Research article

Behavioral intentions of university teachers and students toward the adoption of the hyb-blended learning method: Evidence from Bangladesh

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A B S T R A C T

Hyb-blended learning is a novel method that can serve as a substitute for conventional classroom-based learning activities, demonstrating effectiveness in both pandemics like COVID-19 and other crises, as well as in non-pandemic situations. The successful application of this method in the field of education depends on the users' intentions to adopt it. Therefore, this study aims to understand the behavioral intentions of teachers and students at Bangladeshi universities toward the adoption of the hyb-blended learning method. A correlational, cross-sectional, and sample survey-based research design was employed. Two structured questionnaires, one for teachers and one for students, were used to collect data from 171 teachers and 713 students from 11 public and 8 private universities in Bangladesh. The conceptual model of the study was developed on the theoretical underpinnings of the "Unified Theory of Acceptance and Use of Technology (UTAUT)." The study used a structural equation modeling technique to test the hypotheses. The results of the study revealed that the proposed learning method would increase teaching and learning opportunities for both teachers and students in Bangladeshi universities. They would adopt this method without relying on the experiences of others or what others think or say. Unlike teachers, the study also found that students would use it if they received support and influence from friends, fellow students, university authorities, and other external factors. However, their intentions toward adopting this method depend on the availability of resources and support for adopting it, as well as adequate and necessary understanding and talent to use it effectively. Results also revealed that they would adopt the method if it was found to be simple to use. The study has a notable practical implication, as it has proposed an alternative learning and teaching method that would be effective in Bangladeshi universities during the COVID-19 pandemic or other crises and in non-pandemic situations as well.

1. Introduction

The COVID-19 pandemic, which broke out in mid-March 2020, led to a complete disruption of traditional university education

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systems [1]. More than 180 countries' educational institutions were compelled to shut down to prevent the spread of the COVID-19 virus, revealing the vulnerability of education systems worldwide during the pandemic outbreak [2]. This disruption in education, combined with the slowing of global economic growth as a result of the recession, has far-reaching consequences for the most underprivileged students, who come from low-income families [3]. The pandemic affected 90 percent of all students worldwide, including 800 million girls [4]. Bangladesh was one of the worst-affected countries in the world, with all educational institutions completely closed, adversely affecting the socioeconomic conditions of low- and middle-income people. The school dropout rate was high at the primary and secondary school levels in Bangladesh during the COVID-19 pandemic [5].

The COVID-19 pandemic globally disrupted traditional face-to-face classroom learning activities in universities [6]. Therefore, higher education institutions made some changes to their learning processes during the pandemic [7]. Many universities around the world converted their traditional face-to-face classrooms into live online classes due to the prolonged shutdown aimed at preventing the spread of the pandemic [2,3]. Teachers used various technologies accessed through the internet to facilitate learning activities and engage learners' active participation in online learning management while staying geographically remote from each other during instruction. Therefore, online live classes received attention as a solution to the world's existing learning gap during the pandemic.

However, the human-physical interaction that a traditional classroom teaching environment offers is absent from online live classes [8]. Consequently, teachers are unable to assess students' attitudes, levels of involvement, and engagement in the same way that they can in a face-to-face in-house classroom. Additionally, students in online live classes are unable to wholeheartedly communicate with their fellow students, and they rely solely on email or other online platforms instead of being able to organize study groups in person [8]. Moreover, some teachers only share materials with students without teaching them.

Currently, 53 public universities and 109 private universities serve an increasing number of tertiary students in Bangladesh [9]. Like in other countries, online teaching activities were available at all private universities and most public universities in Bangladesh during the COVID-19 pandemic. However, not all faculty members of public universities in Bangladesh were involved in a full-fledged online learning approach, as some of them had no prior knowledge or experience regarding online learning management and lacked technological knowledge [10]. Similarly, not all students of the country's universities were able to participate in online live classes due to a lack of technology support [11]. Furthermore, the high cost of internet in Bangladesh and the inadequate networks or lack of high-speed internet connections in the majority of rural areas continue to hinder online live classes. Consequently, students need to look for suitable locations with adequate internet access [12]. Most online students felt a lack of teacher interaction and low study motivation due to home distractions, beyond logistical issues [2].

The COVID-19 pandemic has weakened worldwide. However, the world could experience similar types of pandemics in the future, or a country could face other types of crises that could hinder in-person learning activities in the classroom. For example, currently, Bangladesh is experiencing an electricity shortage due to the dollar crisis, which prevents the required importation of fuel energy. For this reason, many universities are conducting online classes to reduce electricity consumption in order to curb the dollar crisis by importing less fuel. Therefore, in the years to come, a pandemic or crisis may vary in severity, potentially becoming an unavoidable aspect of our lives. In these cases, educational institutions may have to close again or limit their in-person teaching activities. Now is the moment to consider how to lessen the effect of these unforeseen circumstances on learning activities.

Considering the problems of full-fledged online live classes and the long-term ongoing pandemic or crisis, two alternative learning methods are typically used for learning activities. The first is the hybrid learning method, in which some students attend in-person classes while others attend live online classes [1]. Teachers use technology such as video conferencing to teach both remote and in-person students simultaneously. With the hybrid learning method, the in-person class students and the online live class students are different individuals. Khan et al. [2] found that students in the survey preferred a combined approach of both normal and online classes in their school education. However, the segment of students who participate in an online live class under this approach may encounter the same problems common to full-fledged online live classes. The second is the blended learning method, where teachers combine in-person instruction with online learning activities [13–15]. That is, students complete some components online and do the rest of the components in person. With the blended learning method, the students who study online and in person are the same individuals. According to Leon [16], this learning method, however, has some drawbacks. First, for example, full-fledged blended learning involves a significant amount of additional work for teachers. They must widen their perspectives, select the best appropriate curriculum, and devote substantially more time and effort to finding the perfect mix of in-person and online learning. Regrettably, not all teachers may be willing to do so. Second, teachers may begin to overdo learning activities and provide too much content because this method offers such a wide range of possibilities. Third, a learning environment that supports technology could result in more plagiarism from online sources. Furthermore, several untrustworthy online resources present misleading or wrongly interpreted factual information. Given the limitations of hybrid and blended learning methods, there is an urgent need for more flexible education opportunities in Bangladeshi universities to cope with the pandemic or crisis prevailing currently, such as electricity.

The COVID-19 pandemic has necessitated a paradigm shift in higher education, prompting institutions to demonstrate innovation, proactivity, and adaptability to effectively navigate the post-COVID-19 landscape. This entails a comprehensive reassessment of the sector's future direction and the implementation of requisite measures [17]. Therefore, in light of the constraints associated with hybrid and blended learning methods, as well as the crisis prevailing currently in the country, such as electricity, there is a pressing need to establish an innovative educational framework that integrates elements of both hybrid and blended learning. This framework should leverage technological advancements to enhance the learning experience. Thus, the study proposes an integrated learning method, namely, the hyb-blended learning method.

1.1. What exactly does the hyb-blended learning method entail?

The hyb-blended learning method is a new learning method that amalgamates the best parts of hybrid and blended learning methods. It follows a four-step process (Fig. 1). First, when a pandemic or crisis is not entirely contained or overcome but remains tolerable, the hybrid classroom setting will be used for teaching and learning transactions. A subset of students who do not suffer from crises, such as COVID-19 and similar others, will be allowed or able to physically attend the classes during the crisis. Another subset of students facing crises will be prohibited from attending physical classes, or they may be unable to attend physical classes due to the continuing crisis. This subset of students will attend live online classes. That is, students who attend physical classes and those who attend live online classes are two different subsets of students. Teachers will physically conduct classes for the first subset of students, while simultaneously broadcasting their physical lectures online through real-time communication (RTC) for the second subset of students. That means that teachers will deliver lectures in the physical classroom for students who can attend physical classes. Simultaneously, Zoom software and similar tools will stream these lectures in real-time to students participating in online classrooms.

Second, when a pandemic like the COVID-19 virus or crisis reaches its peak and the government or university authority imposes a ban on attending physical classes, or when universities are unable to hold physical classes due to unforeseen circumstances, all students are required to participate in live online classes. The university will continue online classes until the pandemic or crisis is effectively under control or livable. During that period, online classes will teach a segment of the curriculum.
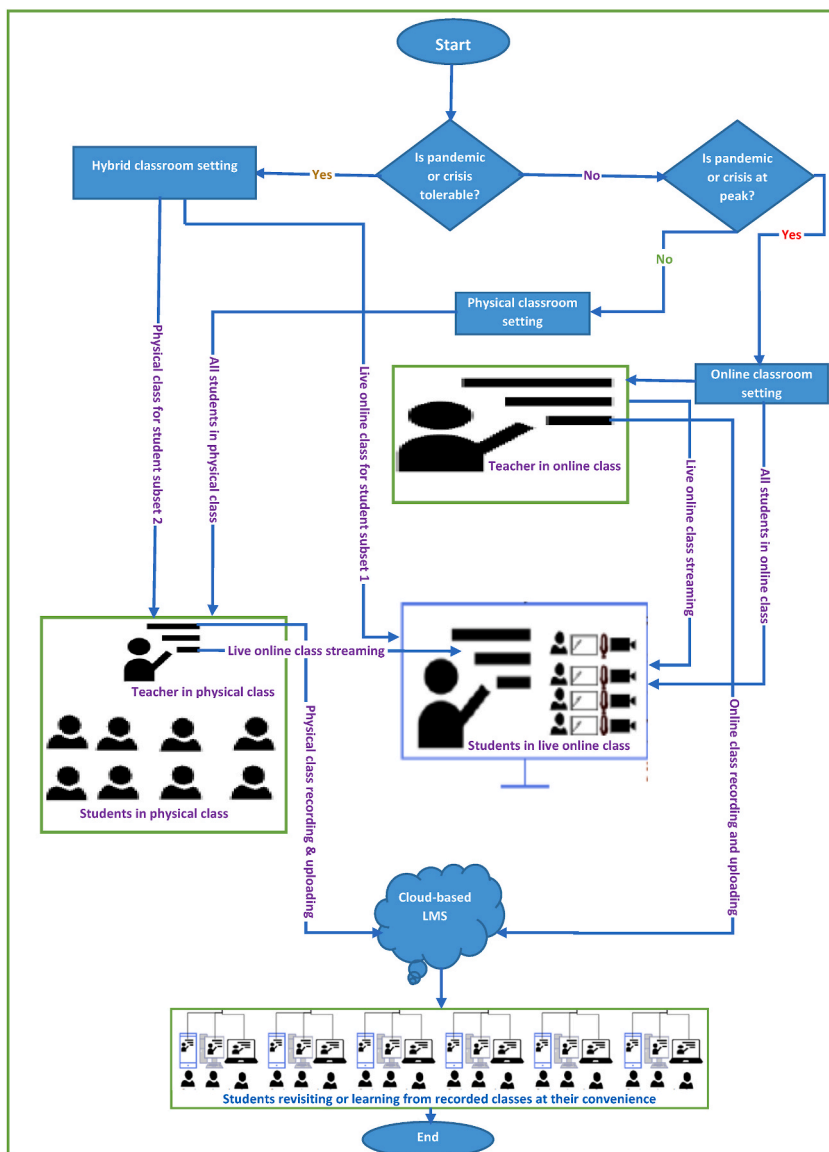

Fig. 1. Hyb-blended learning method.

Third, once the pandemic or crisis period has passed, all students will actively participate in physical classes. Physical classes will cover the remaining portion of the syllabus. In the first and second situations, the same students participate in both live online classes and physical classes, but they participate in both modes in two different circumstances.

Fourth, all classes conducted by a teacher, whether physically or online, shall be recorded and subsequently uploaded to an authorized and suitable online platform, such as a cloud-based Learning Management System (LMS). Students who are unable to attend physical or online classes can use this cloud-based LMS. Even students who attended physical and live online classes may revisit the recorded classes at their convenience.

Through an educational social network channel that offers instructive videos, students could virtually use the recorded classes to help them with their weekly homework assignments [1]. However, these recorded classes should be customized and briefly provided for each lesson, unit, or assignment. Moreover, several factors, such as lack of speed, clarity, quality, variety, and congruence, can make recorded video courses ineffective [18].

The hyb-blended learning method differentiates itself from typical hybrid and blended methods by suggesting adjustable solutions to crises. The hybrid learning method combines in-person and live online classes for different subsets of students simultaneously, while blended learning combines in-person instruction with online activities for the same group of students at different times. However, the hyb-blended learning method offers a more flexible approach that can adapt to various crisis situations. For example, during manageable crises, physical and live online courses are allowed simultaneously; at peak crises, entirely online classes are switched to; and once the crisis is over, physical classes are resumed. Furthermore, all classes—in person or online—are videotaped and uploaded to the cloud-based LMS for the benefit of the students, ensuring that the learning materials will be available to them regardless of their mode of attendance.

Unlike typical hybrid and blended learning methods, which maintain a consistent mode of instruction regardless of the circumstances, the hyb-blended learning method adapts the modes of instruction according to the severity of the crisis. It offers an innovative solution to the challenges posed by unexpected events like pandemics or crises. Thus, the unique aspect of the hyb-blended learning approach is its capacity to adjust and be versatile in addressing emergency circumstances. This adaptability enables a smooth shift between in-person and virtual sessions, ensuring uninterrupted education while accommodating the different requirements of students who may have different degrees of access or safety concerns. Furthermore, the incorporation of recorded lectures that can be accessed via a cloud-based LMS improves accessibility and convenience, adding to its originality. In summary, the hyb-blended learning method's unique approach to handling crisis circumstances in educational settings demonstrates its originality in the area of pedagogy.

In the wake of the COVID-19 pandemic and its profound impact on the education sector, technology-assisted education and the digital proficiency of educators and learners have attained an unprecedented scale [19]. The proposed method is, therefore, expected to play an important role in improving students' knowledge and skills and provide flexibility in teaching and learning processes in various ways. First, all students, whether they attend physical classes or online, have the option to join or do further recorded online classes if they so desire. Second, students who are unable to attend physical or online classes will be able to attend recorded online classes at their convenience. Third, students' participation in learning activities will increase, and there will be no students missing classes throughout the pandemic or crisis. In summary, this learning method facilitates participation in learning activities for all types of students, including those who learn best in a structured environment with face-to-face interaction with teachers and those who learn best online.

This method of learning is novel, not only for teaching staff at Bangladeshi universities but also for students who may believe that their learning opportunities will improve as the pandemic or other global or local crises progress. However, understanding teachers' and students' adaptive behavior to this proposed learning method is essential before implementing it. This is due to the fact that the success of the hyb-blended learning method in higher education depends on the positive perceptions of teachers and students toward the new learning method and their behavioral intentions. Therefore, the study aims to understand the behavioral intentions of teachers and students of Bangladeshi universities toward the adoption of the hyb-blended learning method in learning transactions.

The remainder of the study is organized as follows: Section 2 introduced the theoretical framework and research model, and Section 3 reviewed the empirical literature and developed hypotheses. Section 4 described the materials and methods used for the study, and Section 5 presented the results. The discussion was made in Section 6, while Section 7 concluded the study.

2. Theoretical framework and research model

The Unified Theory of Acceptance and Use of Technology (UTAUT) model developed by Venkatesh et al. [20] is one of the most prominent models for testing the adoption of new technologies. The model is used in various disciplines to understand how people respond to new technologies [21]. According to this model, people can only use a newly developed technology or system if it is intended for their use [20]. Four key constructs, namely performance expectancy (PE), effort expectancy (EE), social influences (SI), and facilitating conditions (FC), have a direct impact on how likely people are to adopt the technology or system. In addition, factors such as age, gender, experience, and willingness of potential users to use a new technology or system moderate the effect of predictors [20]. Later, Venkatesh et al. [22] expanded the model to include three additional constructs, such as price value, hedonic motivation, and habit, known as UTAUT2.

Consistent with the UTAUT model, this study assumes that the actual adoption of the hyb-blended learning method is determined by the behavioral intention (BI) of teachers and students in Bangladeshi universities, which depends on the direct effect of four constructs: PE, EE, SI, and FC. To understand BI, a new construct, namely "personal innovativeness (PI)," was added, assuming that human behavioral intention to adopt the proposed hyb-blended learning method is highly influenced by PI. The study also hypothesizes that the impact of PE, EE, SI, FC, and PI on teachers' BI is influenced by the ownership pattern of the universities (private or

public) where teachers teach, the gender of the teachers and the teaching discipline (e.g., science, engineering and technology, social sciences and arts, business, and others), and the teaching position or rank of teachers (e.g., lecturer, assistant professor, associate professor, and professor). Fig. 2 illustrates the research model used in the study to understand teachers' behavioral intentions.

Similarly, the study hypothesizes that the ownership structure of the universities where students enroll, as well as their gender, degree level (e.g., undergraduate and postgraduate), and the type of degree they pursue (e.g., science, engineering, and technology, social science and arts, business, and others), moderate the effect of PE, EE, SI, FC, and PI on the BI of students. The research model employed in the study to understand the behavioral intentions of students is illustrated in Fig. 3.

3. Empirical literature review and hypotheses development

The research model states that the responding construct of the five explanatory constructs—performance expectancy, effort efficiency, social influence, facilitating conditions, and personal innovativeness—is Bangladeshi university teachers and students' behavioral intentions to adopt the proposed hyb-blended learning method. Thus, hypotheses were formed after a literature review.

3.1. Behavioral intention (BI)

Users' desire to use a technology or adopt a new idea is referred to as "behavioral intention" [23]. BI is referred to in this study as the desire of teachers and students to adopt the hyb-blended learning method in their learning and teaching activities. This means that BI foresees how the hyb-blended learning method will be adopted. When teachers and students intend to use the hyb-blended learning method, it is actually used. According to Venkatesh et al. [20], predicting the use and acceptance of a particular technology depends largely on the behavioral intention of using it. Several studies have examined how behavioral intentions affect actual technology use. For example, Harsono and Suryana [23] rated behavioral intention and use of behavioral constructs very highly, concluding that respondents demonstrated a significant level of need and enthusiasm for the system. Tsourela and Roumeliotis [24] also documented that the greater the user's intention toward technology-based services, the greater the likelihood that the end user will ultimately choose to use them. Recently, it was found that students' behavioral intentions to use the blended learning method had a significant impact on their actual use [13]. Abbad [21] also found that students' behavioral intentions had a significantly positive impact on their Moodle use.

3.2. Performance expectancy (PE)

PE is defined as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" [20]. This study refers to PE as the extent to which students and teachers believe that using the hyb-blended learning method will increase the opportunities for students to learn and for teachers to teach in order to achieve their respective goals. Venkatesh et al. [20] revealed that PE was the best predictor of behavioral intention to use a new technology or system. A more recent study by Hassan et al. [25] found PE to be an important determinant that affects users' behavioral intentions toward the adoption of a newly designed health information system. Dakduk et al. [26], Okocha [27], Azizi et al. [13], and Abbad [21] revealed that learners perceive the technology-based blended learning model as more beneficial, efficient, and of higher quality, with PE being one of the key factors in its adoption in various educational institutions. Recently, Zacharis and Nikolopoulou [28] confirmed that PE had a significant impact on Greek university students' intention to use eLearning platforms to learn. Humida et al. [29] also revealed that perceived usefulness significantly predicted the behavioral intentions of students to use e-learning at Begum Rokeya University in Bangladesh. Based on the evidence, the study hypothesizes as follows:

H1a. Performance expectancy has a positive direct effect on the behavioral intention of Bangladeshi university teachers toward the
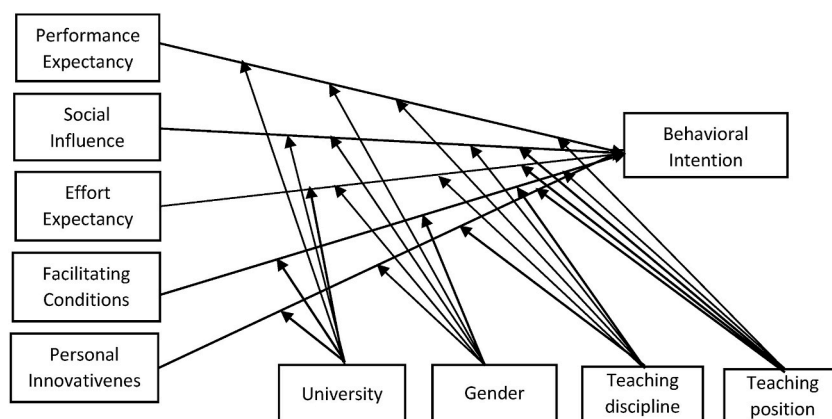

Fig. 2. Research model for understanding behavioral intentions of teachers. Adapted from Venkatesh et al. [20].
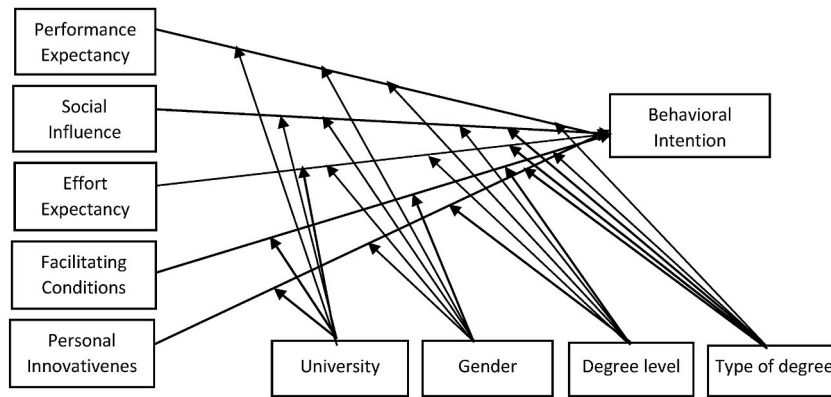
Fig. 3. Research model for understanding the behavioral intentions of students. Adapted from Venkatesh et al. [20].

adoption of the hyb-blended learning method.

H1b. Performance expectancy has a positive direct effect on the behavioral intention of Bangladeshi university students toward the adoption of the hyb-blended learning method.

3.3. Social influence (SI)

People may adopt or use a new system or technology due to social influences like peer pressure, conformity, socialization, obedience, leadership, or persuasion. According to Abbad [21], users who are susceptible to peer pressure are more likely to adopt positive trust in novel systems or technologies. This study refers to SI as the degree to which a student and teacher recognize the proposed hyb-blended learning method as important enough that peers, friends, colleagues, university authorities, and others believe that he or she should adopt the method. The views and attitudes of the university administration, as well as other faculty members and students, contribute to forming the social and cultural atmosphere at a university [13]. The university's social and cultural atmosphere influences students' decisions to use the hyb-blended learning method, either directly or indirectly. That means SI is another predictor of a student's and teacher's behavioral intentions to use the hyb-blended learning method. Empirically, Azizi et al. [13] documented a significant positive effect of SI on Iranian medical students' behavioral intention to use the blended learning method. Olatubosun et al. [30] also revealed that social influence had a significant positive influence on undergraduate students' behavioral intention to use the Moodle e-learning system. Furthermore, Zacharis and Nikolopoulou [28] confirmed that social influence significantly influenced the intention of Greek university students to use e-learning platforms to learn. Similarly, Hassan et al. [25] provided evidence of a positive effect of social influence on citizens' behavioral intentions to use health information systems.

Bangladesh is a developing nation, yet its youth use technology more. Thus, social influence may not affect users' behavioral intentions that affect system and technology use. Because the present digital generation grew up in a digital environment, they don't need incentives or peer pressure to use technology. Several studies support this premise. Of direct relevance to this study, for example, Dakduk [26] and Abbad [21] found no significant relationship between social influence and the behavioral intentions of students to adopt blended learning. Therefore, the study hypothesizes as follows:

H2a. Social influence has no positive direct effect on the behavioral intentions of Bangladeshi university teachers toward the adoption of the hyb-blended learning method.

H2b. Social influence has no positive direct effect on the behavioral intentions of Bangladeshi university students toward the adoption of the hyb-blended learning method.

3.4. Effort expectancy (EE)

EE is the degree to which a student and a teacher believe that using the hyb-blended learning method does not require any additional effort for them. If students and teachers find the hyb-blended learning method easy to use, they are more likely to adopt and use it. EE includes elements of perceived ease of use and perceived complexity [20]. Therefore, these elements are expected to stimulate students' and teachers' behavioral intentions to adopt and use the hyb-blended learning method. Hassan et al. [25] documented that EE had a significant impact on a citizen's behavioral intention to use newly developed health information systems. Chan et al. [31], Lwoga and Komba [32], and Morosan and DeFranco [33] also provided evidence of a significant positive effect of EE on users' behavioral intentions towards using newly developed technologies or systems. Similarly, Azizi et al. [13] and Dakduk et al. [26] found that EE had a significant positive effect on students' behavioral intentions to use blended learning. Of direct relevance, Humida et al. [29] documented that perceived ease of use significantly predicted students' behavioral intention to use e-learning at Begum Rokeya University in Bangladesh. Therefore, the study hypothesizes as follows:

H3a. Effort expectancy has a positive direct effect on the behavioral intention of Bangladeshi university teachers toward the adoption of the hyb-blended learning method.

H3b. Effort expectancy has a positive direct effect on the behavioral intention of Bangladeshi university students toward the adoption of the hyb-blended learning method.

3.5. Facilitating conditions (FC)

FC refers to teachers' and students' perceptions of the availability of resources and support for adopting the hyb-blended learning method, as well as their confidence that they have the necessary understanding and talents to use it effectively. This is because the availability of resources and support is directly related to teachers' and students' behavioral intentions to adopt the new learning method. Therefore, students and teachers who have better environments for hyb-blended learning are more likely to adopt and use it. In empirical studies, Oh and Yoon [34], Asare et al. [35], Masadeh et al. [36], and Batucan et al. [37] documented a significant positive effect of FC on users' behavioral intentions and use of e-learning systems. Similarly, Okocha [27] showed a significant positive effect of facilitating conditions on undergraduate students' intentions to adopt blended learning. It also has a significant impact on students' behavioral intentions to use blended learning [13], and students believe that supportive conditions are essential for using Moodle [21, 35]. Of direct relevance, Humida et al. [29] found that conducive conditions significantly predicted students' behavioral intention to use e-learning at Begum Rokeya University in Bangladesh. Therefore, the study hypothesizes as follows:

H4a. Facilitating conditions have a positive direct effect on the behavioral intention of Bangladeshi university teachers toward the adoption of the hyb-blended learning method.

H4a Facilitating conditions have a positive direct effect on the behavioral intention of Bangladeshi university students toward the adoption of the hyb-blended learning method.

3.6. Personal innovativeness (PI)

PI is a person's attitude towards accepting or rejecting a new idea [38]. It is a person's openness to experimenting with new models, systems, or technologies. It illustrates how an innovative person is more likely to hold a positive attitude toward the benefits of innovation than other people [39]. In this study, PI refers to the extent to which students' and teachers' attitudes reflect their willingness to experiment with the hyb-blended learning method, regardless of what others have said. It is expected that higher PI levels among students and teachers will lead to a more positive attitude towards the adoption of the hyb-blended learning method. However, adoption of new ideas can vary depending on how inventive a person is compared to others. Consider two groups of students who all agree that the hyb-blended learning method is a good idea. It is assumed that one group of students with a higher PI level is more likely to use the hyb-blended learning method than the other group of students with a lower PI level. Okumus et al. [40] revealed that users' level of innovation influences their intention to adopt diet apps. Similarly, Cao et al. [38] found that PI in information technology positively influences students' behavioral intentions toward using a cloud classroom app for knowledge acquisition. Khan et al. [41] documented a strong and positive relationship between PI and the use of digital libraries, which influences the intention to use them. Therefore, the study hypothesizes as follows:

H5a. Personal innovativeness has a positive direct effect on the behavioral intention of Bangladeshi university teachers toward the adoption of the hyb-blended learning method.

H5b. Personal innovativeness has a positive direct effect on the behavioral intention of Bangladeshi university students toward the adoption of the hyb-blended learning method.

3.7. Moderating effect of demographic information

The impact of performance expectancy, social influence, effort expectancy, facilitating conditions, and personal innovativeness on behavioral intentions to adopt the proposed learning method may be influenced by factors such as age, gender, university ownership pattern, degree level, type of degree, teaching discipline, and teaching position of the respondents. Private and public universities in Bangladesh have different governing principles, management, and administrative structures. Public universities receive direct government funding, unlike private universities, which rely on students to cover costs. Private universities' teachers have higher accountability to the university than public universities. Teachers and students have greater freedom at public universities than at private ones. For this reason, the relationship of performance expectancy, social impact, effort expectancy, facilitating conducive conditions, and personal innovativeness with the behavioral intention to adopt the new learning method may differ between teachers and students in public and private universities.

Male teachers and students may be more inclined than females to use new technologies in teaching and learning, or to adopt e-learning. According to Nysveen and Pedersen [42], men were more influenced by performance expectancy than women. Postgraduate students may be more inclined to prefer the hyb-blended learning method than undergraduate students. Most postgraduate students are preoccupied with employment and other obligations; therefore, they may choose this flexible learning method. The method is assumed to be more likely to be adopted by students of science, technology, and engineering than by students of other majors, because

they are expected to be more tech-savvy than social science, arts, and business students. Science, technology, and engineering discipline teachers may also be subject to a similar assumption.

As with the UTAUT model by Venkatesh et al. [20], teaching experience may also affect this relationship. This is because experience strongly influences users' perceptions of the usability of e-learning [43]. Teaching positions such as lecturer, assistant professor, associate professor, and professor serve as proxies for teaching experience in this study. Lecturers have less teaching experience than assistant professors, associate professors, and professors. Therefore, it is likely that teaching experience moderates the relationship between performance expectancy, social influence, effort expectancy, facilitating conditions, personal innovativeness, and teachers' behavioral intentions in adopting the hyb-blended learning method. Therefore, based on the above discussion, the study comes to the following hypotheses:

H6a. University ownership pattern, gender, teaching discipline, and teaching position moderate the effect of performance expectancy on Bangladeshi university teachers' behavioral intentions to adopt the hyb-blended learning method.

H6b. University ownership pattern, gender, degree level, and type of degree moderate the effect of performance expectancy on Bangladeshi university students' behavioral intentions to adopt the hyb-blended learning method.

H7a. University ownership pattern, gender, teaching discipline, and teaching position moderate the effect of social influence on Bangladeshi university teachers' behavioral intentions to adopt the hyb-blended learning method.

H7b. University ownership pattern, gender, degree level, and type of degree moderate the effect of social influence on Bangladeshi university students' behavioral intentions to adopt the hyb-blended learning method.

H8a. University ownership pattern, gender, teaching discipline, and teaching position moderate the effect of effort expectancy on Bangladeshi university teachers' behavioral intentions to adopt the hyb-blended learning method.

H8b. University ownership pattern, gender, degree level, and type of degree moderate the effect of effort expectancy on Bangladeshi university students' behavioral intentions to adopt the hyb-blended learning method.

H9a. University ownership pattern, gender, teaching discipline, and teaching position moderate the effect of facilitating conditions on Bangladeshi university teachers' behavioral intentions to adopt the hyb-blended learning method.

H9b. University ownership pattern, gender, degree level, and type of degree moderate the effect of facilitating conditions on Bangladeshi university students' behavioral intentions to adopt the hyb-blended learning method.

H10a. University ownership pattern, gender, teaching discipline, and teaching position moderate the effect of personal innovativeness on Bangladeshi university teachers' behavioral intentions to adopt the hyb-blended learning method.

H10b. University ownership pattern, gender, degree level, and type of degree moderate the effect of personal innovativeness on Bangladeshi university students' behavioral intentions to adopt the hyb-blended learning method.

4. Materials and methods

4.1. Data collection

This study aimed to understand the behavioral intentions of Bangladeshi university teachers and students toward the adoption of the hyb-blended learning method. Data were collected between January and April 2022 by administering questionnaires (electronic and/or manual). Two separate structured questionnaires were developed: one for teachers and one for students. The measurement items used in this study were adapted from the studies of Sarkar et al. [12], Abbad [21], Dakduk [26], Ibrahim et al. [44], Venkatesh et al. [22], and Khan et al. [41]. The Unified Theory of Acceptance and Use of Technology (UTAUT) framework served as the foundation for the questionnaire items' design.

There were 4 sections in the questionnaire. Respondents were requested to participate in the survey in Section 1. Additionally, the main purposes of the survey were stated in this section, and the respondents were reassured that the information they provided would be kept confidential. Section 2 described the pattern of the hyb-blended learning method and how it works, its major benefits, and the devices and infrastructure needed for adopting and implementing the hyb-blended learning method. Section 3 included questions related to the demographic information of the respondents. Section 4 contained the questions related to the teachers' and students' behavioral intentions toward the hyb-blended learning method.

4.2. Respondents

The respondents to this study were teachers and students of 11 public and 8 private universities in Bangladesh. Questionnaires were distributed among 718 teachers and 1970 students of the sample universities to collect primary data. Teachers and students finally returned 189 and 896 questionnaires, respectively, after distributing them. Incomplete questionnaires were excluded from the study. The sample finally included 171 teachers and 728 students from the sample public and private universities in Bangladesh. Teachers from various academic disciplines (e.g., science, engineering and technology, business, social sciences and arts, and others) who were willing to participate in the survey and were teaching as lecturers, assistant professors, associate professors, and professors were included in the sample survey. The sample survey included second- to fourth-year students and postgraduate students from various

academic disciplines (e.g., science, engineering and technology, business, social sciences and arts, and others) who were willing to participate in the survey. Respondents were selected using a simple random sampling method. By signing the end of the questionnaire, the respondents also gave their written consent to take part in the survey.

4.3. Measurement

The study developed one questionnaire for teachers with 29 items and 6 constructs: performance expectancy (5 items), social influence (5 items), effort expectancy (5 items), facilitating conditions (6 items), personal innovativeness (4 items), and behavioral intentions (4 items). For students, it developed a separate questionnaire with 28 items and 6 constructs: performance expectancy (5 items), social influence (5 items), effort expectancy (5 items), facilitating conditions (5 items), personal innovativeness (4 items), and behavioral intentions (4 items). Respondents' opinions on statements related to the variables being studied were assessed using a five-point Likert scale. It consisted of a series of options ranging from 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), and 5 (strongly agree). Respondents were advised to learn about the hyb-blended learning method, its key advantages, and the necessary equipment and infrastructure for its adoption and implementation before providing their responses.

4.4. Validity and reliability of the measurement model

The content validity of the questionnaires was assessed by two experts and researchers who had previously used the UTAUT model in research in a variety of fields. Several revisions, additions, and deductions were made in accordance with the experts' recommendations to increase the clarity of the items. Subsequently, the content validity indices (CVI) and content validity ratio (CVR) were used to assess the final version of the questionnaires' validity. The CVI and CVR had respective values of 0.88 and 0.85. To assess the internal consistency, 25 questionnaires were randomly distributed to teachers and students at one of the sample public universities. Cronbach's alpha coefficient was then used to calculate the reliability of the questionnaires. Teachers' and students' alpha coefficients were, respectively, 0.87 and 0.83, above the cutoff coefficient of 0.70.

Confirmatory factor analysis was performed to assess the measurement model. Standardized factor loadings (FL) were calculated for each item as part of this process to know if the items accurately measured the constructs. The minimum cutoff value of FL was set at 0.50 for items included in the study. The Cronbach's alpha (CA) coefficients and composite reliability (CR) coefficients were calculated to assess the constructs' reliability. The Average Variance Extracted (AVE) indices were calculated to assess the convergent validity of scale items. The acceptable levels for CA and CR were set at 0.70 and for AVE at 0.50. The Fornell-Larcker criteria were used to assess the discriminant validity of the relationships between the constructs. This was done by comparing the square root of a construct's average variance with its correlations to other constructs.

4.5. Structural model

This study employed a correlational, cross-sectional, and sample survey-based research design to understand the behavioral intentions of Bangladeshi university teachers and students toward the adoption of the hyb-blended learning method. Data were analyzed by SPSS (version 25.0) and SPSS AMOS (version 21.0) software. The study tested the hypotheses using a structural model. Two regression models were run to understand the effects of PE, SI, EE, FC, and PI on the BI towards adopting the hyb-blended learning method.

4.5.1. Models 1
Model 1was run to know the direct effect of the independent variable (i.e., PE, SI, EE, FC, and PI) on the dependent variable (i.e., BI).

$$y = a_0 + \beta x + \varepsilon \tag{1}$$

where y = behavioral intention (BI).

α_0 = constant term.

β = beta coefficient.

x = independent variables (i.e., PE, SI, EE, FC, and PI).

4.5.2. Model 2
Model 2 was run to understand how moderating variables affect the relationship between independent variables and the dependent variable.

$$y = a_0 + \beta_1 x + \beta_2 w + \beta_3 xw + \varepsilon \tag{2}$$

where y = behavioral intention (BI).

α_0 = constant term.

β = beta coefficient.

x = independent variables (i.e., PE, SI, EE, FC, and PI).

w = moderating variables (i.e., ownership pattern of university, gender, degree level and type of degree being pursued by students,

teaching discipline, and teaching position of teachers.)

5. Results

5.1. Teachers' behavioral intentions towards adopting the hyb-blended learning method

5.1.1. Sample teachers' demographic characteristics

Table 1 presents the demographic characteristics of the sample teachers. 81.3 % of the 171 teachers surveyed were from public universities, while 18.7 % were from private. The majority (78.9 %) were male, while 21.1 % were female. 40.4 % of teachers taught science, technology and engineering; 28.7 % taught social science and the arts; 28.1 % taught business; and 2.9 % taught other academic fields. The survey received responses largely from assistant professors (52.6 %), followed by associate professors (17 %), lecturers (16.4 %), and professors (14 %).

5.1.2. Results on the reliability and validity of the measurement model

Confirmatory factor analysis in Table 2 shows that all items had standardized factor loadings (FL) above 0.564, exceeding the required 0.50 threshold. The estimates indicate that the items effectively measured the constructs. However, three items (e.g., EE5, FC1, and PI3) were removed for failing to meet the minimum loading criterion. The Cronbach coefficients α (CA) and composite reliability (CR) ranged from 0.705 to 0.78 and 0.75 to 0.84, respectively, exceeding the benchmark of 0.70, indicating internal consistency in the scale items. The scale utilized in the study consistently demonstrated the necessary convergent validity, as indicated by the Average Variance Extracted (AVE) indices unfailingly exceeding 0.50.

5.1.3. Results on discriminant validity

Table 3 exhibits that the square root of a factor's AVE was greater than the factor's correlation coefficient, which confirmed the Fornell-Larcker criterion. These results support the strong discriminant validity of the questionnaire and show that the constructs were in fact unrelated to each other.

5.1.4. Goodness-of-fit of the structural model

This study employed maximum likelihood estimation to compare the structure coefficients between the latent variables. Estimations of all indicators of the structural model fit assessment were found to be within the recommended value, with the exception of the RFI (0.896), indicating a goodness-of-fit of the structural model (Table 4).

5.1.5. Results of hypotheses test – the relationship between independent and dependent variables

The results of the hypothesis test are presented in Table 5. The estimate of PE on BI was positive and statistically significant ($p < 0.01$), thus failing to reject hypothesis H_{1a}. Hypothesis H_{2a} was accepted as the coefficient of SI on BI was positive and statistically insignificant. The estimate of EE on BI was found to be positive and statistically significant ($p < 0.01$), failing to reject hypothesis H_{3a}. The estimate of FC on BI was positive and statistically significant ($p < 0.01$), providing support for hypothesis H_{4a}. Finally, the coefficient of PI on BI was also found to be positive and statistically significant ($p < 0.01$), confirming hypothesis H_{5a}.

5.1.6. Results of hypotheses test for moderating variables

Table 6 shows that the estimates of PE × university, gender, teaching discipline, and teaching position on BI were statistically insignificant ($p > 0.10$), rejecting hypothesis H_{6a}. The estimates of SI × university, gender, teaching discipline, and teaching position on BI were statistically insignificant ($p > 0.10$), rejecting hypothesis H_{7a}. The hypothesis H_{8a} was rejected as the coefficients of EE ×

Table 1
Demographic characteristics of sample teachers.

Variables	Category	N	Valid %
Ownership pattern of university	Public	32	18.7
	Private	139	81.3
Total		171	100
Gender	Male	36	21.1
	Female	135	78.9
Total		171	100
Teaching discipline	Science, technology, and engineering	69	40.4
	Business	48	28.1
	Social science and arts	49	28.7
	Others	5	2.9
Total		171	100.0
Teaching position	Lecturer	28	16.4
	Assistant Professor	90	52.6
	Associate Professor	29	17.0
	Professor	24	14.0
Total		171	100

Table 2
Confirmatory factor analysis.

Latent constructs	Code	Measurement items (adapted from Sarkar et al. [12], Abbad [21], Dakduk [26], Ibrahim et al. [44], Venkatesh et al. [22], and Khan et al. [41].)	Mean	SD	FL	CA	CR	AVE
PE	PE1	Hyb-blended learning will improve my teaching opportunities during crises like the COVID-19 pandemic and other crises.	3.78	1.111	0.617	0.71	0.84	0.52
	PE2	Hyb-blended learning will help me explain course materials better than face-to-face teaching.	3.55	0.951	0.714			
	PE3	Hyb-blended learning method will help me teach students enough to get a good CGPA.	3.21	0.965	0.874			
	PE4	Hyb-blended learning method will be as comfortable as classroom teaching.	2.93	1.031	0.745			
	PE5	I will have more possibilities to support students with hyb-blended learning method.	3.23	1.056	0.613			
SI	SI1	My university colleagues using hyb-blended learning method will inspire me to use it.	3.55	0.959	0.769	0.705	0.83	0.50
	SI2	My colleagues at other universities using hyb-blended learning method will inspire me to use it.	3.25	0.986	0.621			
	SI3	Hyb-blended learning method will be used if my pupils want it.	3.24	0.989	0.656			
	SI4	Hyb-blended learning method will be used if my university insists.	3.64	1.047	0.813			
	SI5	Hyb-blended learning method will be used if pandemic and non-pandemic situations force me to use it.	3.89	1.006	0.671			
EE	EE1	Students will understand lectures if they use hyb-blended learning method.	3.4	0.955	0.734	0.705	0.81	0.52
	EE2	I can give students lesson materials like in a typical classroom using hyb-blended learning method.	3.63	1.059	0.793			
	EE3	If hyb-blended learning is introduced, I can easily conduct classes.	3.59	0.924	0.656			
	EE4	Hyb-blended learning will give me greater time and place flexibility than face-to-face learning method.	3.72	1.049	0.686			
FC	FC2	I know how to use Zoom, Google Meet, or other video conferencing platforms to deliver lectures using hyb-blended learning methods.	4.05	1.069	0.694	0.72	0.84	0.52
	FC3	I have uninterrupted electricity at my university to deliver lectures from my department using hyb-blended learning method.	3.17	0.997	0.793			
	FC4	I have uninterrupted electricity at home to deliver lectures using hyb-blended learning.	3.04	0.911	0.800			
	FC5	I have a reasonably fast internet connection to deliver lectures using hyb-blended learning method.	3.13	0.906	0.564			
	FC6	I shall adopt hyb-blended learning method if my university extends logistic support for it.	3.56	0.935	0.734			
PI	PI1	I like to try out new teaching methods such as hyb-blended learning method.	3.43	1.041	0.728	0.73	0.75	0.50
	PI2	I want to try a new method like hyb-blended when I hear about it.	3.86	0.884	0.737			
	PI4	I may be the first to test the hyb-blended among my colleagues.	3.61	0.808	0.653			
BI	BI1	Hyb-blended learning method will be my future teaching method.	3.82	0.897	0.744	0.78	0.81	0.52
	BI2	I shall recommend hyb-blended learning method to my university colleagues.	3.65	0.972	0.713			
	BI3	I shall promote hyb-blended learning to my colleagues at other universities.	3.71	0.872	0.692			
	BI4	I shall use the method as it will please me	3.68	0.98	0.727			

Table 3
Discriminant validity results.

	BI	PE	SI	EE	FC	PI
BI	**0.721**					
PE	0.517**	**0.721**				
SI	0.361**	0.502**	**0.707**			
EE	0.319**	0.403**	0.322**	**0.721**		
FC	0.243**	0.180*	0.192*	0.222**	**0.707**	
PI	0.483**	0.378**	0.253**	0.350**	0.187*	**0.707**

Note: ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$. PE = performance expectancy, SI = social influence, EE = effort expectancy, FC = facilitating conditions, PI = personal innovativeness, BI = behavioral intention.

university, gender, teaching discipline, and teaching position on BI were found to be statistically insignificant ($p > 0.10$). Also, the coefficients of FC × university, gender, teaching discipline, and teaching position on BI were statistically insignificant ($p > 0.10$), thus rejecting hypothesis H_{9a}. Finally, the estimates of PI × university, gender, teaching discipline, and teaching position on BI were statistically insignificant ($p > 0.10$), providing no support for hypothesis H_{10a}.

5.2. Students' behavioral intentions towards adopting the hyb-blended learning method

5.2.1. Sample students' demographic characteristics

The demographic characteristics of the sample students are presented in Table 7. Most respondents (65.5 %) were enrolled in public

Table 4

Goodness-of-fit statistics for the structural model.

Fit statistic	Recommended Value	Model value
Chi-square/df (CMIN/DF)	<3.0 [45]	2.299
Goodness-of-fit index (GFI)	>0.90 [46]	0.914
Adjusted goodness-of-fit index (AGFI)	>0.80 [45]	0.824
Standardized root mean squared residual (SRMR)	<0.080 [45]	0.060
Normalized fit index (NFI)	>0.90 [47]	0.910
Relative fit index (RFI)	>0.90 [48]	0.896
Incremental fit index (IFI)	>0.90 [48]	0.917
Comparative fit index (CFI)	>0.90 [49]	0.913
Tucker-Lewis index (TLI)	>0.90 [47]	0.926
Root mean squared error of approximation (RMSEA)	<0.080 [48]	0.067

Table 5

Hypothesis test results.

Hypothesis	Path	Estimate (β)	Standard error (se)	Decision on hypothesis
H_{1a}	PE → BI	0.5345***	0.0660	Confirmed
H_{2a}	SI → BI	0.3562	0.3776	Confirmed
H_{3a}	EE → BI	0.2946***	0.0690	Confirmed
H_{4a}	FC → BI	0.2500***	0.0787	Confirmed
H_{5a}	PI → BI	0.5550***	0.0785	Confirmed

Note: ***$p < 0.01$. PE = performance expectancy, SI = social influence, EE = effort expectancy, FC = facilitating conditions, PI = personal innovativeness, BI = behavioral intention.

Table 6

Moderating results.

Hypothesis	Path	Coefficient (β)	Standard error (se)	Decision on hypothesis
H_{6a}	PE × University → BI	0.1770	0.1524	Not confirmed
	PE × Gender → BI	0.0468	0.1701	Not confirmed
	PE × Teaching discipline → BI	−0.0638	0.0718	Not confirmed
	PE × Teaching position → BI	−0.0264	0.0647	Not confirmed
H_{7a}	SI × University → BI	−0.2247	0.1928	Not confirmed
	SI × Gender → BI	−0.1032	0.2392	Not confirmed
	SI × Teaching discipline → BI	−0.1349	0.1285	Not confirmed
	SI × Teaching position → BI	0.1265	0.0983	Not confirmed
H_{8a}	EE × University → BI	0.1202	0.1857	Not confirmed
	EE × Gender → BI	−0.1864	0.1956	Not confirmed
	EE × Teaching discipline → BI	−0.0948	0.0765	Not confirmed
	EE × Teaching position → BI	−0.1211	0.0814	Not confirmed
H_{9a}	FC × University → BI	−0.0951	0.2213	Not confirmed
	FC × Gender → BI	−0.0015	0.1843	Not confirmed
	FC × Teaching discipline → BI	−0.0624	0.0909	Not confirmed
	FC × Teaching position → BI	0.1213	0.0889	Not confirmed
H_{10a}	PI × University → BI	0.0416	0.1907	Not confirmed
	PI × Gender → BI	−0.1272	0.2223	Not confirmed
	PI × Teaching discipline → BI	0.0997	0.0918	Not confirmed
	PI × Teaching position → BI	0.0967	0.0838	Not confirmed

Note: ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$. PE = performance expectancy, SI = social influence, EE = effort expectancy, FC = facilitating conditions, PI = personal innovativeness, BI = behavioral intention.

universities, while the remaining 34.5 % were studying at private universities. Out of the 728 students who participated in the survey, 63 % were male and 37 % were female. Of the students surveyed, 80 % were pursuing undergraduate degrees, while just 20 % were seeking postgraduate degrees. The majority of students in the survey (37.7 %) majored in social science and the arts, with business (34.1 %), science, technology, and engineering (25.4 %), and other fields (2.8 %) following.

5.2.2. Results on the reliability and validity of the measurement model

   Table 8 shows that all items in the confirmatory factor analysis had standardized factor loadings (FL) above 0.660, which is above the required threshold of 0.50. The estimates indicate that the items measured the constructs effectively. However, two items (e.g., EE5 and FC5) were removed because they did not meet the minimum loading criteria. The Cronbach coefficient α (CA) and composite reliability (CR) were above 0.70. They were between 0.74 and 0.83 for CA and between 0.80 and 0.86 for CR. These estimates suggest that there was internal consistency in the scale items. The AVE (average variance extracted) indices were always greater than 0.50,

Table 7
Demographic characteristics of sample students.

Variables	Category	N	Valid %
Ownership pattern of university	Public	477	65.5
	Private	251	34.5
Total		728	100
Gender	Male	459	63.0
	Female	269	37.0
Total		728	100
Degree level	Undergraduate	583	80.0
	Postgraduate	145	20.0
Total		728	100
Type of degree	Science, technology, and engineering	181	24.86
	Business	243	33.38
	Social science and arts	269	36.95
	Others	35	4.81
Total		728	100

Table 8
Confirmatory factor analysis.

Latent constructs	Code	Measurement items (adapted from Sarkar et al. [12], Abbad [21], Dakduk [26], Ibrahim et al. [44], Venkatesh et al. [22], and Khan et al. [41].)	Mean	SD	FL	CA	CR	AVE
PE	PE1	Hyb-blended learning method will improve my learning during crises like the COVID-19 pandemic and other crises.	3.85	0.950	0.682	0.74	0.84	0.51
	PE2	Hyb-blended learning will help me understand course material better than face-to-face.	3.60	1.002	0.723			
	PE3	Hyb-blended learning method will help to boost my CGPA.	3.50	1.009	0.751			
	PE4	Hyb-blended learning method will be as comfortable as classroom learning method.	3.44	1.078	0.715			
	PE5	I'll have more possibilities to collaborate with classmates using hyb-blended learning method.	3.36	1.050	0.688			
SI	SI1	My friends at other universities using hyb-blended learning method will inspire me to use it.	3.49	0.935	0.688	0.83	0.86	0.56
	SI2	My classmates using hyb-blended learning method will inspire me to use it.	3.53	0.948	0.712			
	SI3	I will use hyb-blended learning method if my teachers suggest it.	3.62	0.926	0.776			
	SI4	I shall use hyb-blended learning method if my university insists.	3.56	0.933	0.784			
	SI5	Hyb-blended learning method will be used if pandemic and non-pandemic situation force me to use it.	3.87	1.035	0.763			
EE	EE1	Hyb-blended learning method will make lectures understandable.	3.72	0.940	0.786	0.77	0.82	0.52
	EE2	Hyb-blended learning method will allow me to take class notes like I would in a traditional classroom.	3.63	0.986	0.685			
	EE3	I will have easy access to classes if hyb-blended learning method is introduced.	3.81	0.988	0.710			
	EE4	Hyb-blended learning method will allow me greater time and place flexibility than face-to-face learning.	3.80	1.000	0.713			
FC	FC1	I have a personal laptop/desktop/smartphone required to use the hyb-blended learning method.	4.04	0.930	0.724	0.74	0.81	0.51
	FC2	I know how to use the video conferencing tools required for the hyb-blended learning method (e.g., Zoom, Google Meet).	4.14	0.921	0.696			
	FC3	I have an uninterrupted electricity supply at my residence to use the hyb-blended learning method.	4.04	0.922	0.745			
	FC4	I have a reasonably fast internet connection to use the hyb-blended learning method.	3.60	1.109	0.698			
PI	PI1	My learning transactions often will include novel methods like hyb-blended learning methods.	3.83	0.921	0.742	0.74	0.80	0.51
	PI2	I want to try new methods like hyb-blended when I hear about them.	3.98	0.912	0.732			
	PI3	I normally try new methods like hyb-blended first among my friends, families, and peers.	3.72	0.934	0.706			
	PI4	I am not hesitant to try out the hyb-blended learning method.	3.76	0.921	0.666			
BI	BI1	I intend to use the hyb-blended learning method in my learning transactions in the future.	3.82	0.915	0.660	0.80	0.81	0.52
	BI2	I will recommend my classmates to take courses using the hyb-blended learning method.	3.71	0.940	0.722			
	BI3	I will recommend my friends studying at other universities to attend classes using the hyb-blended learning method.	3.73	0.896	0.751			
	BI4	I will be happy if the hyb-blended learning method continues in the future.	3.76	1.042	0.749			

showing that the scale used in the study had the required convergent validity.

5.2.3. Results on discriminant validity

Table 9 displays the findings of the discriminant validity. Findings show that a factor's square root of AVE was larger than its correlation coefficient, indicating strong discriminant validity for the questionnaire. These estimates validate the Fornell-Larcker criterion.

5.2.4. Goodness-of-fit of the structural model

This study used maximum likelihood estimation to compare the structure coefficients between the latent variables. The structural model fit assessment found that all estimates were within the acceptable range, indicating a good fit of the model (Table 10).

5.2.5. Results of hypotheses test – the relationship between independent and dependent variables

The hypothesis test findings are shown in Table 11. PE had a positive and statistically significant relationship with BI ($p < 0.01$), thus supporting hypothesis H_{1b}. SI had a statistically significant positive influence on BI ($p < 0.01$), leading to the rejection of hypothesis H_{2b}. The positive and statistically significant relationship between EE and BI ($p < 0.01$) provided support for hypothesis H_{3b}. A statistically significant and positive FC for BI ($p < 0.01$) found no evidence to reject hypothesis H_{4b}. PI showed a statistically significant positive impact on BI ($p < 0.01$), supporting hypothesis H_{5b}.

5.2.6. Results of hypotheses test for moderating variables

The results of the hypothesis test are presented in Table 12. The coefficients of PE × university, gender, degree level, and type of degree on BI were statistically insignificant ($p > 0.10$), thus rejecting hypothesis H6b. The estimate of SI × university on BI was negative and statistically significant ($p < 0.10$), supporting hypothesis H7b, and the estimate of SI × degree level on BI was positive and statistically significant ($p < 0.05$), also supporting hypothesis H7b. However, the coefficients of SI × gender and type of degree on BI were statistically insignificant ($p > 0.10$), providing no evidence of supporting hypotheses H7b. The coefficients of EE × university, gender, and type of degree on BI were statistically insignificant ($p > 0.10$), thus rejecting hypothesis H8b. Contrarily, the analysis revealed that EE × degree level on BI were positive and statistically significant ($p < 0.10$), thus failing to reject hypothesis H8b. FC × university, gender, and degree level on BI were statistically insignificant ($p > 0.10$), rejecting hypothesis H9b. However, the estimates of FC × type of degree on BI were negative and statistically significant ($p < 0.01$), failing to reject hypothesis H9b. Finally, hypothesis H10b was rejected because the effects of PI by university, degree level, and type of degree on BI were not statistically significant ($p > 0.10$). However, the estimates of PI × gender on BI were positive and statistically significant ($p < 0.10$), failing to reject hypothesis H10b.

6. Discussion

The study examined the behavioral intentions of teachers and students in public and private universities in Bangladesh towards adopting the proposed hyb-blended learning method. Following the modified Unified Theory of Acceptance and Use of Technology (UTAUT) framework, the discussion focused on how individual psychological factors (e.g., performance expectancy, effort expectancy, and personal innovativeness), institutional factors (e.g., facilitating conditions), and social factors (e.g., social influence) affect the behavioral intentions of teachers and students of Bangladeshi public and private universities toward adopting the hyb-blended learning method. The study also examined whether university ownership, student and faculty gender, degree level and type of degree pursued by students, teaching position, and teachers' teaching discipline influence their behavioral intentions toward adopting the proposed learning method.

The results revealed that performance expectancy had a significant positive effect on the teachers' and students' behavioral intentions toward adopting the proposed hyb-blended learning method. This finding fits with the UTAUT framework and the findings of Dakduk et al. [26], Okocha [27], Azizi et al. [13], Abbad [21], Batucan et al. [37], and Humida et al. [29]. These studies all agree that performance expectancy is one of the most important key factors for adopting the blended learning model. This finding indicates that both teachers and students believe that adopting the proposed hyb-blended learning method will increase the opportunities for students to learn and for teachers to teach in order to achieve their respective goals. The study found no difference in performance expectancy between teachers and students in public and private universities, between male and female teachers and students, between

Table 9
Discriminant validity.

	PE	SI	EE	FC	PI	BI
PE	**0.714**					
SI	0.400**	**0.748**				
EE	0.484**	0.367**	**0.721**			
FC	0.283**	0.175**	0.379**	**0.714**		
PI	0.339**	0.257**	0.390**	0.399**	**0.714**	
BI	0.492**	0.324**	0.448**	0.346**	0.508**	**0.721**

Note: **$p < 0.05$, *$p < 0.10$. PE = performance expectancy, SI = social influence, EE = effort expectancy, FC = facilitating conditions, PI = personal innovativeness, BI = behavioral intention.

Table 10
Goodness-of-fit statistics for the structural model.

Fit statistic	Recommended Value	Model value
Chi-square/df (CMIN/DF)	<3.0 [45]	2.096.
Goodness-of-fit index (GFI)	>0.90 [46]	0.941
Adjusted goodness-of-fit index (AGFI)	>0.80 [45]	0.925
Standardized root mean squared residual (SRMR)	<0.080 [45]	0.039
Normalized fit index (NFI)	>0.90 [47]	0.921
Relative fit index (RFI)	>0.90 [48]	0.916
Incremental fit index (IFI)	>0.90 [48]	0.952
Comparative fit index (CFI)	>0.90 [49]	0.952
Tucker-Lewis index (TLI)	>0.90 [47]	0.943
Root mean squared error of approximation (RMSEA)	<0.080 [48]	0.039

Table 11
Hypothesis test results.

Hypothesis	Path	Estimate (β)	Standard error (se)	Decision on hypothesis
H_{1b}	PE → BI	0.5018***	0.0330	Confirmed
H_{2b}	SI → BI	0.3048***	0.0358	Not confirmed
H_{3b}	EE → BI	0.4414***	0.0325	Confirmed
H_{4b}	FC → BI	0.3900***	0.0362	Confirmed
H_{5b}	PI → BI	0.5412***	0.0337	Confirmed

Note: ***$p < 0.01$. PE = performance expectancy, SI = social influence, EE = effort expectancy, FC = facilitating conditions, PI = personal innovativeness, BI = behavioral intention.

Table 12
Moderating results.

Hypothesis	Path	Coefficient (β)	Standard error (se)	Decision on hypothesis
H_{6b}	PE × University → BI	0.0376	0.0687	Not confirmed
	PE × Gender → BI	0.0119	0.0696	Not confirmed
	PE × Degree level → BI	0.0383	0.0810	Not confirmed
	PE × Type of degree → BI	−0.0211	0.0393	Not confirmed
H_{7b}	SI × University → BI	−0.1184*	0.0708	Confirmed
	SI × Gender → BI	−0.1199	0.0733	Not confirmed
	SI × Degree level → BI	0.2125**	0.1016	Confirmed
	SI × Type of degree → BI	−0.0180	0.0420	Not confirmed
H_{8b}	EE × University → BI	0.0237	0.0695	Not confirmed
	EE × Gender → BI	−0.0855	0.0711	Not confirmed
	EE × Degree level → BI	0.1437*	0.0798	Confirmed
	EE × Type of degree → BI	0.1156	0.0731	Not confirmed
H_{9b}	FC × University → BI	0.0643	0.0708	Not confirmed
	FC × Gender → BI	0.0956	0.0729	Not confirmed
	FC × Degree level → BI	0.1065	0.0899	Not confirmed
	FC × Type of degree → BI	−0.1157***	0.0400	Confirmed
H_{10b}	PI × University → BI	0.0724	0.0686	Not confirmed
	PI × Gender → BI	0.1217*	0.0718	Confirmed
	PI × Degree level → BI	0.0972	0.0886	Not confirmed
	PI × Type of degree → BI	−0.0362	0.0403	Not confirmed

Note: ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$. PE = performance expectancy, SI = social influence, EE = effort expectancy, FC = facilitating conditions, PI = personal innovativeness, BI = behavioral intention.

undergraduate and postgraduate students, and between students majoring in science, technology and engineering, business, social sciences and arts, and other areas. Furthermore, faculty members teaching in different disciplines and in different ranks or positions (e. g., lecturer, assistant professor, associate professor, and professor) showed no difference in performance expectancy. These findings suggest that teachers and learners concur that the proposed hyb-blended learning method will give both students and teachers more opportunities for learning and teaching in order to achieve their goals, regardless of whether it is a public or private university, the gender of the teachers and students, the teaching position, and the level and type of degree the students are seeking.

Concerning the social influence of teachers' and students' behavioral intentions to adopt the hyb-blended learning method, the study found inconclusive findings. The adoption of the hyb-blended learning method among Bangladeshi university teachers is unlikely to be influenced by individuals within their immediate social and professional circles, including peers, colleagues, and university administrators. While this result contradicts the UTAUT framework in theory, it is consistent with the findings of Dakduk [26] and Abbad [21]. A plausible explanation for this might be that teachers are pragmatic and rational individuals who prioritize adopting a

new learning method based on the perceived necessity and potential benefits of the target groups rather than social attitudes. Conversely, the study findings revealed that social influence exerted a noteworthy and encouraging impact on the students' behavioral intentions concerning adopting the hyb-blended learning method. This finding implies that students at Bangladeshi universities are more likely to build positive faith in the proposed learning method because they are more reactive to social pressure, friendship, university administration, and other external influences. This conclusion is in line with the UTAUT framework and similar to Azizi et al. [13], Olatubosun [30], and Hassan et al. [25], who found that social influence affected users' behavioral intentions to use blended learning, e-learning, or health information systems, respectively. This finding, however, differs with reference to the age, gender, university ownership pattern, degree level, teaching discipline, and teaching position of respondents. Interestingly, the study revealed that, unlike public university students, private university students had an adverse response to the influences exerted by their peers, university authorities, and other individuals in adopting this learning method. Postgraduate students are more likely to use the method than undergraduates. However, there were similar social influences observed among both male and female teachers and students, as well as teachers occupying various levels and positions.

Consistent with the UTAUT framework and studies by Hassan et al. [25], Chan et al. [31], Lwoga and Komba [32], Morosan and Defranco [33], Azizi et al. [13], Dakduk et al. [26], and Humida et al. [29], this study found that the behavioral intentions of teachers and students to adopt the proposed hyb-blended learning method were significantly positively influenced by effort expectancy. This result implies that if students and teachers find the hyb-blended learning method simple to use, they are more likely to adopt and use it. The effect of effort expectancy on the behavioral intentions to adopt the method in teaching and learning transactions is unlikely to be affected by the gender identities of the teachers and students, the private or public universities, the type of degree being pursued by the students, or the teaching discipline and teaching position of the teachers. However, the study demonstrates that postgraduate students are more likely to adopt the method than undergraduate students, provided that the proposed method is simple to use.

Facilitating conditions were found to have a significant positive effect on the teachers' and students' behavioral intentions in adopting the proposed learning method. This finding agrees with the UTAUT framework and those of Oh and Yoon [34], Asare et al. [35], Masadeh et al. [36], Okocha [27], Azizi et al. [13], Kim and Lee [50], Abbad [21], and Humida et al. [29]. This result suggests that the adoption of this method depends entirely on the availability of resources and support, in addition to users having the necessary knowledge and expertise to use it efficiently. The impact of facilitating conditions on behavioral intentions to adopt the method in teaching and learning transactions is consistent across various factors, including the gender identity of both teachers and students, the distinction between private and public universities, the degree level of the students, the teaching discipline, and the teaching position of the teachers. Unexpectedly, the study documented that students majoring in science, technology, and engineering had an adverse response to the relationship between facilitating conditions and their behavioral intentions. This was not the case for students pursuing business, social science, the arts, or other degrees.

Finally, personal innovativeness was found to significantly influence teachers' and students' behavioral intentions in adopting the proposed hyb-blended learning method. This finding implies that, regardless of what others think or say, teachers and students will be interested in trying the new learning method. This result is consistent with those of Okumus et al. [40], Cao et al. [38], and Khan et al. [41]. The level and type of degree students pursue, the gender of teachers, their subject expertise, and their position are all similar when it comes to the extent to which innovativeness influences the behavioral intentions of teachers and students in public and private universities. This result is unexpected because it shows that the effect of the personal innovativeness of students majoring in science, technology, and engineering on their behavioral intentions in adopting the hyb-blended learning method is the same as that of students majoring in non-science, technology, and engineering. This is also unusual because it does not matter which degree the students are pursuing, which subject teachers teach, or which teaching positions they hold. However, the research findings indicated that male students exhibited a greater degree of personal innovativeness compared to their female counterparts. Consequently, this higher level of personal innovativeness was associated with a more favorable attitude towards the adoption of the hyb-blended learning method.

7. Conclusion

This study examined the behavioral intentions of teachers and students in public and private universities in Bangladesh towards adopting a new learning method, namely the "hyb-blended learning method." The proposed learning method can be used as an alternative to the face-to-face learning method during the COVID-19 pandemic or other crises, as well as in non-pandemic situations in Bangladeshi universities. The Unified Theory of Acceptance and Use of Technology (UTAUT) provided the theoretical framework for developing the conceptual model for the study.

The results of the study reveal that teachers and students in Bangladeshi universities believe that the proposed hyb-blended learning method will increase learning and teaching opportunities. They will also be interested in adopting this method without relying on the experiences of others or what others think or say. The study shows that male students have higher levels of innovativeness than female students, resulting in more positive attitudes among males toward adopting the hyb-blended learning method. However, their positive attitude toward the adoption of this method depends on the accessibility of required resources and support for using it, as well as adequate and necessary understanding and talent to use it effectively. The study also reveals that students pursuing science, technology, and engineering degrees believe that the availability of necessary resources and the possession of necessary knowledge and skills are more important than those pursuing other degrees. Also, if students and teachers find this method simple to use, they are more likely to adopt and use it. However, the study demonstrates that postgraduate students are more likely to adopt the method than undergraduate students, provided that the proposed method is simple to use. Unlike teachers, students will use it if their friends, peers, authorities, and other elements around them support and influence them. The perceived necessity and benefits of this method may influence teachers. Private university students are more likely to adopt this method of learning than public university

students because their friends, university authorities, and other people in their environment have a greater influence on them. Postgraduate students at public and private universities are also more likely to adopt it if their friends and other people around them do.

The results of this study make three important contributions. First, the study proposed a new learning method as an alternative to face-to-face classroom education. This method is expected to minimize the gaps in online, hybrid and blended learning methods. Secondly, universities in Bangladesh are still unsure of what to do to continue conducting teaching and learning transactions during a crisis like COVID-19 and similar crises. The study's conclusions supported the notion that the proposed hyb-blended learning method is a cutting-edge method for Bangladeshi university teachers and students hoping to benefit from enhanced learning opportunities in the wake of the pandemic or other major global or personal crises. Finally, the proposed learning method can also be used in non-pandemic situations to expand students' knowledge and skills while allowing greater flexibility in the teaching and learning processes.

This study has some limitations. First, this study used a correlational, cross-sectional, and sample survey-based research design to understand the behavioral intentions for adopting the hyb-blended learning method. A cross-sectional study may produce misleading results due to its inability to determine causality or analyze behavior across time. A longitudinal study examining the behavioral intentions of teachers and students in adopting the proposed hyb-blended learning method would provide a more precise measurement. Second, the study used four moderating variables to predict teachers' and students' behavioral intentions. Age, voluntary use, and income of potential users were not considered in the study as moderating variables that could improve the prediction of teachers' and students' behavioral intentions. Finally, as with the extended UTAUT2 model by Venkatesh et al. [22], this study did not consider constructs such as hedonic motivation, price value, and habit, all of which influence behavioral intentions. Incorporating these three constructs may improve outcomes related to teachers' and students' behavioral intentions. Therefore, future research may involve a longitudinal design and include constructs like hedonic motivation, price value, and habit, along with moderating variables like age, the voluntariness of use, and income.

Data availability statement

Data will be made available on request.

Ethics statement

Ethical approval is not required as the authors declare the research did not involve human or animal experiments.

CRediT authorship contribution statement

Mohammad Kamal Hossain: Writing – original draft, Methodology, Funding acquisition, Formal analysis, Conceptualization. **Md Abdus Salam:** Writing – review & editing, Project administration. **Mostafijur Rahman Akhond:** Visualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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