and explores the challenges encountered in its implementation. Section 3 describes the methodology used in this study. Section 4 presents the results, while Section 5 discusses them. Finally, Section 6 summarizes the findings, identifies the study's limitations, and offers recommendations for future research.

LITERATURE REVIEW

Blended Learning

The concept of BL has evolved with technology, with various definitions offered. For example, Ramirez-Arellano et al. (2019) defined BL as a combination of online and face-to-face instruction using online learning activities designed to guide and complement face-to-face instruction. In 2020, the United Nations Educational, Scientific and Cultural Organization (UNESCO) provided a universal definition of BL as "a way of learning that combines distance learning and face-to-face learning to improve the student experience and ensure continuity of learning" ("Concept Note," 2021). Implementing BL can effectively solve several practical problems in teaching and learning, accomplish teaching objectives or activity design that cannot be achieved individually by face-to-face instruction or online learning, maximize teaching and learning outcomes, and enhance students' independent abilities. With the development of new technologies, the platforms used to support BL are no longer limited to specific media types, as all-in-one tools, social media platforms, mobile digital resources, and online access modes can support face-to-face teaching and learning. Moreover, with the development of BL practices owing to the COVID-19 pandemic, Chinese scholars have proposed that BL relies on a hybrid infrastructure and open educational practice (OEP). BL integrates online and offline learning spaces in real-time while teaching students seamlessly in physical and online classrooms (R.H. Huang et al., 2021).

Due to the broad concept of BL, Chinese secondary school teachers may have differences in understanding its definition. Some scholars believe BL should include a combination of online and offline learning and emphasize the integration of different technologies, theories, and teaching

strategies (He, 2004; Wu, 2016). Furthermore, they argued that the learning environment is the school, and students must possess the ability for self-directed learning, while teachers' instructional design should stimulate students' motivation and creativity (He, 2004). Chinese scholars' ideas differ from the implementation context proposed by Staker and Horn (2015) for BL, which emphasized that the place for BL is limited to schools or other supervised settings by teachers, advocating personalized learning, learning pathways, and comprehensive learning experiences.

However, some teachers interpret BL as simply transferring offline classroom content to online platforms for learning, such as providing online teaching resources through video recordings, slide sharing, and similar methods (Yu, 2017). They believe BL primarily focuses on enhancing students' self-directed learning abilities and personalized learning experiences through technology, offering more flexible learning approaches and resources.

In summary, there are specific differences in Chinese teachers' understanding of BL. As a result, there are still research gaps regarding the definition and understanding of BL in Chinese educational settings that need further exploration and clarification.

Issues and Challenges Associated With BL

This subsection reviews the issues and challenges associated with BL in the extant literature.

(1) Student competencies need to meet the requirements for implementing BL. The successful implementation of BL requires a certain level of ICT literacy skills for teachers and students (Kintu et al., 2017; Ponomareva, 2021). Nevertheless, the ability of secondary school students to master ICT can vary widely depending on the region, family, and school, thus affecting BL's effectiveness (Chen & Cao, 2020). Through analyzing previous literature, Chinese scholars paid much attention to the performance of students' competence while implementing BL. Sun and Qiu (2017), Teo et al. (2019), N. Wang et al. (2019), and Yang et al. (2019) have all raised teachers' concerns and worries about students' autonomous learning ability when implementing BL. Since the practice of BL in China occurs mainly in higher education institutions, students' independent learning ability and information technology level are much better than those of secondary school students. Therefore, whether secondary school students can effectively participate in BL is an issue that deserves in-depth discussion among researchers.

(2) BL increases teacher workload. In the early research on BL, many scholars have pointed out that BL design is very time-consuming. Teachers had to spend more time iteratively designing transitions between face-to-face and online activities (Owston & York, 2018). Dyment and Downing (2018) also argued that the online course component of BL stresses teachers and increases their workload in several ways. First, secondary teachers must spend considerable time preparing the resources for online instruction, including videos, exercises, assessments, and discussions. Second, the sudden shift in the instructional model adds multiple teacher tasks. It includes allocating time to organize online and offline activities and solving problems that students encounter while learning online. Third, teachers must clarify the sequence of online and offline activities in the interface between activities. Hence, compared with traditional teaching, BL undoubtedly increases teachers' workload (An et al., 2021). The difference with previous scholars' studies on workload is that previous studies showed that the increase in workload was mainly reflected in the change in teachers' academic workload (Ibrahim & Nat, 2019). In contrast, secondary school teachers in China have a heavy teaching workload. Typically, a teacher is responsible for multiple classes with 40 or more students in each class. It means that Chinese secondary school teachers have a great deal of lesson planning, classroom work, and homework correction. However, only some studies have analyzed why BL increases the workload of secondary school teachers from the reality of Chinese secondary school teachers.

(3) Poor quality of blended course design. Blended course design is a core category among the critical factors of BL and a significant challenge for teachers (Mozelius & Hettiarachchi, 2017). Andujar

and Nadif (2022) argued that in blended education, course design should consider accessibility and inclusiveness. The features are relatively simple, while existing BL is conducted through several learning platforms. It leads to the need to alternate between offline and online learning, and the online component often fails to create a class atmosphere, thus affecting the learners' sense of belonging. Chinese scholars in BL research have also recognized the lack of sound BL instructional design as a significant problem currently facing the development of BL in China (Li et al., 2020; Zhang et al., 2020; Shi et al., 2021; C. Wang, 2021). However, these studies were conducted with higher education teachers as the research object and did not look at the problems Chinese secondary school teachers face in accomplishing blended instructional design under the existing education system and assessment mechanism.

(4) The online learning platform is one of the main factors affecting the effectiveness of BL. The support of a learning platform is indispensable in BL, as it supports the interaction and collaboration between teachers and students. On the one hand, teachers must use teaching platforms to create course resources, design teaching processes, and make teaching announcements. In addition, teachers use multimedia classrooms or online platforms to carry out classroom teaching and evaluate the effectiveness of teaching through the back-end data analysis function of the learning platform. On the other hand, students must also use the learning platform to participate in the BL process. Moreover, the effectiveness and satisfaction of BL are affected when students and teachers find that traditional learning styles are unsuitable for the digital platform (Rasheed et al., 2020; Haron et al., 2021). Zhang et al. (2020) showed in their study that in China's BL practice, operational platforms and systems still have deficiencies that cannot effectively support the implementation of BL. The rapid development of information technology in China has led to the creation of numerous learning platforms. However, secondary school teachers must have adequate technology to apply these facilities and resources to conduct effective BL programs.

All these issues and challenges have caused the researcher to focus on secondary school teachers. Therefore, this study aims to explore the differences in the factors influencing the implementation of BL among secondary school teachers. The findings of the study will provide the necessary reference for the development of policy guidelines in the future.

Community of Inquiry Model

Garrison et al. (1999) proposed a community of inquiry (CoI) theory to support learning experiences in higher education. CoI is an analytical framework that combines the reconstruction of personal experience with social collaboration from the educational perspective of collaborative construction. This theory provides three dimensions, namely teaching presence, cognitive presence, and social presence, to analyze BL.

This study explores the factors that influence secondary school teachers' adoption of blended learning from the teachers' perspective. Therefore, an in-depth understanding of CoI can help researchers explore different aspects of secondary school teachers' perceptions of blended learning and help fill the research gap.

Teaching presence includes designing, guiding, and supporting cognitive and social communication processes. This dimension achieves the learning goals of individuals and organizations. Cognitive presence refers to learners completing and consolidating the meaning construction of knowledge through constant reflection and dialogue in the learning community. Social presence is the social and emotional manifestation of participants in a BL community.

The CoI model can improve the effectiveness of BL. Teaching presence plays a vital role in it. Garrison et al. (2001) pointed out that teaching presence includes three sub-categories of teaching (curriculum): design and organization, promotion of dialogue, and direct guidance. Teaching (course)

design and organization refers to the setting of course content, design methods, establishing time series, and effective media use. Promoting dialogue refers to setting up a learning environment, attracting participants, triggering discussion, identifying consensus or differences in the field, and evaluating the effectiveness of the process. Direct pointing refers to presenting content and problems, diagnosing misunderstandings, focusing on the debates, summarizing and reflecting, and confirming understanding through evaluation and interpretive feedback while solving technical oral questions. In short, teaching presence directly influences the learning effect of BL.

BL Implementation Models

Staker and Horn (2015) proposed four BL practice models and believed that these four practice models meet the implementation of BL in the K-12 stage. The first model is the rotation model. The typical feature of this model is that students can switch between different learning modules, but they must do so according to the fixed time arranged by the teacher. The second model is the a la carte model. This model often refers to the use of online courses to supplement the insufficiency of face-to-face courses when school resources cannot meet the requirements of students. The third is the flex model. Students' learning activities are autonomous, and they can freely arrange their learning activities according to the timetable of the learning module. The last type is the enriched virtual model. This model is commonly found in some K-12 schools in the United States ("Blended Learning Models," 2021). Students divide their time between attending campus and online distance learning. The enriched virtual model often does not require daily school education; most student learning occurs online.

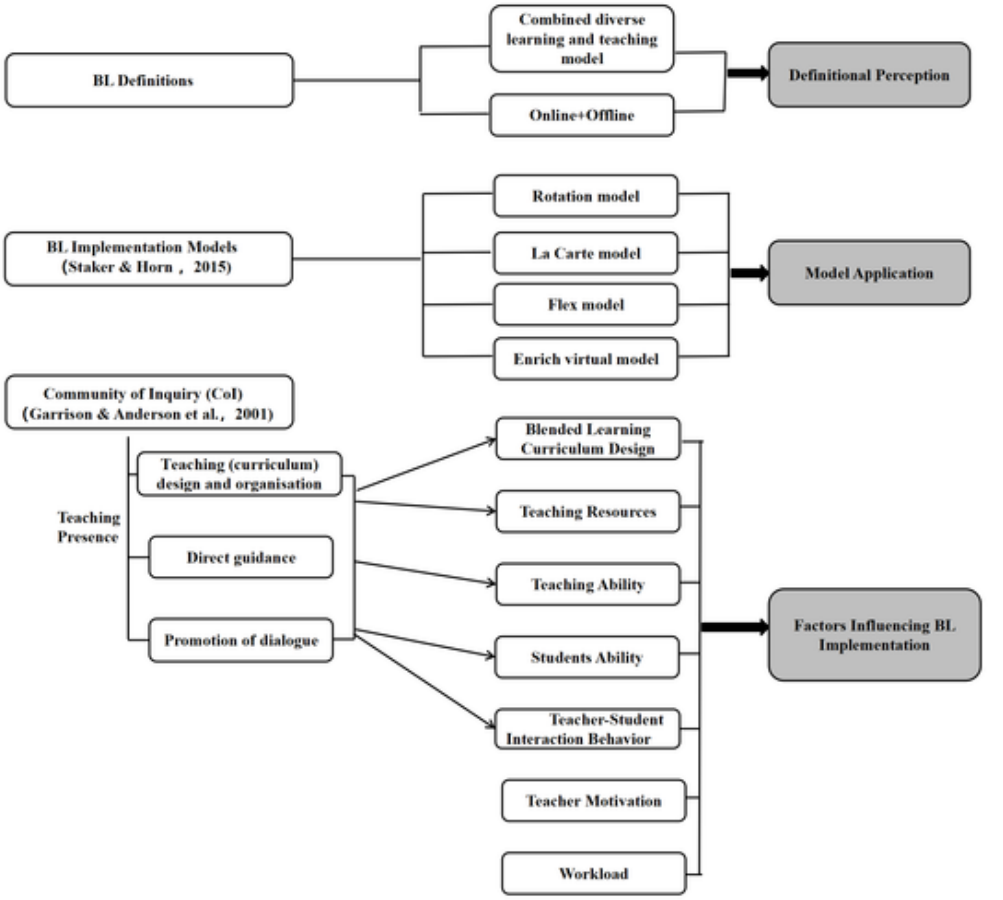
Chinese scholar Wu (2016) explored the implementation of BL in practice. Taking students in higher education as his research object, Wu proposed a framework for BL implementation from the course design perspective. His research focuses on constructing a BL environment and emphasizes the importance of goal setting for BL implementation. However, from previous literature reviews, Chinese scholars seldom analyze the practical experience of secondary school teachers in BL. Although the research by Wu (2016) provides a framework, it needs a detailed exploration of secondary school teachers' practical experiences. In order to fill this research gap, there is a need to explore further the challenges faced by secondary school teachers in BL implementation.

Theoretical Frameworks

The primary purpose of this study was to explore the differential reactions to implementing BL in urban and rural areas of Guangdong, China. Through the literature review, the researchers found differences in understanding the definition of BL among Chinese scholars. Chinese secondary school teachers seldom summarize BL implementation experiences and need more guidance on BL models. Moreover, through the literature review, the CoI model was found to be an important theory in BL research. The model emphasizes the critical influence of teaching presence on student learning outcomes and provides theoretical support for researchers to explore the factors influencing implementation of BL from teachers.

This study will explore three aspects of BL's definitional understanding, implementation model, and influencing factors, as shown in Figure 1. The CoI model is utilized as a theoretical framework in the study, aiming to reveal the factors that differentiate teachers' implementation of BL in urban and rural areas of Guangdong. Through interviews with secondary school teachers' implementation experiences in urban and rural Guangdong, the study compares the responses of secondary school teachers in different areas with the same influencing factors. Also, the study considers other potential factors, such as teacher motivation and workload, to understand the factors that affect secondary school teachers' promotion and embrace of BL in urban and rural areas of Guangdong. By revealing these differential reactions, this study will provide a strong rationale for Chinese educational policymakers and educational practices to facilitate the effective implementation of BL.

Figure 1. Theoretical framework of the study



MATERIALS AND METHODS

Respondents

This study aims to explore urban and rural teachers' differential responses to BL implementation in Chinese secondary schools. Therefore, this study uses purposive sampling. Both Patton (2002) and Creswell (2012) emphasized that purposive sampling deliberately selects a central phenomenon that individuals can understand, and the selected individuals can provide rich information about this phenomenon.

Therefore, before starting data collection, the researchers specified the sampling strategy. The following sampling criteria were applied to select the teachers interviewed.

(1) The secondary school teachers must have participated in the Information Technology Upgrade Project 2.0 (ITU2.0) for Primary and Secondary School Teachers in Guangdong Province in 2020 as a population. This is because these teachers have a certain level of information literacy and can use technology flexibly to apply BL in the teaching process.
(2) They had at least three years of professional work experience.
(3) They had obtained junior or middle titles (junior lecturer and middle lecturer).
(4) They had engaged in BL practice in relevant courses for at least three years.

The entire interview process was accomplished with the support of the Zhaoqing University Provincial Primary and Secondary School Teacher Development Center. Through semi-structured interviews, 13 secondary school teachers were interested in participating in the study and shared their experiences regarding implementing BL. Among them, 53.85% were from urban areas, while 46.15% were from rural areas. Additionally, 30.7%. of the respondents had more than 10 years of work experience, and 38.4% were responsible for the basic secondary school curriculum (language and literature, mathematics, and English). Overall, the interviewed teachers covered various subjects in Chinese secondary schools. Also, during the interview process, the researchers interviewed and validated the interview material with the interviewees on a case-by-case basis. When the information provided by the subsequent teachers interviewed satisfied the thematic content of the interview protocol, and no new information was generated, the researchers considered that the data from this interview had reached saturation.

Data Collection

The researchers invited three experts specializing in BL and qualitative research to validate the interview questions. A final interview protocol was developed based on the experts' guidance and consisted of five descriptive and 12 open-ended questions. Subsequently, the researchers transcribed the raw data from the interviews and further analyzed them.

Data Analysis

Qualitative content and thematic analyses are widely considered transparent and systematic methods of analysis in qualitative research (Vaismoradi et al., 2016). Hence, thematic analysis (Braun & Clarke, 2006) was used in this study to analyze the interview data from secondary school teachers. The data analysis process followed the six-stage thematic analysis framework provided by Braun and Clarke (2006). The researchers used the qualitative data analysis software ATLAS.ti 22 for classification and reference point intensity representation. To ensure the reliability of the coding process, the researchers sent back the compiled interview data to the interviewed teachers for confirmation and invited peer experts to validate the coding manual.

RESULTS

Definitional Perception

Through semi-structured interviews with secondary school teachers, the interviewees explained their understanding of the BL concept, which can be categorized into three main ideas: "a combined diverse learning and teaching model," "the online+offline viewpoint," and "the five rights definition."

The teachers who held the viewpoint of BL as "a combined diverse learning and teaching model" believed that BL is "an efficient and diverse learning and teaching model that uses information technology, such as the internet, to learn and teach regardless of time and place" (Participant C03). Participant C02 further explained this view by suggesting that modern multimedia networks have led to a more diverse "pedagogy" and "presentation" of classroom formats. This view differs from the argument of Ronsen and Stewart (2015) that BL is a mixture of multiple teaching methods and delivery styles, with 30-79% of the content online. They intentionally emphasized the percentage of the online component in the BL process. However, in our study, the interviewed teachers cared more about integrating online and classroom teaching in the BL process and had multiple different teaching or learning models that resulted from the integration process. This view is consistent with the study by Cronje (2020).

The teachers who held the "online+offline" viewpoint believed that BL is a learning model that combines online and offline learning. This view is consistent with the majority of scholars' perspectives. The interviewed teachers' experiences of implementing BL revealed that the online

component of BL implemented by Chinese secondary school teachers complements and supports classroom instruction. For example, Participant R03 stated,

BL is a learning model that combines online and offline instruction. I use different approaches to blended learning in different teaching contexts. In my demonstration lessons, I prepare micro-learning videos to record the key points or difficult parts of the material to be taught. These will be provided to students to preview before class and help them watch them repeatedly when they review them after class….

Only one teacher (Participant C04) adopted the "five rights definition," following Singh and Reed (2001). Singh and Reed (2001) defined BL as an approach that "focuses on optimizing achievement of learning objectives by applying the 'right' learning technologies to match the 'right' personal learning style to transfer the 'right' skills to the 'right' person at the 'right' time." This concept of BL emphasizes the appropriate application of multiple technologies in the teaching and learning process; however, it does not deliberately emphasize online learning.

The analysis showed that all interviewed teachers could articulate their understanding of the BL concept. Both urban and rural teachers recognized BL as a combination of online and offline instruction. Only urban teachers offered different understandings of the BL concept. One of the interviewed teachers could clearly state the definition of BL given by Singh and Reed (2001). The commonality in the perceptions of urban and rural teachers of BL arose because all of the interviewed teachers were involved in the Guangdong Province Information Technology Upgrade Project 2.0. In particular, the interview period coincided with when education in China was affected by the COVID-19 pandemic, and many secondary schools were promoting the implementation of BL. Therefore, the training content was closely related to the teachers' professional skills. For example, Participant C03, an English teacher, described the content of her training at this stage: "The training was about online teaching, the direction of teaching English in the new curriculum, and modern educational technology. All these contents will help me implement blended teaching in the future."

The ITU 2.0 training attended by the interviewed teachers supported the secondary teachers' understanding of BL theory. However, why could only urban teachers present a different understanding of BL? The reason for the difference lies in the way of training. On the one hand, the urban teachers' training format uses a blended model, meaning that part of the training is online, and part is focused learning in thematic lectures. Hence, the online learning component allows teachers to choose the content they want to learn. The content is updated quickly, and teachers have access to more timely information. Especially during the pandemic, teachers suddenly entered into the BL practice process and were able to find more suitable training content in time.

On the other hand, the training model for rural teachers is mainly in the form of centralized lectures organized by schools/education authorities. Therefore, rural teachers have no choice regarding the training content, prompting them to maintain their initial understanding of the BL theory. Two interviewed rural teachers even considered the training completely ineffective.

Model Application

Staker and Horn (2015) summarized the standard BL application models at the K-12 level, including the rotation, a la carte, flex, and enriched virtual models. Through the summary of the interview themes, the interviewed teachers also stated the BL models they applied, including flipped classrooms, multiple technical supports, Sanqi classrooms, smart classrooms, and virtual classrooms, of which some other interviewees held uncertain views.

From the distribution of application models, the flipped classroom was the most supported BL application model, as indicated by the interviewed teachers. In addition, Staker and Horn (2015) regarded the flipped classroom as the third type of rotation model. Although there are some differences between education scholars concerning BL application models, all regard the flipped classroom as one of the BL application models. However, the interviewed teachers needed to be more confident and held uncertain views regarding the proposed application models rather than simply adopting the

flipped classroom approach. In the following, we offer a detailed analysis of these BL application models proposed by the interviewed teachers.

The flipped classroom can also be defined as an "inverted classroom" approach. Scholars generally agree that the flipped classroom teaching model originated in the United States and uses ICT as the flipping medium, flipping the previous knowledge transfer in the classroom to micro-courses (videos) for students' self-learning outside the classroom. In particular, in the flipped classroom approach, in-class learning focuses on teacher-student communication, collaboration, assignment completion, and internalization of knowledge (Deng, 2019). Many secondary schools in China have searched for examples of flipped classroom implementation processes that suit the characteristics of their schools in practice. For example, Chongqing Jukui Secondary School summarizes the basic model of classroom flipping with "four steps before class and five links during class." Shenzhen Nanshan Experimental School adopts a flipped classroom approach in a cloud computing environment. Students use the micro-videos provided by the teacher to do self-study before class and take the corresponding test. The teacher first uses the flipped classroom platform to focus on students' learning in the next day's class and spends most of the remainder of the class discussing and communicating with teachers and students to solve the learning problems they encountered during self-study.

Further, Nanjing Xingchi Secondary School and Changle Secondary School in Shandong Province are examples of successful flipped classroom implementation in China. Thus, 10 of the 13 interviewed teachers presented the flipped classroom approach as a suitable model for implementing BL. They acknowledged that there is only one model of BL application that they use. Instead, they use a mix of models to facilitate BL practices in their teaching context.

Sanqi classrooms is a BL model (30% online, 70% face-to-face) practiced at the interviewed teachers' schools. Participant C04 was from Guangzhou Olympic Secondary School. This school supports teachers' pedagogical reform and regards Sanqi classrooms as a pedagogical innovation. Respondents adopting the smart classrooms perspective, such as teachers with an "uncertainty" perspective, were seen by the researchers as teachers who had implemented BL but had never summarized their experiences and had not thought about BL. In other words, they had not considered the so-called BL implementation framework/model/process, which led them to mistakenly use smart classrooms as a model for the BL application. Instead, smart classrooms is not a BL model but a learning platform, namely, the National Smart Education Platform for Primary and Secondary Schools. The state has provided this platform to teachers and students to effectively support primary and secondary schools implementing BL during the pandemic. This idea is further supported by Participant C05's explanation: "In my course, I will use the platform named Smart Classroom Learning to achieve blended learning." Thus, both smart classrooms and multiple technical support models emphasize a way to use technology to support BL implementation. Consequently, the teacher who held the "virtual classrooms" viewpoint acknowledged that he had tried this model but often mixed it with flipped classrooms, multiple technical support, and other application forms.

In summary, what urban and rural teachers have in common regarding BL application models is a weak link between theory and practice. In agreement with Fu et al. (2021), over half of urban teachers would adopt the state-provided smart classroom platform, which is higher than the percentage of rural teachers using it. Meanwhile, most rural teachers would adopt a multi-technology support approach to implement BL. Moreover, most of the urban teachers would use the flipped classroom model. These results are closely related to the schools' support in the physical teaching environment. Urban secondary schools have a better teaching environment, and their multimedia classrooms or online platforms are better than those in rural secondary schools. In addition, the urban secondary schools provided learning terminals (iPads) for their students and were able to ensure that teachers adopted a fixed BL model.

Conversely, the rural teachers' schools needed help to provide this level of support regarding teaching and learning equipment. This difference in school support caused the rural teachers to think about implementing BL using a variety of technology supports. Therefore, implementing BL in

China is geographically specific and cannot be directly guided by existing foreign BL models. First, Chinese secondary schools adopt full-time teaching styles, and the online component implemented in BL classrooms is under the guidance of teachers. Second, schools regulate the responsibility to teachers; thus, it is easier for teachers to explore or implement BL independently with school/parental support. Consequently, differences in the environment of BL implementation would affect teachers' exploration and practice of BL. The interviewed teachers also expected that future ITU 2.0 training content would add more BL theory and practical content (Participants C04, C05, R04, and R07).

Influencing Factors

The results of the qualitative analysis provided insights into the factors that influence secondary school teachers' implementation of BL. Through semi-structured interviews with secondary school teachers, they explained the issues they faced in implementing BL. The thematic analysis revealed that teachers were affected by BL curriculum design (BLCD), teaching resources (TR), teaching ability (TA), teacher-student interactive behavior (TSIB), teacher motivation (TM), students' ability (SA), and workload. Table 1 summarizes the results of the influencing factors based on thematic analysis.

BLCD emerged due to the complexity of course design in BL. Compared to traditional teaching models, BL course design requires teachers to choose teaching strategies appropriate for learner-centered instruction or collaborative learning. Therefore, teachers are constrained to various degrees in four areas: effective use of media, course content, design method, and establishing a fixed schedule.

Table 1. Influencing factors' themes and sub-themes

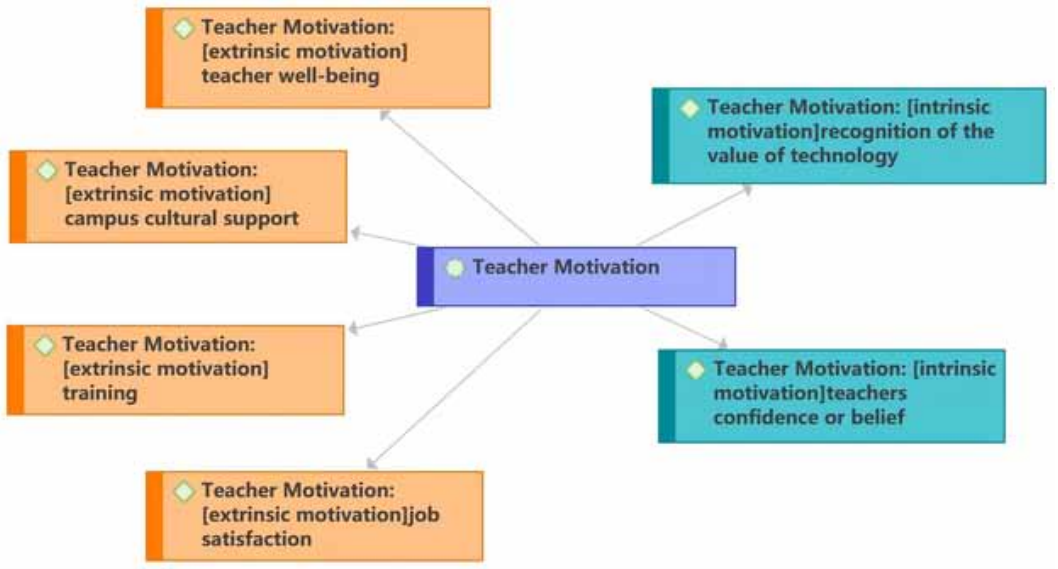
Theme	Sub-Theme
Blended Learning Curriculum Design	Effective use of media
	Course content
	Design method
	The establishment of a fixed schedule
Teaching Resources	Online platform
	Resources platforms
	Network environment
Teaching Ability	Expression ability
	ICT literacy
	Observation ability
	Organization ability
Teacher-Student Interactive Behavior	Setting up learning environment
	Attracting participants
Teacher Motivation	Intrinsic motivation
	Extrinsic motivation
Students' Ability	Experience in using technological tools
	Competency in learning independently
Workload	Course Preparation
	Daily work
	Tutoring after class

TR aspects include the online platform, resource platforms, and network environment. Unstable and poor connections to the network and the internet will undoubtedly lead to interruptions/delays in the course, affecting students' attention and interest in participating. Teachers must also create course materials suitable for online and face-to-face instruction and spend considerable time on resource selection and integration. Participant R06 also mentioned, "When I started using the blended learning model, I spent considerable time designing the appropriate courses on the IT tools platform." The answer means that teachers need sufficient time to adapt to the learning platform and complete the lesson plan arrangement and content design on the learning platform. In an ideal BL model, technology and open educational resources can facilitate communication and interaction between teachers and students, whether they adopt an online or offline approach. However, influenced by TR, the actual effect of TSIB needs to meet the teachers' expectations. Thus, it is difficult for teachers to set up discussion venues in the learning platform quickly, and students' attention can be easily distracted.

TM is also one factor that influences teachers' implementation of BL. Ibrahim and Nat (2019) stated that teachers' extrinsic motivation to implement BL includes instructor interactions with technology, instructor academic workload, institutional environment, and instructor interactions with students. Moreover, intrinsic motivation includes two aspects: instructor attitudes and beliefs and instructor learning. In this qualitative study, intrinsic motivation affecting secondary school teachers' implementation of BL included recognition of the value of technology and teachers' confidence in implementing BL. The extrinsic motivation involved four aspects: job satisfaction, campus cultural support, training, and teacher well-being, as shown in Figure 2. Although there were variations in the expression of TM, teachers implementing BL needed incentives to break out of traditional teaching models and innovate. For example, Participant C06 indicated that support from her school would increase her "confidence" in implementing BL and that BL would be more successful. Participant C01 also indicated that she would be more likely to adopt BL if its effects could lead to "career promotion."

Nevertheless, the BL approach cannot achieve this without the support of new technologies, including augmented reality (AR), virtual reality (VR), and intelligent classrooms supported by artificial intelligence (AI) technologies, which challenge the information literacy of students and teachers (Patricia Aguilera-Hermida, 2020). Thus, TA and SA can indeed influence the success of BL.

Figure 2. Teacher motivation themes (intrinsic and extrinsic)



Workload is a common challenge encountered when implementing BL. The same point of workload, as mentioned by Owston and York (2018) and Dyment and Downing (2018), is that teachers spend considerable time on course preparation, especially the online and integration components. The difference is that the interviewed teachers also mentioned daily work and tutoring after class as the main reasons for the increased workload. Chinese secondary school teachers are also responsible for teaching tasks and daily work, including group support and teaching and research activities. In addition, due to the imperfect reminder function in the learning platform, teachers also need to use social networking software (WeChat, QQ) to contact students after school for homework reminders and homework evaluation feedback.

DISCUSSION

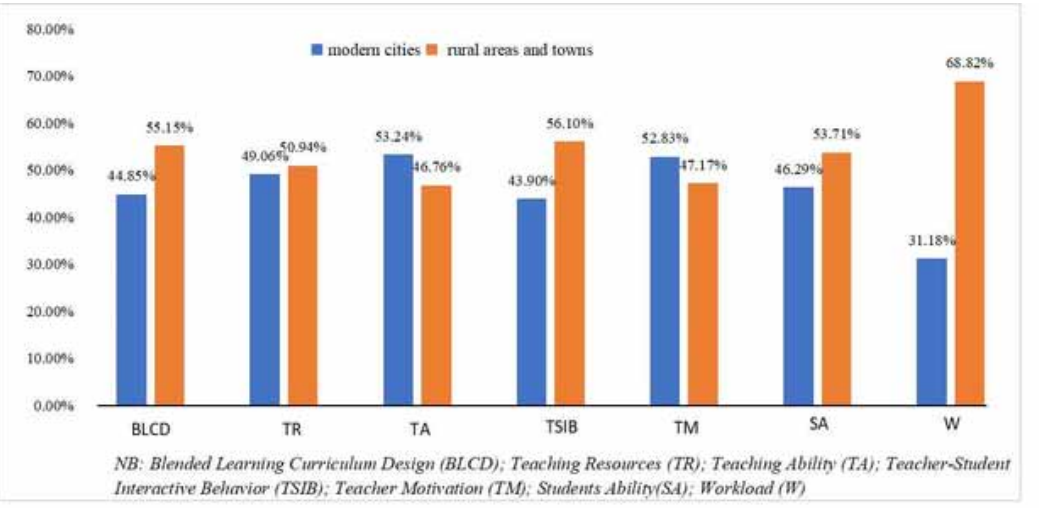
The research question posed in this study was to compare the differential responses of urban and rural teachers in Chinese secondary schools to BL implementation based on their personal experiences. The previous analysis examined the common perceptions of urban and rural teachers about the factors influencing BL. From Figure 3, except for the TR, TA, and TM factors, urban and rural teachers' support intensity differs for BLCD, TSIB, SA, and workload.

Impact of Blended Learning Curriculum Design

This study explored the finding that the quality of BLCD does affect the effective implementation of BL, which is consistent with the research of some previous scholars (Mozelius & Hettiarachchi, 2017; Yang et al., 2019; C. Wang, 2021). However, most researchers in the past have analyzed the reasons affecting the design of BL courses from the perspective of higher education institutions. For example, Shieh and Reynolds (2021) argued that teachers' beliefs influence the design of BL courses while Ashraf et al. (2022), in a literature review study, showed that the challenge to the success of BL in China lies in the lack of a robust course design system. This study suggests that the strength of school support for BLCD affects the effectiveness of BL implementation.

The difference in the intensity of support for BLCD is due to school conditions. Urban teachers use learning and teaching resource platforms that provide numerous resources and features that are more readily available to meet the needs of curriculum design and media processing, compared to

Figure 3. Distribution of influencing factors by urban and rural areas



rural teachers, who are bound by school conditions and must consider multiple aspects. For example, in BLCD, there is a difference in establishing a fixed schedule. Urban teachers have pre-set times for video release, lectures, and Q&A in their course design. Conversely, rural teachers need to adjust their schedule according to the actual situation of the lecture. Rural teachers need to adjust the schedule flexibly according to the specific situation during instruction, which is different from urban teachers' practice of setting a fixed schedule in BLCD. First, rural teachers face teaching environments that may be more complex and variable. Due to the inconvenient transportation and lack of resources, the teaching conditions in rural schools are relatively poor, and the number of students is small. As a result, rural teachers need to adjust the schedule of their lessons according to the actual situation to ensure teaching runs smoothly. Second, rural teachers may face more challenges and difficulties. For example, due to the lack of modernized teaching equipment and technological means, rural teachers may need to spend more time and effort preparing teaching materials and aids. Students in rural areas often come from different backgrounds and cultural environments, and students' needs and interests may differ from those of urban students. Therefore, rural teachers need to adapt the content of the curriculum and teaching methods to their students' specific situations to meet their learning needs. Third, rural teachers must consider students' physical and mental health and development. Rural students may face more pressure and distress due to the limitations of their families' economic conditions and the lack of social resources. Therefore, rural teachers need to consider these problems in their curriculum design and take appropriate measures to help students solve problems and improve their self-confidence and self-esteem.

In addition, how to use media effectively to solve the problems of teaching and improve its efficiency and quality in BLCD is a common question for urban and rural teachers. The study found that, with the localization of BL development, teaching resources with technical support constantly increase the cost of education, creating a need for more educational resources. Ideally, students in both urban and rural areas would benefit from BL in different spatial and temporal domains to enjoy quality resources alike (Hamouda, 2018; Wahab et al., 2018). However, the interviewed rural teachers needed help with limited functionality and payment when using the resource platform.

Furthermore, the uneven development of regional educational resources emerged during the implementation of BL. The regions limit township secondary schools, and there are differences in the teaching materials used; thus, the supporting digital education resources provided by the state cannot be combined with the local teaching materials. Therefore, although both urban and rural teachers agree that BLCD affects the effective implementation of BL, the degrees of the challenges in the four areas of effective use of media, course content, design method, and the establishment of a fixed schedule remain different.

Challenges in Teacher-Student Interaction Behavior

In BL, TSIB is considered an essential indicator of a good experience of BL (Hamouda, 2018). As seen in previous studies, researchers focused on the amount of teacher-student interaction during BL implementation (Jerry & Yunus, 2021) and the impact of technology application on TSIB (Haron et al., 2021). The exploration of this study found that both urban and rural teachers faced challenges in setting up the learning environment and attracting participants. The interviewed teachers acknowledged that BL increases opportunities for interaction between students and teachers. Students do not have to ask for help face-to-face but can also benefit from online communication through online forums and course chat rooms. However, Chinese secondary schools also present challenges and limitations for teacher-student interactions when implementing BL regarding the number of students in a class. China's Ministry of Education has clearly defined the number of students in a class in secondary schools as 45-50 (Tian, 2016). However, in the BL framework, it is challenging to accomplish teacher-student interactions with such large class sizes when only one teacher is teaching without a teaching assistant. Due to limited interaction and communication, it is difficult for students to follow teachers'

instructions in BL (Chan, 2019; Jerry & Yunus, 2021). In particular, rural teachers need help with setting up the learning environment.

First, quality students and teachers are lost due to poor resources in rural areas. Hence, rural teachers need more energy to think about creating a learning environment for teacher-student interactions in the BL process. In addition, in this new model of student-teacher interaction, the shortage of quality and mutual motivation for students to learn poses a challenge to rural teachers. Second, the family educational concept and parental support also affect teacher-student interactions. The interviewed urban teachers acknowledged that parents knowledgeable about BL accepted and fully supported BL in their schools and that the learning terminals held by students were purchased with parental support rather than being fully provided by the school.

Meanwhile, rural families need to be equipped and have more resources to support their children's learning, and only a few can afford to provide additional learning support resources beyond school materials, such as televisions or cell phones. Parents also need help giving clear input into school instruction due to their level of education. Therefore, most rural secondary schools that can implement BL are supported by the appropriate physical environment provided by the school for the students. Moreover, many secondary school students in rural towns come from left-behind families (children whose parents work outside the home and are supervised only by their grandparents); thus, they must live in the school. These children often encounter difficulties in their studies and cannot receive parental guidance and assistance. Therefore, for rural secondary school teachers, establishing good teacher-student interactions in BL depends entirely on the level of support from rural schools and does not allow as much room for creativity in teaching interaction patterns as urban teachers.

Student Ability Differential Performance

SA in BL is mainly characterized by students' self-directed learning and ICT competencies in dealing with BL (Sun & Qiu, 2017; Teo et al., 2019; N. Wang et al., 2019; Yang et al., 2019). Jerry and Yunus (2021), in their study on implementing BL in rural areas of Malaysia, also emphasized the negative impact of ICT competencies on students in rural and remote areas. These results coincide with the researchers' findings.

Not only that, the teachers interviewed acknowledged that students' self-directed learning skills would improve during the BL process. However, simultaneously, in terms of expectations for students' self-directed learning skills, they felt that secondary school students needed help to acquire the cognitive abilities required for implementing BL. It is a very contradictory yet reasonable perspective. For example, Participant C05 suggested that "blended learning is significantly more appropriate for upper-grade students." Nevertheless, teachers who hold this view have two misconceptions about student learning. The first misconception is that they need to pay more attention to the ability of students to adapt to new modes of instruction. The second is that teachers ignore the dynamic nature of student learning. Students who have just entered their first year, i.e., the early grades, appear new, curious, and overwhelmed when faced with a new mode of instruction. Hence, teachers should guide students through the platform and monitor their completion of the online learning component. However, as students become familiar with the BL model and move into the upper grades, teachers are surprised to find that students' self-learning skills have improved. It is precisely a sign of students' improved self-information literacy.

Further, the difference between urban and rural teachers in SA was found in "experience in using technological tools." Most rural teachers felt that many students had problems using the learning platform due to location and home conditions. Rural teachers also explained the steps and repeated them several times to accommodate the students' levels (Participant R03). This view is the same as that of Ghimire (2022), who showed in his study that students would face more challenges in rural areas due to the lack of high-speed internet facilities in remote areas. In contrast, urban teachers believed that students only had operational problems when first introduced to the BL platform (Participant C04). In the long run, the digital era requires digitally literate people. Specifically, students' information

literacy ability in BL affects the effectiveness of BL. However, from another perspective, BL can help secondary school students, especially those in rural areas, to be equipped with the multifaceted skills of information-based learning as early as possible. It includes searching for online self-learning resources, seeking mutual learning support, screening information, and many other skills. Therefore, student ability can affect the effectiveness of BL, but it should never be a reason for teachers to give up or refuse the implementation of BL.

Workload of Secondary School Teachers

Previous studies have identified increased workload as a common difficulty in teachers' reluctance to adopt BL (Sun & Qiu, 2017; Q. Huang, 2019). Simpson (2010) recognized that redesigning blended instruction is inherently a time-consuming approach. Ibrahim and Nat (2019), on the other hand, argued that teachers take on the investment of all the time involved in BL practice, and this investment comes at the expense of scholarship. However, some scholars have also stated that when teachers become proficient in using blended methods, they can organize their time more efficiently and handle the work involved in BL courses (Oweis, 2018; Xu et al., 2020).

In this study, the researchers acknowledged that the cumbersome and complex operation of pre-class preparation (e.g., micro-learning, self-study guide design) resulted in the need for secondary school teachers to invest more time in BL. However, in contrast to previous scholars' views, more rural area teachers emphasized the workload generated for after-school guidance and daily work for students.

Participants R05 and R06 said that they were required to teach classes in their regular work and shouldered other schoolwork and activities related to BL. Participant R03 emphasized that "the school's focus on lower-achieving students made her teaching repetitive." Moreover, R01 said that tutoring and supervision of after-school work were challenging because the students were from rural areas. The increased workload of rural teachers in terms of after-school tutoring and regular work is due to three reasons. The first reason is the failure of schools to provide appropriate platforms and tools. Second, rural teachers need more confidence in the teaching conditions of their schools and their student's abilities and attitudes toward independent learning, which make their predictions of the effects of BL not optimistic. Third, currently, in China, the assessment of the teaching and learning processes is based on the summative assessment of the secondary school examinations, and many teachers are afraid to act rashly out of caution and the pressure of heavy workloads, fearing the risk of experiencing a drop in test scores if they are slightly careless in the BL process. In particular, teachers in rural areas with poor teaching conditions are even more afraid to practice BL. It further demonstrates that the significant challenge facing BL research in colleges and universities is the increase in the academic workload of college teachers (Brown, 2016). Meanwhile, based on the current study's findings, the workload experienced by secondary school teachers involves the three sub-themes of course preparation, daily work, and tutoring after class.

CONCLUSION

This study investigated the factors influencing the implementation of BL in Chinese urban and rural secondary schools from the perspective of secondary school teachers; 13 Chinese secondary school teachers were interviewed. The researchers conducted a comparative analysis of their experiences using thematic analysis. The study identified a consensus among Chinese secondary school teachers regarding their theoretical perceptions of BL implementation. However, urban teachers showed diversity in their theoretical perceptions. This result is due to differences in the mode of ICT training attended by the interviewed teachers. Urban teachers' training content was updated faster than rural teachers, and urban teachers had more autonomy in their choice of training content. It shows that despite the information literacy training for urban and rural teachers, rural teachers can experience a relative lag in accessing the same information resources. Beyond that, bridging this information

gap between urban and rural teachers can only be realized by introducing supportive government policies in the future.

This study also highlights that BL application models in Chinese secondary schools are still exploratory. Owing to the geographical characteristics of China's education system, BL application models cannot directly replicate existing forms from other international studies. Moreover, differences in support between urban and rural schools result in different technical support approaches to BL by urban and rural teachers. These findings suggest that urban teachers apply a more stable approach, while rural teachers change their BL application models depending on the level of school support.

As well, following an in-depth analysis of the themes, this study obtained seven factors that influence the implementation of BL by secondary school teachers. These factors are consistent with the findings identified in the extant literature. However, it identified differences in the presentation of the sub-themes. By comparing the intensity of teacher support in rural and urban areas, the researchers found that rural secondary school teachers were under more pressure to attempt instructional reform. Therefore, the researchers suggest that the government, society, and education-related research groups must further explore the moderating mechanisms underlying the relationships among the elements of education when studying BL in the future. Based on the geographical differences in educational approaches and outcomes, future studies should seek an optimal approach for implementing BL in different geographical areas based on the sub-thematic factors. This optimal approach will support the professional sustainability of teachers in transforming information-based teaching and learning.

Nevertheless, the current study has the following limitations. China is a large and diverse country with significant differences in educational development between urban and rural areas. This study chose schools in the economically developed Guangdong Province because the physical environment (campus, teaching facilities, and information technology equipment) in these schools can accommodate the implementation of BL. Additionally, the teachers who participated in the interviews all had long experience implementing BL; thus, their feedback on the factors influencing BL implementation was representative and typical. However, whether the same influencing factors exist in implementing BL in secondary schools in other regions of China is a question that needs further investigation.

Moreover, BL has propelled digital technology adoption in teaching and learning processes in Chinese secondary schools. However, the differential responses to BL implementation among rural and urban teachers in secondary schools revealed an imbalance in the allocation of educational resources between urban and rural schools. Not only that, but the findings also reflect that the Chinese educational environment, teaching system, and teacher and student characteristics require the development of BL to overcome geographical and cultural constraints. Specifically, the training of urban and rural teachers should provide actionable training content to address the differences in the professional needs of teachers in different regions. Therefore, in the follow-up study, we shall sort out and summarize the problems of influencing factors urban and rural teachers face in BL implementation and propose corresponding solutions. It provides practical guidance for frontline teachers to improve their teaching strategies and enhance their participation in BL.

AUTHOR CONTRIBUTIONS

LW proposed the study protocol, collected the data, analyzed the data, and wrote the paper. MKO conceived and designed the analysis. NSZ and NNZ provided data validation and analysis tools. All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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