

Optimizing Blended Learning with Digital Technologies: Insights into Faculty Readiness in Higher Vocational Education

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Abstract:

Blended Learning (BL) has emerged as a transformative strategy in higher education, propelled by advancements in educational and computational technologies and the growing demand for flexible learning environments. Based on the framework of Barriers to Technology Integration, this study focuses on China's higher vocational education sector, specifically at Guangdong Polytechnic of Science and Technology (GPST), where the successful implementation of BL hinges on understanding the interplay between key dimensions influencing teacher readiness: Institutional Culture, Technological Pedagogical and Content Knowledge (TPACK), Affective Factors, and BL Awareness. Utilizing a mixed-methods approach, this research surveyed 370 GPST teachers and conducted in-depth interviews with 10 experienced educators to assess their preparedness for BL. The findings underscore significant challenges in BL readiness, particularly linked to institutional culture, which adversely impacts teachers' TPACK and emotional readiness for BL. While BL Awareness had a limited direct effect, the synergy between technological and psychological factors was found to be crucial in shaping overall readiness. These insights inform policy development and emphasize the need for enhanced technological infrastructure and robust teacher support systems to foster greater BL readiness in Chinese higher vocational institutions.

Keywords: Blended Learning, faculty readiness, digital technologies, higher vocational education.

INTRODUCTION

Technology-Enabled Learning (TEL), incorporating both digital and computational technologies, has revolutionized higher education, prompting institutions worldwide to adopt innovative teaching methodologies. Among the five major trends in TEL, Blended Learning—which integrates both online and offline learning—has garnered significant attention as a flexible and adaptable pedagogical approach [1-3]. BL is defined as a strategic fusion of digital and traditional teaching approaches, employing technology and media to deliver flexible, learner-centered experiences that enhance educational outcomes [4]. Despite its numerous benefits for teachers, students, and institutions, the implementation of BL remains in its formative stages, requiring readiness from key stakeholders, particularly teachers, for successful adoption [5].

In the context of China's higher vocational education (HVE) system, which plays a crucial role in cultivating a skilled workforce to support the nation's economic and social development, BL has been increasingly embraced as a method to enhance workforce preparation [6]. Computational technologies, including AI-driven learning platforms, offer the potential to streamline BL by aiding in student engagement monitoring and personalized learning support [7]. China's national policies, such as China's Education Modernization 2035, have recognized the value of empowering BL with digital and computational innovations to advance quality education and informatization [8]. Institutions like Guangdong Polytechnic of Science and Technology (GPST) have actively responded to these policies by initiating efforts to prepare their teaching staff for BL since 2019.

This study investigates the readiness of GPST teachers for BL by examining the interplay between technological, institutional, and psychological factors. Specifically, it uses a validated BL Teacher Readiness Scale to explore how TPACK, Institutional Culture, Affective Factors, and BL Awareness collectively shape teacher preparedness. The integration of digital and computational technologies into BL forms a crucial part of this analysis, highlighting areas where technology can enhance teacher readiness. The insights gleaned from this research will not only contribute to the theoretical understanding of BL readiness but also inform the development of targeted professional development programs aimed at enhancing BL implementation in China's HVE institutions.

This study is guided by the following research questions:

1. What are the key features of GPST teachers' readiness for BL, as indicated by their scores across the four dimensions of BL readiness: BL Awareness, Institutional Culture, TPACK, and Affective Factors?
2. How do GPST teachers perceive their BL readiness in relation to these four domains?

3. To what extent can GPST teachers' TPACK be predicted by their BL Awareness, Institutional Culture, and Affective Factors?

The research hypotheses are as follows:

1. GPST teachers exhibit positive perceptions of BL readiness, reflected in their scores on BL Awareness, TPACK, Institutional Culture, and Affective Factors.
2. GPST teachers' TPACK can be significantly predicted by their BL Awareness, Institutional Culture, and Affective Factors.

LITERATURE REVIEW

Digital technology, encompassing information and communication technologies (ICTs), plays a critical role in technology-enhanced learning (TEL) in higher education [9]. Although its potential is widely recognized, the effective implementation of digital tools still demands more attention. BL has emerged as a significant trend in TEL research, with China's educational system experiencing a revolution through the integration of digital technologies [2,3].

Research on BL has surged in the past decade, especially during the COVID-19 pandemic [10]. However, existing studies predominantly focus on BL readiness from the perspectives of students and institutions, with relatively little attention paid to teacher readiness. This literature review centers on the theoretical framework of this study- barriers to technology integration, and gaps in current research on BL teacher readiness.

Barriers to Technology Integration

The framework of barriers to technology integration was initially introduced by Cuban [11] and Fullan & Stiegelbauer [12], and further expanded by Brickner [13], who identified as first- and second-order barriers. First-order barriers are external and include challenges such as insufficient resources, lack of infrastructure, time, training, institutional support, and teacher competence [14,15]. These external challenges are commonly encountered in technology integration within education [16].

Second-order barriers encompass internal factors, such as teachers' personal beliefs, attitudes, and psychological readiness for change [14]. While removing first-order barriers may alleviate some external challenges, success in adopting new technologies, such as BL, also depends on addressing second-order barriers [17,18].

A recent addition to this framework is the concept of third-order barriers, which involve teachers' design thinking and dynamic knowledge creation in response to new technologies [15]. These third-order barriers are closely linked to Technological Pedagogical Content Knowledge (TPACK), a framework for evaluating teachers' knowledge on content, pedagogy, and technology in e-learning [19]. Addressing these third-order barriers is crucial for successfully overcoming both first- and second-order challenges [15].

BL Teacher Readiness

The current body of research on teacher readiness for effective BL implementation reveals notable gaps. While successful BL implementation depends on the readiness of institutions, students, and teachers, much of the literature has concentrated primarily on institutional and student readiness. Consequently, teacher readiness remains relatively under-explored, despite the critical role teachers play in the teaching and learning process [20,21]. Therefore, it is imperative that research shifts focus to better understand teachers' perspectives in this context. Research on BL teacher readiness can be categorized into three key areas, aligned with the Barriers to Technology Integration framework.

Group one: institutional culture (first-order barriers)

The first category focuses on external factors related to institutional culture, including physical access and support systems that enhance faculty's BL competency. This area has been extensively researched, particularly concerning infrastructure and training support [22,23]. However, crucial elements such as the broader institutional atmosphere and policy support have been comparatively neglected, warranting further investigation [24,25].

Group two: teacher beliefs and affective factors (second-order barriers)

This category centers on the internal factors influencing teacher readiness, particularly teacher beliefs and affective responses. Specifically, it examines teacher attitudes toward BL—referred to here as “BL awareness” to distinguish it from other attitudinal concepts [26,27]. Despite some attention in the literature, emotional responses such as comfort with risk-taking and the impact of BL on teacher identity have often been overlooked. While these barriers have begun to receive more focus [28,29], further investigation is essential.

Group three: TPACK (third-order barriers)

The third category examines the dynamic development of teacher knowledge system in TEL, particularly through the lens of Technological Pedagogical Content Knowledge (TPACK) [30,31]. However, research on TPACK within the context of BL has often been siloed, failing to integrate this knowledge framework with the other two levels of barriers [32,33]. To advance the field, a comprehensive exploration of BL teacher readiness that integrates all three-order barriers is critical.

To address these research gaps holistically, the development of an assessment instrument that incorporates all three types of barriers is necessary [34,35]. Specifically, a scale that measures the affective and identity-related variables in faculty readiness for online teaching would provide valuable insights [25]. Applying such a comprehensive BL teacher readiness scale to China’s higher vocational education institutions could advance our understanding and fill important gaps in the existing research. The research framework of this study is shown in Figure 1.

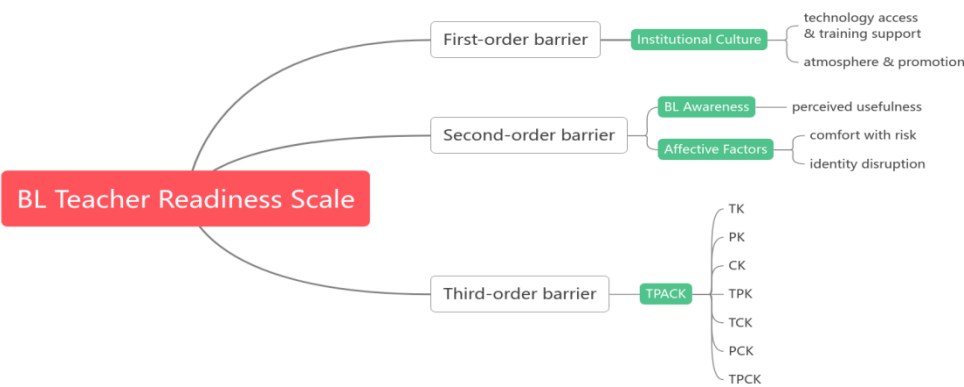


Figure 1. BL Teacher readiness scale

METHODS

This study utilizes an mixed-methods approach, integrating quantitative survey data with qualitative insights. The goal is to systematically examine the readiness of faculty for BL through a structured, data-centric framework. By leveraging both numerical analysis and thematic exploration, the study captures a holistic understanding of the factors influencing BL readiness and the relationship among those affecting domains [36].

Survey Design and Validation

A carefully structured survey instrument was developed in two stages, targeting key constructs that influence BL readiness. Drawing from established framework - Barriers to Technology Integration [13], the survey was segmented into four core domains: BL awareness, Institutional Culture, TPACK, and Affective Factors. Each domain was operationalized with high internal consistency, evidenced by a Cronbach’s alpha of $\alpha = .896$ post-revision (Table 1). Besides, construct validity was assessed using the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett’s Test of Sphericity. The results showed acceptable construct validity, see Table 2. The sources of question items were displayed in Table 3. The survey was disseminated via Wenjuanxing, a widely recognized digital platform, ensuring streamlined data collection from 370 valid responses across Guangdong Polytechnic of Science and Technology (GPST).

Table 1. Reliability coefficient of formal data

Cronbach’s Alpha	N of Items	N of Cases
.896	52	370

Table 2. Results for KMO test and Bartlett’s test

Prerequisite		Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.751
Bartlett’s Test of Sphericity	Approx. Chi-Square	444.227
	df	6
	Sig.	.000*
Note. *p < .001		

Table 3. Sources of the constructs in Blended Learning readiness scale

Top-constructs	Sub-constructs	Items	Sources	Crobach- α
BL Awareness	perceived usefulness	6	Alqabbani et al. [37]	0.92
		6	Moukali [24]	0.85
Institutional Culture	access & training support	3	Cutri et al. [38] Moukali [24]	0.71
	atmosphere & promotion issues	5		0.85
TPACK	PK,TK,CK,PCK,TCK,TPK,TPCK	24	Archambault & Crippen [39]	0.78
Affective Factors	comfort with risks	6	Cutri et al. [38]	0.71
	identity disruption	2		0.71

Qualitative Data Collection and Analysis

Complementing the survey, semi-structured interviews were conducted with a purposive sample of 10 GPST teachers, see Table 4. These interviews were designed to extract deeper insights into the faculty's experiential readiness for BL, with each session transcribed and thematically coded for analysis. Data saturation was achieved after coding, following Creswell's guidelines for qualitative data integrity [40,41].

Table 4. Participants of the semi-structured interview

Participants No.	Employment status	Discipline	BL experience
Teacher 1	Long-term teachers	Soft	both experience as a student and instructor
Teacher 2	Part-time teachers	Hard	No previous experience with BL
Teacher 3	Long-term teachers	Soft	Previous experience as a student
Teacher 4	Short-time teachers	Soft	Previous experience as an instructor
Teacher 5	Short-time teachers	Hard	Previous experience as an instructor
Teacher 6	Long-term teachers	Hard	Previous experience as a student
Teacher 7	Short-time teachers	Hard	Previous experience as an instructor
Teacher 8	Long-term teachers	Hard	both experience as a student and instructor
Teacher 9	Long-term teachers	Soft	Previous experience as an instructor
Teacher 10	Part-time teachers	Soft	No previous experience with BL

Data Collection Procedures

Both quantitative and qualitative data collection processes adhered to rigorous protocols designed to maximize data reliability and validity [42]. The quantitative data were analyzed using SPSS version 23, with a focus on descriptive statistics and multiple regression analysis to predict the influence of identified constructs on teacher readiness for BL. Qualitative data were processed manually through thematic coding, with results cross-referenced against quantitative findings to provide comprehensive insights.

RESULTS

Demographic Information

In this section, the participants' demographic features were introduced, which included participants' gender, and age. See Table 5.

Table 5. Demographic data for participants

Demographic Variable		Frequency	Percent
Gender			
	Female	204	55.1
	Male	166	44.9
Age			
	30 and below	75	20.3
	31-50	223	60.3
	50 and above	72	19.5
Total		370	100.0

Findings on Research Question One

The exploration of Research Question One focused on unraveling the attributes of GPST teachers' readiness for BL by delving into four influential factors affecting BL teacher readiness: BL Awareness, Institutional Culture, TPACK, and Affective Factors. An analysis of the quantitative questionnaire data was undertaken to provide a response to this inquiry.

Quantitative analysis of the survey data unveiled a notable trend of negative perceptions among GPST teachers regarding BL Awareness, Institutional Culture, TPACK, and Affective Factors. Notably, the mean score hovered around 2 ($M = 2.42$, $SD = .45$) on the Likert-type scale, indicating a tendency towards disagreement with the statements, as shown in Table 6. According to the insights shared by Holsapple and Lee-Post [43], stakeholders, including students, educators, and institutions, can be deemed "e-ready" when their mean score reaches 4 on a five-point scale. Within this context, a closer examination reveals that the lowest mean score was attributed to Institutional Culture ($M = 2.31$, $SD = .46$). Therefore, Research hypotheses 1 is rejected, GPST teachers do not exhibit positive perceptions of BL readiness in terms of the mean scores of BL Awareness, TPACK, Institutional Culture, and Affective Factors. Further elucidation of the scores associated with individual statements is presented in the subsequent section for enhanced clarity and insight.

Table 6. Mean and standard deviation of major variables

	N	Mean	Std. Deviation
BL Awareness	370	2.4142	.42422
Institutional Culture	370	2.3095	.46097
TPACK	370	2.4727	.41988
Affective Factors	370	2.4620	.51015
Valid N (listwise)	370		
Average		2.4146	.453805

Findings on Research Question Two

Research Question Two sought to investigate GPST teachers' perceptions of their readiness for BL across the dimensions of BL Awareness, Institutional Culture, TPACK, and Affective Factors. The analysis of this question was guided by a set of thematic categories, as delineated in Table 7, each offering an avenue to explore the nuanced perspectives provided by the interviewees.

Table 7. Themes reflecting responses to research question one

Research Question	Themes
Research Question Two How do GPST teachers perceive their BL readiness in relation to these four domains (BL awareness, Institutional culture, TPACK, and affective factors)?	-Features on BL Awareness -Features on Institutional Culture -Features on TPACK -Features on Emotional Responses

Features on BL awareness

Table 8. Categories of features on BL awareness

Theme	Categories	Sub-categories
Features on BL awareness	-BL is definitely useful (Teacher 1.3.4.6)	Benefits for students 1. Easier Access to Learning Resources 2. Promotion of learning interest 3. Enhanced learning efficiency Benefits for teachers 4. Additional tutoring opportunities and teaching methods 5. Better understanding of student progress 6. Improved teaching effects Benefits for schools 7. Enhanced soft power of the school 8. Optimized use of teaching resources
	-BL has limited usefulness (Teacher 2.5.7.10)	1. Suitable mostly for practice courses 2. Useful but increasing workload 3. Effective in special situations, but limited learning outcomes
	-BL is not useful (Teacher 8.9)	1. Limited effectiveness of BL in adverse situations 2. Negative impact on student focus and learning 3. Challenges in student self-regulation in BL

Slightly more teachers indicated that BL was not useful or limitedly useful (5 out of 10) than teachers who thought BL was definitely useful (4 out of 10). To explain the GPST teachers' perceptions of the features of BL Awareness, three categories and fourteen subcategories were identified in Table 8. As category two "BL has limited usefulness" included views that involved both the benefits and limitedness of BL, teachers' interview data in this category may be partly quoted as proof in presenting both category one (BL is definitely useful) and three (BL is not useful).

BL is definitely useful

Four out of the ten interviewed teachers expressed a strong belief in the usefulness of BL for students, teachers, and the school. Their perspectives centered around benefits for students, teachers, and schools.

For students, they have easier access to learning resources, better learning efficiency and improved learning interest. Teacher 3 explained the flexibility of BL: "For students, they can feel free to learn in many places, such as their dormitory and the library... Besides, study time is under control, and therefore BL is a great supplement to classes". Teacher 2 mentioned increased student engagement in BL, "...at least students have become more interested in studying than the time without BL". Another two teachers believed that BL could promote student's learning efficiency, "the online portion of BL has been an effective supplement and extension of classroom learning..., contents can be made into an intuitive expressive form, like video, audio and so on, so that students find it easier to understand and accept" [Teacher 4].

For teachers, BL provided opportunities for teachers to enhance learning both before and after classroom sessions. Two teachers mentioned that BL can provide extra time for teacher tutoring: "I assign online homework before class, and inform them of the points that we will learn in next class" [Teacher 2]. Another two teachers mentioned that BL can provide extra teaching methods: "BL provides extra teaching methods compared with traditional approaches, and can be seen as an effective supplement to it" [Teacher 4]. Besides, BL platforms offered valuable data on student performance and it improved teaching effects. Three teachers gave similar comments on "better command of students" or "improved teaching effects". Teacher 5 stated, "We can check out their learning status on the Internet, so as to adjust our teaching progress in real time. I suppose this helps us master the teaching". Teacher 1 mentioned: "For teachers, first of all, BL increases the efficiency of classroom teaching, since it brings an extension of study and exercise, either before or after class".

For schools, half of the participants acknowledged that BL could contribute to the overall development of the school, improving the institution's soft power. "For our school, it's essential to construct BL platform...In fact, it is conducive to the growth of our school's soft power" [Teacher 3]. Apart from that, two teachers especially focused on the better use of the teaching resources of GPST: "For the school, BL makes better use of teaching resources, and causes a decrease in educational investment..." [Teacher 4].

BL has limited usefulness

Four teachers expressed that while BL had some usefulness, but its benefits were constrained in certain aspects. One teacher highlighted that the usefulness of BL was more pronounced in practical courses. "BL is mainly necessary for practice courses" [Teacher 2].

The other three believed that BL was only useful for maintaining teaching continuity during unforeseen circumstances like the COVID-19 pandemic. However, it was acknowledged that the quality of learning outcomes might not be as high as traditional in-person teaching. As one teacher mentioned, "For our school? Well, I suppose that BL makes it possible to have lessons as usual even if epidemic or typhoon happens. The teaching schedule won't be affected, that's the only benefit" [Teacher 7].

BL is not useful

Some teachers indicated that BL was not useful (Teacher 8.9). Two participants believed that BL did not help in promoting teaching effects, it has limited benefits and it is often a distraction for students. One stated: "...In special circumstances, such as the COVID-19 epidemic, typhoons, or heavy rains, BL can be used as a substitute to maintain teaching order. It is like a plan B, that is the only benefit" [Teacher 8]. Another teacher said, "While applying BL, ... it also creates opportunities for playing or doing irrelevant things, there is high possibility that students became distracted or slack off" [Teacher 5]. Two teachers mentioned the difficulty in students management in BL, "once teachers can't keep an eye on them, they are more likely to stop learning..., they are just playing video games, in most cases" [Teacher 10].

Features on institutional support

The participating teachers generally acknowledged the presence of technological infrastructure and training at GPST, but their evaluations of the quality varied. Half of the participants emphasized the importance of policy and financial support for BL implementation, especially those engaged in teaching or research programs. They appreciated GPST's professional development opportunities but noted that strict criteria for BL course acceptance often impeded progress. Additionally, some teachers highlighted the need for more comprehensive training, not just in technology but also in content development, particularly to ensure smooth transitions during disruptions like typhoons. To elucidate the perceptions of GPST teachers regarding institutional culture, this study identified four overarching categories with ten corresponding subcategories, as presented in Table 9.

Table 9. Categories of features on Institutional Culture

Theme	Categories	Sub-categories
Features on Institutional support	-Technological infrastructure and access	1. Campus Network 2. Computers and other equipment 3. Classrooms/teaching sites 4. Online platforms
	-Training and technical support	1. Training frequency 2. Sources and intensity of technological support
	-Policies	1. Encouraging policies 2. obligatory policies and some negative results
	-Financial support	1. Financial support for BL-related research program 2. Financial support for BL-related teaching program

Technological infrastructure and access

There is consensus among nine out of ten participants, they believed that the school possesses the foundational technological infrastructure and offers some training support. However, the potential for improvement remains evident.

Nine participants mentioned technological equipment like computers “The school offers infrastructure and access, such as the Internet, computer, or some kinds of techniques” [Teacher 1]. As for smart classrooms, two teachers with BL-related programs especially mentioned: “In regard to computers, the support is sufficient. And there are many classrooms that are especially applicable for BL” [Teacher 5].

Four participants focused on Online platforms: “In my opinion, our school is trying its best to gradually guide more teachers to participate in BL. There are unified platforms for teachers, like Xuexitong, purchased by the school” [Teacher 4].

All of the ten teachers talked about the campus network but had different comments on its quality. One teacher thought it was not good enough to support the online part of BL as it was not provided for free in all areas of the school: “... (Hesitating) Well, it's still insufficient... there are many limits on using the campus network, sometimes you can't use it unless you pay the fee” [Teacher 2]. Two teachers considered that the campus network was good, the rest of the participants thought that the campus network in GPST is OK or mediocre: “The network is not bad” [Teacher 3]. Campus network is useful for BL, but improvement is also necessary indeed” [Teacher 9].

Training and technical support

In terms of training, teachers have different views on the frequency of receiving training from school. Teacher 9 thought there is little training: “I've got some training, but not that much”. but two teachers indicated that the school provided abundant training in BL: “The related training is relatively sufficient” [Teacher 1].

As for sources and intensity of technological support, there were three parties involved in the participant's responses. Five teachers indicated that there was adequate technical support, “There is a unified platform for teachers. Moreover, there's even a WeChat group offered by the platform company to solve those basic technical problems we meet” [Teacher 4]. Teacher 3 and 4 also stated that there was some support from the school, but teachers need to solve some problems by self-taught study too. “I once had a 2-3 days' intensive training about that, since then, I've also learned some relevant techniques on the Internet by myself” [Teacher 4].

Policies

Half the teachers (5 out of 10) mentioned supporting policies for BL in GPST. When referring to these supporting policies, one teacher described that the school encouraged teachers to apply BL, “to be honest, I seldom read about the theory of BL, the school has BL-related policies and encouraging rules, I just follow these guidance and policy of our school to perform BL step by step” [Teacher 4]. Others may indicate that teachers did not have much choice but to comply with the school stipulation to perform BL during COVID-19, “not all of us do it voluntarily, we just take it as a duty and responsibility” [Teacher5].

It should be noted that, obligatory regulations and requirements on BL application and lack of flexibility in part of the assessment and management measures on BL implementation led to some unexpected negative results. Teachers may choose to perform BL courses based on stipulated rules rather than students’ real needs: “Well, my concern is that we have been limited by certain standards of the school. For example, the BL curriculum video must be over 1000 minutes, and the quantity of announcements we send out also needs to be up to par. I don’t think it is necessary” [Teacher 5].

Financial support

Similarly, half of the participants mentioned financial support for implementing BL in GPST. One teacher stated that there were funds for promoting BL-related research programs: “... Also when we construct online resources, we might establish research projects later, and then get paid sometimes” [Teacher 1]. Five teachers mentioned funds for promoting BL-related teaching programs: “... If you mean the funds, we have enough funds to apply for new BL curricular... Well, when we give lessons, making use of BL, the online portion can be taken into credit hours as well, and we got paid for that” [Teacher 1].

Features on TPACK

All ten teachers acknowledged having sufficient BL-related TPACK after training and self-exploration. However, they emphasized the constant need for improvement due to rapidly evolving technologies and changing student profiles, which created pressure to continuously enhance their competencies. Additionally, they noted that BL implementation required ongoing adjustments in teaching content and pedagogy, as current outcomes remained mediocre despite their confidence in their existing knowledge and skills. To explain the GPST teachers’ perceptions of the features on TPACK, six categories were identified in Table 10.

Table 10. Categories of features on TPACK

Theme	Categories
Features on TPACK	1. Adequate proficiency of teachers for BL implementation 2. Pressure on continuous improvement on technological skills 3. Moderate teaching outcomes within BL context 4. Necessity to enhance technological competence, technological pedagogical content knowledge, and content and pedagogical knowledge

Adequate proficiency of teachers for BL implementation

Some participants stated that they had enough BL-related TPACK, and were able to perform BL as they planned. “I’d like to say that most teachers are basically qualified for this work” [Teacher 1].

Pressure on continuous improvement on technological skills

Three teachers especially mentioned the necessity to update their technological competence continuously. “In fact, it is all based on continuous learning and reflection on teaching practice and exploration” [Teacher 4].

Moderate teaching outcomes within BL context

Two teachers indicated that teachers with qualified knowledge on BL did not necessarily perform BL effectively, because “we just know some basic computer operation. What I really want to fulfill is to offer teaching in a video-game-playing mode, which is the real technology-assisted learning” [Teacher 9].

Necessity to enhance technological competence, technological pedagogical content knowledge, and content and pedagogical knowledge

Two teachers mentioned that their technological knowledge required more improvement. “My weak link seems to be the technological skills. How to make better use of new media and big data in a quicker way is becoming important in teaching evaluation and students’ learning” [Teacher 1]. Four teachers shared similar points on technological pedagogical content

knowledge, “not just the technical part, we need to figure out how to present knowledge points with the best approaches in BL” [Teacher 9]. In terms of Content knowledge, two teachers mentioned that the challenges coming with the content knowledge were not brought about by applying BL, but because they are required to add content that is not closely related to their discipline. Teacher 3 was an English for Specific Purposes (ESP) teacher, she has to pay special attention to the teaching content as she had to deal with language instruction and new disciplinary knowledge while applying BL.

Features on emotional responses

A larger part of the teacher participants did not prefer to apply BL if there was a choice (7 out 10) as they have doubts about the teaching effects of BL, did not get used to the new teaching mode, or because they felt unprepared to offer online part of BL at short notice. Only three teachers clearly stated that they would willingly take BL courses due to their benefits in assisting learning.

All teachers mentioned challenges or difficulties in different areas of teaching and learning in BL: student’s lack of initiative and self-regulation in BL, confusion for newly-recruited teaching staff in using BL, concerns with teaching effects of BL, and the increased workload of teachers in preparing the online portion in BL were mentioned by a few teacher participants. However, most of the teachers (9 out 10) have found the measures to tackle those problems, either by consulting with technical supporting workers or colleagues, or by a self-taught study by themselves. To explain the GPST teachers’ perceptions on the features of emotional responses, three categories and five subcategories were identified in Table 11.

Table 11. Categories of emotional responses

Theme	Categories	Sub-categories
Features on Emotional responses	-Unwillingness to use BL	1. Limited enthusiasm among teachers for BL implementation
	-Challenges in applying BL	1. Insufficient student initiative and self-regulation in BL 2. Initial challenges for certain teachers in adopting BL 3. Sub-optimal teaching outcomes in BL 4. Significant increase in teachers’ workload due to BL
	-Abilities in tackling problems in applying BL	1. Competently managing challenges of BL application is common among most teachers.

Unwillingness to use BL

Seven teachers have showed different degrees of unwillingness to perform BL. Among them, three teachers had a strong tendency for declining the implementation of BL. Teacher 8 had such feelings because he found online teaching led to lower student scores. So he said, “...my overall feelings towards applying BL is unhappy and unwilling, I should say” [Teacher 8]. Teacher 9 did not accept BL because teachers were required to change from offline teaching to online instruction all of a sudden.

Challenges in applying BL

Three teachers mentioned the difficulties they met when they first learned to apply BL. “At the very beginning, I felt stressed, to be honest. I had no idea what BL meant. I only had a vague notion of BL at that time” [Teacher 1].

Four participants explained challenges related to teaching effects in BL. “...we have to carry out online teaching right away. This can happen within one day, how can that lead to good teaching and learning” [Teacher 9]. Teacher 8 gave a detailed example of students’ unsatisfactory performance in blended mode. “...the class in traditional mode did much better. The scores of the class which learned mostly online were generally very poor...It’s so obvious, it’s so obvious, the difference in teaching effects is so obvious, it’s so different”.

Three teachers mentioned the increase of workload when implementing BL., “...secondly, as I’ve just mentioned, the preparation of online resources is much more complicated... it takes us more time and energy to prepare a high-qualified online resource than to prepare a traditional one, sometimes it’s so energy-consuming that even leads to a sense of anxiety and stress” [Teacher 4].

Abilities in tackling problems in applying BL

Most teachers have the ability to deal with the problems arising from applying BL. Except one teacher who has not found the ways to deal with the challenge he met in implementing BL: “... I’m still wondering how to deal with the problem that students in our school have an extreme lack of self-regulation” [Teacher 10]. The rest nine teachers have worked out some measures to tackle the problems in applying BL.

With regards to the problem that students in GPST lacking learning initiative and self-regulation, teacher 5 offered a practice, “Basically, my solution is to call the roll and ask them questions randomly. If a student can’t answer the question, which I have emphasized its importance time and again, that means he or she was somewhat absent-minded just now. And then I’m going to have a private chat with that student after class to ask what’s the matter” [Teacher 5]

For the unexpected requirements of online teaching, Teacher 8 suggests that teachers make extra preparation, for example, I record two types of videos...I spend a lot of time recording videos that can be easily explained clearly in classroom teaching”.

For technological problems, teachers may turn to professionals for help: “Yeah, at the very beginning, there were certainly many things I didn’t know how to do, so I join a QQ Group and asked for help” [Teacher 6].

For the increase of workload. Teachers had solutions that may be suitable only for their specific course. They may communicate with colleagues, form a team with teachers, or search on the internet for resources and advice, “How to deal with it? Well, on the one hand, I may look for other teachers who can cooperate on the construction of the course. On the other hand, I am likely to surf online and search for existing resources that match with my online-lecture and fill it in, so that the efficiency is raised. If I still have some spare time, I’d like to go on with further study of software and technique to be more efficient” [Teacher 4].

Findings on Research Question Three

A multiple linear regression analysis using the enter method was conducted to examine whether GPST teachers’ TPACK can be predicted by their BL Awareness, Institutional Culture, and Affective Factors. The model was significant, $F(3,366) = 83.95$, $P < .001$, explaining 41% ($R^2 = .41$) of the variance in the outcome variable TPACK. BL Awareness did not contribute significantly to the model ($B = .04$, $p = .48$, $t = .714$). Both Institutional Culture ($B = .44$, $p < .001$, $t = 9.60$), and Affective Factors ($B = .18$, $p < .001$, $t = 4.61$) contributed significantly to the model. This means that 41% of the variation in GPST teachers’ TPACK scores can be accounted for by differences in BL Awareness, Institutional Culture, and Affective Factors. See Table 12.13 and Equation (1), (2).

Table 12. Analysis of variance and regression results of predictiveness of TPACK towards BL awareness, institutional culture, and affective factors

	df	MS	F	Sig.	R	R ²	Adjusted R ²	Std. Error of the Estimate
Regression	3	8.840	83.954	.000 ^{b***}	.638 ^a	.408	.403	.32448
Residual	366	.105						
Total	369							

Note. a. Dependent Variable: TPACK

b. Predictors: (Constant), Affective_Factors, BL_Awareness, Institutional_Culture

c. *** $p < .001$, ** $p < .01$, * $p < .05$

Table 13. Regression coefficients: relationship between TPACK and BL awareness institutional culture, and affective factors

Predictors	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.925	.110		8.425	.000***
BL Awareness	.036	.050	.036	.714	.476
Institutional Culture	.444	.046	.487	9.595	.000***
Affective Factors	.177	.038	.215	4.605	.000***

Note. a. *** $p < .001$, ** $p < .01$, * $p < .05$

b. Dependent Variable: TPACK

c. Predictors: (Constant), Affective_Factors, BL_Awareness, Institutional_Culture

The regression equation for predicting TPACK:

$$\hat{Y} = B_{\text{Constant}} + B_{\text{Institutional Culture}} + B_{\text{Affective Factors}} \quad (1)$$

where the predicted TPACK is:

$$\text{Predicted TPACK} = 0.925 + 0.44 \times \text{Institutional Culture} + 0.18 \times \text{Affective Factors} \quad (2)$$

Therefore, Research hypotheses 2 is partially accepted. GPST teachers’ TPACK can be significantly predicted by their Institutional Culture and Affective Factors. GPST teachers’ BL Awareness did not have a statistically significant impact on their TPACK scores. Though BL awareness predicts 4% of the the variance in the outcome variable TPACK it is not a significant

predictor of TPACK in this study. This suggests that differences in Institutional Culture and Affective Factors among GPST teachers contribute significantly to the variation in their TPACK scores. To be noted, the regression assumptions were checked and there are no concerns with heteroscedasticity, or multicollinearity. See Table 14, and Figure 2, Figure 3.

Table 14. Regression assumptions check

Prerequisite	Durbin-Watson	Cook's Distance	VIF
(Constant)	1.797	.059 (Maximum)	
BL Awareness			1.576
Institutional Culture			1.595
Affective Factors			1.349

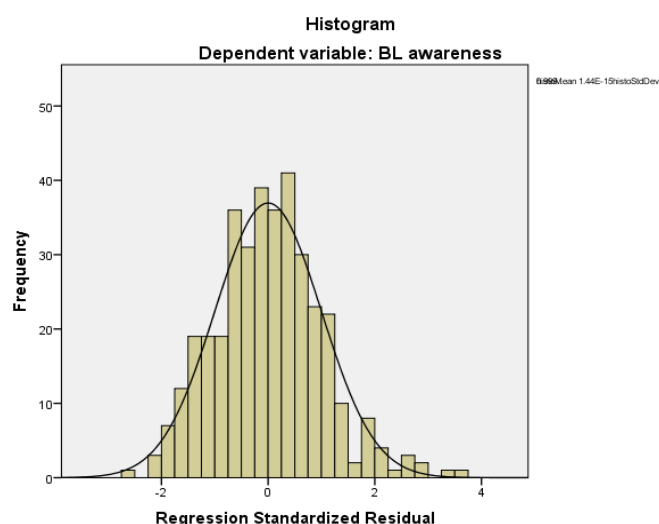


Figure 2. Histogram of standardized residual normality

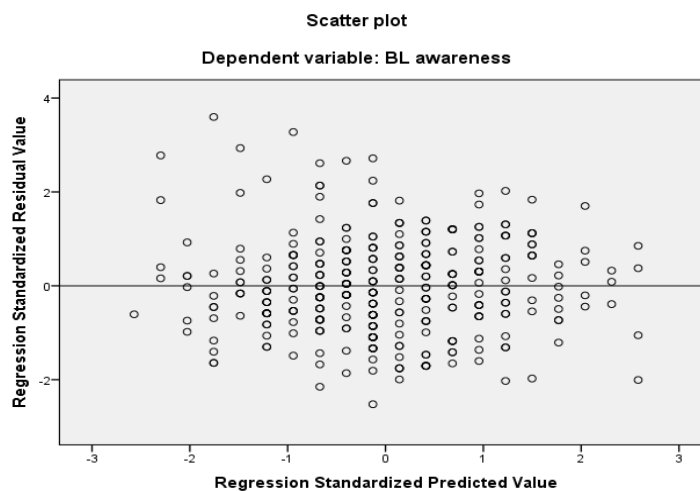


Figure 3. Scatter plot depicting the relationship between standardized predicted Institutional culture and BL awareness

DISCUSSION

Discussion of the Level of GPST Teachers' Readiness for BL

The descriptive statistical analysis of the quantitative data for research question one indicates that GPST teachers' overall readiness for BL is quite low across the four key influencing factors: BL Awareness, Institutional Culture, TPACK, and Affective Factors (Average $M = 2.42$). These findings suggest that GPST teachers are not adequately prepared for BL, particularly concerning the aforementioned factors.

The qualitative analysis reinforces these findings. Thematic analysis of interviews shows that most GPST teachers perceive BL as having limited practical value, often seeing its primary benefit as maintaining teaching order during crises like the COVID-19 pandemic or severe weather events such as typhoons. Teachers reported possessing some degree of BL-related TPACK and receiving some institutional support, yet significant gaps remain in both areas. Moreover, many educators expressed emotional resistance to BL, attributing this reluctance to some mandatory school policies and rigid assessment criteria for BL programs, which often led to unsatisfactory teaching outcomes.

These results align with Zhang et al. [44], who found that teacher readiness for BL in a four-year higher education institution in China was similarly lacking. Their study revealed that teacher preparedness for BL, rated on a five-point Likert scale, was mediocre ($M = 3.77$), with environmental readiness being the lowest ($M = 3.59$). Similar conclusions were drawn by Zou et al. [45] in a study investigating teacher readiness for online learning in twelve Chinese universities, where technical readiness was also below satisfactory levels ($M = 3.73$).

Higher education institutions in China face uneven BL readiness due to their differing infrastructures and organizational cultures. However, across the board, China's higher education sector remains in the early stages of BL adoption. More work is required to foster teacher readiness and address barriers preventing effective BL implementation.

Discussion of the Predictiveness of Institutional Culture, Affective Factors, and BL Awareness Toward TPACK

The quantitative results for research question three showed that GPST teachers' TPACK can be well predicted by their Institutional Culture and Affective Factors with BL Awareness being an important but not a significant predictor.

The findings of this study were congruent with the studies of Cutri and Mena [25] and Cutri et al. [38]. They hold that both institutional support like software and hardware access, training, technical support, tenure issues and Affective Factors like willingness, anxiety, and disruption of identity played vital roles in teachers' BL knowledge and skills promotion. The predictiveness of BL awareness in terms of TPACK was deemed differently in the study of Skhephe et al. [46]. They explored teachers' readiness for e-learning in South African schools and concluded that teachers who did not know the benefits associated with e-learning had less satisfying results in implementing e-learning in their classrooms. They concluded that BL awareness was significantly predictive of BL teacher's TPACK, which was slightly different from the findings from this research.

Some researchers have offered the reasons for the predictiveness of BL Awareness, Institutional Culture, and Affective Factors toward TPACK. Naylor and Nyanjom [47] pointed out that institutional support is vital for the improvement of TPACK in online learning and teaching in higher education. Tondeur et al. [48] claimed that a good institutional culture can motivate teachers to transition to online learning. Beliefs and attitudes like perceptions on BL usefulness and affective factors can explain and predict classroom technology use [49,50].

Words from the interview participants gave some hints about the relationship among the four affecting factors of BL teacher readiness and the similarities and differences between this study and related studies. In GPST, many teachers chose to implement BL due to the supporting institutional culture in GPST, those policies and financial support made them offer BL courses to obtain promotion and finance upgrading or simply to follow the requirements for continuing teaching during COVID-19. At the same time, those BL courses should meet the standards regulated by the school, which consequently directed teachers' attention to improving TPACK. However, as teachers who performed BL were mostly for external needs, it is understandable that many of them preferred not to implement BL as there was a lot of extra workload and the teaching effects were not guaranteed. Unwillingness to perform BL and the external requirement to implement BL led to limited use of online resources which may reduce its impact on teachers' TPACK.

Meanwhile, GPST teachers' perceptions of BL usefulness have an undecided effect on their TPACK as part of GPST teachers are interested in promotion or incentives provided by the school, they take BL as useful because the application of it may lead to benefits in their career development or increase of income. For these teachers, their perceptions of BL awareness could affect their TPACK, if they aim for better incentives, higher TPACK to perform BL is required. Whereas, there are also teachers who only apply BL due to the temporary needs during COVID-19 or extreme weather conditions, for those teachers, whether BL is useful or not does not affect their TPACK, as Institutional Culture, like school policies and financial incentives, are not attractive for them. The above information explains why there are different findings between this study and other studies regarding the predictiveness of BL awareness toward TPACK.

CONCLUSIONS AND IMPLICATIONS

This research offered some insights into the readiness of educators in GPST for the integration of BL based on an extended framework of Barriers to Technology Integration. GPST teachers demonstrate a general lack of readiness for BL, with institutional culture, technology integration, and affective factors contributing significantly to their hesitations. Teachers express concerns about the efficacy of BL, often citing institutional barriers such as certain rigid policies, inflexible assessments, and insufficient support for technological proficiency, despite their recognition of the potential benefits of BL. Negative perceptions surrounding BL persist, particularly regarding its impact on workload, student engagement, and teaching effectiveness.

The study further identifies that teachers' perceptions of Institutional Culture and Affective Factors significantly influence their TPACK. However, BL Awareness alone does not strongly predict their readiness to integrate technology. This underscores the importance of addressing institutional and emotional challenges while leveraging digital innovations to improve BL implementation.

For institutions, Interventions that foster a more conducive environment for effective BL adoption in higher education contexts is called for. For example, continuous professional development tailored to advanced digital tools application is essential. Apart from that, collaboration among educators and researchers can further enhance teachers' TPACK by developing targeted training programs and promoting technological and pedagogical proficiency.

For policymakers, to improve teacher readiness for BL, policies must encourage sustained BL engagement. Policymakers should revise existing incentives, linking them to meaningful outcomes such as teaching effectiveness, rather than quantitative metrics alone. Additionally, policies should better reflect the complexities of BL, providing clear guidance on balancing workload and recognizing teaching quality.

In practice, BL course development should be more collaborative and pre-planned to alleviate teacher workload. Training programs should be continuously updated to address the evolving demands of BL, with differentiated levels for new and experienced teachers. Online platforms need refinement to better track student engagement, aiding teachers in making more informed instructional decisions. For example, by integrating emerging digital technologies such as AI-driven learning platforms and advanced analytics, institutions can enhance instructional flexibility, improve teachers' technological competencies, and more effectively monitor student progress.

Future research should consider broader perspectives by including additional stakeholders like students and institutions. Expanding qualitative methods and incorporating longitudinal studies can provide deeper insights into the dynamic nature of BL readiness. Furthermore, addressing concerns related to teaching effectiveness, workload, and student self-regulation could lead to more focused strategies that better support faculty in overcoming challenges and enhancing their overall readiness for BL.

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