Blended Learning in Higher Education

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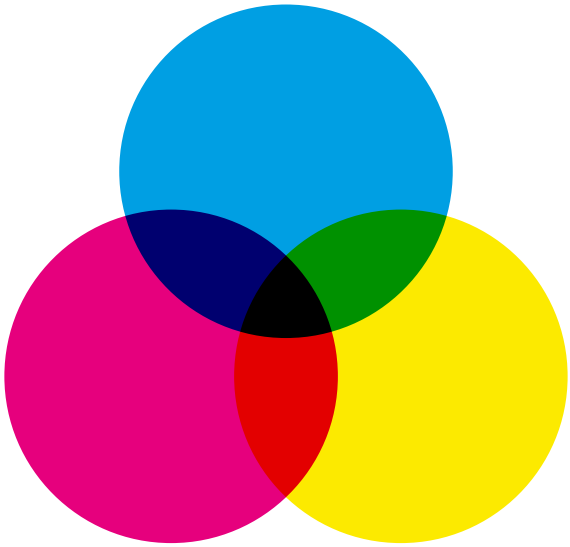

BLENDED LEARNING IN HIGHER EDUCATION

BLTEAE PROJECT TO SUPPORT TEACHER EDUCATORS' PROFESSIONAL DEVELOPMENT THROUGH BLENDED LEARNING

Classifications: Education; Social Sciences and Humanities

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Contents

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Preface

The book is a follow up of the ERASMUS+ project titled “Blended Learning for Teacher Educators in Europe and Asia (BLTeae, http://blteae.eu/). The purpose of the BLTeae project was to support teacher educators' professional development through blended learning based on innovative constructivist theories. The collaborative learning community made up of teacher educators in four European countries (France, Belgium, Denmark, & Estonia) and four Asian countries (Bangladesh, Bhutan, Malaysia, & Pakistan) developed the online Blended Learning courseware with 18 modular courses on pedagogical and information and communication technology (ICT) offered on the Moodle platform (http://moodle.blteae.eu/). For the dissemination of research and development outcomes, the First International Conference on Education in the Digital Ecosystem was held in September 2019, sharing best practices about teacher educators' practices and experiencing and implementing innovative teaching practices and documented in a proceeding.

The book aims to build on the perspectives of scholars from Europe and Asia regarding the design and application of blended learning in various educational contexts. It will provide an insight into international teaching practice by describing the experiences and reflections of academics from around the world, mainly European and Asian countries. It will analyse enablers, barriers to engagement, outcomes, implications and recommendations to benefit from blended learning in different contexts and associated concepts and models. It will serve as a reference for institutions and practitioners who may consider using approaches to learning and teaching with blended learning practices.

The target audience of this book is university and college educators worldwide looking for ways to update, improve and reflect on their teaching practice. The book is expected to benefit students, academics, learning technologists and instructional designers interested in their learning process and the design of digital learning technologies. It can also serve as a reference point for policymakers, higher education leaders and senior managers who are interested in introducing or refining pedagogical approaches aligned to blended learning in their institutions.

Introduction

Technological innovations in the digital ecosystem such as blended learning (BL) are rapidly changing teaching and learning in higher education, where BL integrates face to face teaching with web-based learning. Although BL has been a feature of higher education for approaching twenty years, it is still developing. It is not yet fully embedded and institutionalised in higher education institutions either as an area of practice or a field of research (Smith & Hill, 2018). The term blended learning is used in different ways by different researchers. This leaves uncertainty about its definition (Mortera-Gutierrez 2006, Osguthorpe & Graham 2003, Oliver & Trigell 2005). Oliver & Trigwell (2005) even argued that the term blended learning is redundant and unnecessary by all its definitions. Poon (2014) foresaw that BL is likely to be developed as the leading teaching approach for the future as one of the top ten educational trends to occur in the 21st century. Owston et al. 2019 and Guillén-Gámez et al. 2020 supported that BL offers access to online resources and information to meet the students' level of knowledge and interest and support teaching conditions by offering opportunities for professional development collaboration and also improving the time adeptness of teachers. Cronje (2020) believed that the definition should include context, theory, method and technology and proposed, "The appropriate use of a mix of theories, methods and technologies to optimise learning in a given context. The BL learning may take on more or less radical forms. Bonk and Graham (2012), in their quest to answer, "How to blend?", divide blended learning systems into three categories: Enabling blends, enhancing blends, and transforming blends. They reviewed and identified six major issues that are related to designing blended learning systems: "(1) the role of live interaction, (2) the role of learner choice and self - regulation, (2) models for support and training, (4) finding a balance between innovation and production, (5) cultural adaptation, and (6) dealing with the digital divide."

The growth of blended learning is generally paced with digital tools and has long been acknowledged, both in developed and developing countries. At the turn of the 21st Century, Brown (2001) noted ICT tools had become a way of life so deeply embedded in all aspects of students' lives that they expect their institutions to provide a continuous experience with Web access in academic life social life, and administration. A decade later, Chandra & Fisher (2009) recorded the increasing accessibility, affordability, and capability of the Internet. The array of rich technological tools has created enormous possibilities in designing, developing, and implementing innovative learning environments. After the COVID-19 pandemic outbreak, it can even be argued that blended learning is redundant and unnecessary by all its definitions.

The book is organised into 11 chapters containing examples of the adoption of blended learning in various forms. The outline of each chapter is presented below.

Chapter 1
Blended Learning at Universities of Bangladesh: Initiatives and Challenges during COVID-19 Lockdown

The chapter reports the findings from an empirical qualitative study on the blended learning implementation decision process perceived by the different stakeholders of the selected universities in Bangladesh amidst the COVID-19 lockdown. A phenomenographic research methodology helps question critical academics and management roles affiliated with one international university, three public universities, and two private universities. The identified factors are categorised into 1) institution type and governing system, 2) flexibility to circumvent the barriers: participation and power, 3) location of the university and diversity of the students' profiles, 4) financial need of students and strategy to address the need, 5) technological knowledge and institutional, technological resources, and 6) adoption of teaching and assessment methods. The chapter gives an updated overview of the factors underlying the adoption of online blended learning activities.

Chapter 2
Blended Learning Models for Teacher Education and Training Programs of Bangladesh Open University
The chapter opens with a brief description of teacher education and training programs (TETPs) in Bangladesh. It presents a thesis statement on the possibility of integrating technology, in particular, via blended learning (BL), into the TETPs. The paper then goes on to define BL, with a discussion on its public benefits and challenges. The application of BL in TETPs is explored in Bangladesh's context and its practices in Ukrainian and Vietnam higher educational institutions. Drawing from examples in the three different contexts, this chapter presents three BL models for Bangladesh Open University (BOU) TETPs, one each for the university's Master of Education (M.Ed.), Bachelor of Education (B.Ed.) and short-term teacher training. The M.Ed. model utilises BL for all of its semesters, with online applications focusing on some input and most assessment. The B.Ed. model is similar to that of the M.Ed. but with teaching practice sessions to be recorded and uploaded to the university's learning management system. The model suggested for the short-term training programs comprises a mostly-online second

stage, flanked by face-to-face first and third stages of practical sessions and assessment. The proposal, however, is mindful of the particular context of Bangladesh. Thus, a SWOT analysis is presented to take further actions for effective BL implementation based on the proposed models.

Chapter 3
The Ergonomic Evaluation of Computer use and related health problems in RUB Constituent Colleges
This chapter questions the actuality of modern Bhutanese society with technologies, and indeed, it is still a recent topic of investigation in computer ergonomics. This study mainly examines the current practice of computer and related health problems among the staff of 10 constituent colleges under university staff. The study adopted a convergent parallel design using a mixed-methods study involving 254 computer user staff for a survey and 17 computer user staff for structured interview questionnaires. The results of the survey instrument, structured questionnaire and physical observation were merged and discussed based on the research sub-questions. Although the study has established that there were no exceeding significant health problems, the majority of the computer user staff (CUS) have suffered between slight discomfort to moderate discomfort with eye strain, back pain, neck pain and shoulder pain which pertain to the type of staff, type of personal computer use and frequency of computer use among others, and neck pain was the common significant difference about the above-associated factors. Recommendations are proposed through computer ergonomic assessment policy and guidelines.

Chapter 4
Satisfaction of Teachers and Students with Blended Learning

The chapter proposes a conceptual reflection on blended learning based on the actuality in Pakistan learning and teaching. The main focus of this chapter is to explore teachers and students' satisfaction at higher education institutions regarding the practice of blended learning. Therefore, key determinants of teachers and student's satisfaction have been discussed in detail. Research studies reflected that teacher's willingness towards the use of technology during teaching, the relationship between technology and teacher's identity, the relationship between technology use and pedagogical knowledge, and the role of culture and context in employing the technology in the teaching-learning process are strong predictors of teacher's satisfaction. It has been explored that regarding blended learning, workload management, learners' attitudes, and interaction were significant determinants of students' satisfaction. This chapter also highlights various factors affecting teachers and student's satisfaction regarding blended learning in the Pakistan context.

Chapter 5
Impact of Blended Learning on Teacher Education for Tutors at Bangladesh Open University

The chapter presents the implementation of the blended "teacher education course" under European Union-funded BLTeae project using Moodle Learning Management System (LMS). It discusses the impact on teacher education in Bangladesh from 2018 to 2019. At the end of the implementation, focus group discussion and qualitative analysis studied the tutors' blended learning (BL) experience. Results show that blended tutoring could achieve better learning experiences than a traditional class with a higher satisfaction score. The research outcome shows that BL can improve quality in higher education, can improve teacher education, and should be recommended to the mainstream in Bangladesh. However still, there are some challenges to implementing blended learning as the IT infrastructure is relatively limited.

Chapter 6
A User-centred Approach to Redesigning Teaching and Learning with ICT in Samtse College of Education, Bhutan

The chapter deals with the professional development activity in the Bhutan context Teaching staff from the college participated in the workshop. The methodology, the outcomes, and the perspectives for further work within this professional and educational development are discussed. Besides contributing to the local capacity building for developing education, this study has provided insights into the impact of an intervention based workshop methodology on current and future educational practices and the level of technology use. These findings provide a guide for the planning of future intervention workshops.

Chapter 7
University Teachers' Competence in Domains of Technological, Pedagogical and Content Knowledge An Analysis

The chapter discusses university teachers' competence in technological pedagogical and content knowledge (TPACK). Sample of the study comprised 350 teachers from three public sector universities located in Pakistan. The study's objectives were to assess the competence of university teachers in technological, pedagogical, and content knowledge domains and to identify gender differences in university teachers' competence in TPACK. Data for the study was collected through the administration of a questionnaire. The collected data were analysed by applying Mean, t-test, and ANOVA. The study showed that university teachers were found competent in technological, pedagogical, and content knowledge, and male teachers were found more competent than females in technological knowledge.

Chapter 8
New forms of Teacher and Teacher Educators Professional Development: From Blended Learning to Social Networks

The chapter discusses the development of complex professionalism such as that of the teacher and teacher-educators and how this can allow participants to take advantage of international networking, which today's technology makes possible but is not yet fully proposed by higher institutions. The sharing of experiences could improve the quality of teacher-educators training in different parts of the world. It could be significantly enhanced by formulating a robust and systematic language policy allowing teachers and teacher educators to fulfil their role in the knowledge society. At the same time, it is also essential to focus on the quality of the design of appropriate international training, which considers the possible limits and challenges of the context, including formal and informal modalities and prospects. Hence, designing a hybrid formal and informal learning space for professional development could help support a new generation of international teachers connected beyond national borders.

Chapter 9
21st Century Learning Platforms: Social Media for Teaching and Learning

The chapter discusses how the new digital ecosystem has marked the 21st century. The use of digital technologies continues to transform and accelerate the educational approach in teaching and learning. The advancement of technologies in the 21st century has changed the traditional methods of teaching. The examples of the four social media platforms have demonstrated that organising teaching resources and activities on one's website and integrating technology can bring students' learning experience to a different level. Younger educators from generations Y and Z can quickly adapt to 21st Century Education and will not feel stifled with the traditional classroom teaching approach.

Chapter 10
Digital Learning Technology Blend in Assessment Activities of Higher Education: A Systematic Review

The chapter presents a systematic literature review on various digital assessment activities as the diversity of student assessment and feedback technologies cannot be identified from existing literature. Applying Creswell's five steps and PRISMA guidelines, 40 peer-reviewed articles are reviewed. The synthesis of the digital learning technologies for student assessment and feedback are classified into three categories: regular online examinations, alternative online assessment strategies, and ethical assessment. The authors focus on the recent digital technologies for student assessment and feedback and recommend empirical investigation on the functionalities and pedagogical designs.

Chapter 11
Technological, Pedagogical and Subject Content Knowledge (TPACK) Profile of Final Year Pre-Service Teachers at Paro College of Education, Royal University of Bhutan

The chapter presents a survey conducted to explore and understand the personal and professional needs related to technological, pedagogical, and subject content knowledge (TPACK) of the final year pre-service teachers (N= 223) who had just completed their four-year bachelor and two-year diploma programme. The findings showed that all the respondents (100%) use the Internet every day (87% more than once a day and a pretty significant number using more than three hours a day 72.6%). Social networking, searching information for an assignment, instant messaging topped the reasons for using the Internet. However, integrating Information and Communication Technology (ICT) into the curriculum, lack of pedagogical knowledge on using ICT in teaching and learning, and

Internet connectivity being too slow and expensive were identified as significant problems. Findings also indicated an overwhelming need for professional development on blended learning and other ICT related skills. This paper also presents insights into the seven-factor TPACK model and its implications.

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Blended Learning at Universities of Bangladesh: Initiatives and Challenges during COVID-19 Lockdown

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This empirical qualitative study explores the blended learning implementation decision process perceived by the different stakeholders of the selected universities in Bangladesh amidst the COVID-19 lockdown. The research question addressed in this study is: According to the stakeholders, what are the perceived decision-making and action-taking factors regarding the adoption of blended learning in the universities of Bangladesh? Applying phenomenographic research methodology, 10 academics and management roles affiliated with one international university, three public universities, and two private universities are interviewed and the transcribed texts are analyzed. The identified factors are categorized into 1) institution type and governing system, 2) flexibility to circumvent the barriers: participation and power, 3) location of the university and diversity of the students' profiles, 4) financial need of students and strategy to address the need, 5) technological knowledge and institutional technological resources, and 6) adoption of teaching and assessment methods.

Keywords: blended learning, digital learning technology, e-learning, higher education, university, COVID-19 lockdown, social distancing

1. Introduction

The lockdown due to the COVID-19 pandemic has resulted in an immediate increase of interest in online learning, blended learning, distance learning, e-learning, and learning technologies (see Figure 1). Bangladesh has an estimated population of 162.7 million on July 1, 2017 (Bangladesh Bureau of Statistics, 2017) and according to Google trends, it is the third-top country in the world to have searched the term "blended learning" during the past 12 months from May 31, 2020. Closing down of educational institutions in Bangladesh from 18 March 2020 left online media as the only means of continuing teaching-learning activities.

To investigate the role and effectiveness of online education in higher education and to develop a digital learning policy, the university grants commission of Bangladesh invited faculty members of the universities in Bangladesh to participate in a survey. Before the survey on the higher education of Bangladesh, there was no baseline study on the access to digital and online learning devices, Internet connection, access to learning resources and online communication and teaching-learning practice among the teachers and students. The barriers faced by the members of the higher educational systems, that is, students, teachers, administrative staff, management, governing body, the university grants commission, the education ministry, and other external entities providing and accessing services through the higher educational institutions was an uncharted domain. Regarding the digital technology-mediated learning in the higher educational institutions of Bangladesh, sporadic and small-scale studies were conducted: regarding learners' preparedness (Rahman & Yeasmin, 2013) and readiness and challenges in six public universities and colleges under national university (Hossain et al., 2016). A baseline study followed by a strategic development initiative is possible only with a large project and strong support from the members of the higher educational institutions.

None of the existing literature reported on what blended or digital learning technology decisions were made by the university administration of Bangladesh and how the members of the higher education systems perceive the decision-making process. Therefore, given the above scope and limitations, this empirical qualitative study explores the blended learning implementation decision process perceived by the different stakeholders of the selected universities in Bangladesh amidst the COVID-19 lockdown.

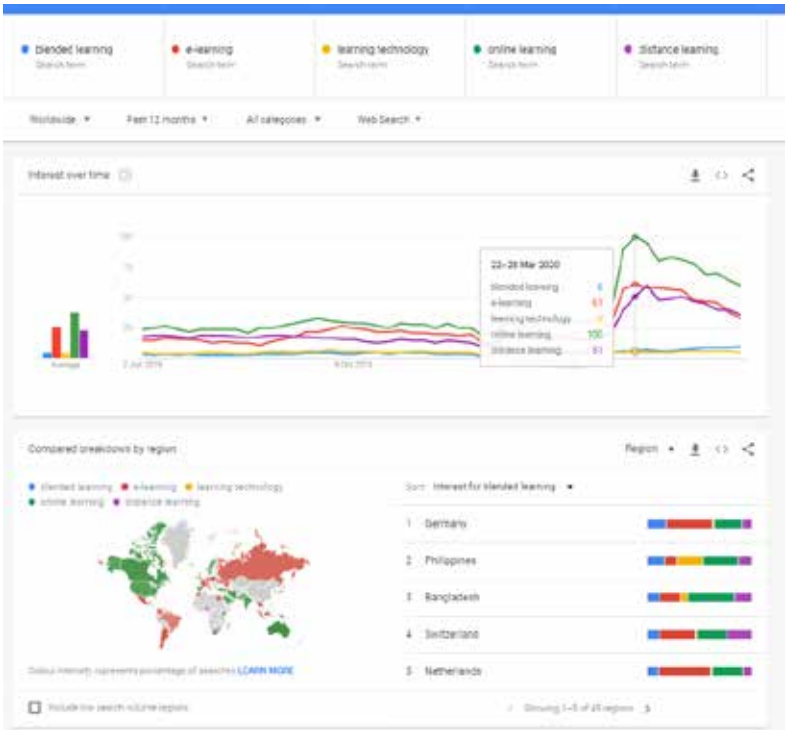

Figure 1. Google trends of blended learning and other similar terms for one year (ending 31 May 2020)

The research question addressed in this study is: *According to the stakeholders, what are the perceived decision-making and action-taking factors regarding the adoption of blended learning in the universities of Bangladesh?*

The research question is addressed based on the analysis of interviews conducted with five types of stakeholders from the university grants commission, two public universities and two private universities of Bangladesh.

2. Definition of Terms and Concepts

Bonk and Graham (2012, p. 5) defined that "Blended learning systems combine face-to-face instruction with computer-mediated instruction". So, this study perceives blended learning as the integration and adoption of information and communication technologies (ICT), particularly digital technologies like computers, mobile, wearables, virtual and augmented reality systems and various software applications in the learning process. Blended learning is defined commonly in three ways: 1. combination of instructional modalities or delivery media focusing access and convenience (i.e. *enabling blends*), 2. a combination of instructional methods or pedagogy by supplementing materials with traditional face-to-face teaching (*i.e. enhancing blends*), and 3. blends "that enable intellectual activity that was not practically possible without the technology" (*i.e. transforming blends*) (Bonk & Graham, 2012, p. 13). Graham, Allen, and Ure (2003, 2005) identified that people chose blended learning for three reasons: (1) improved pedagogy, (2) increased access and flexibility, and (3) increased cost-effectiveness. Bonk and Graham (2012, p. 12) summarized the issues relevant to designing blended learning systems into six categories: "(1) the role of live interaction, (2) the role of learner choice and self-regulation, (3) models for support and training, (4) finding a balance between innovation and production, (5) cultural adaptation, and (6) dealing with the digital divide".

The gradual convergence of traditional face-to-face learning environments and the computer-mediated distributed learning environments are resulting in the development of blended learning systems (Bonk & Graham, 2012, Chapter 1). Figure 2 shows the convergence between face-to-face and computer-mediated learning progresses across four dimensions (Bonk & Graham, 2012, Chapter 1): (1) space (live *physical* — mixed — virtual *distributed,* (2) time (live synchronous — asynchronous), (3) fidelity (*high* e.g. rich in all senses, *medium* e.g. audio-only, and *low* e.g. text only), and (4) humanness (*high human* with no machine and *no human* with a machine).

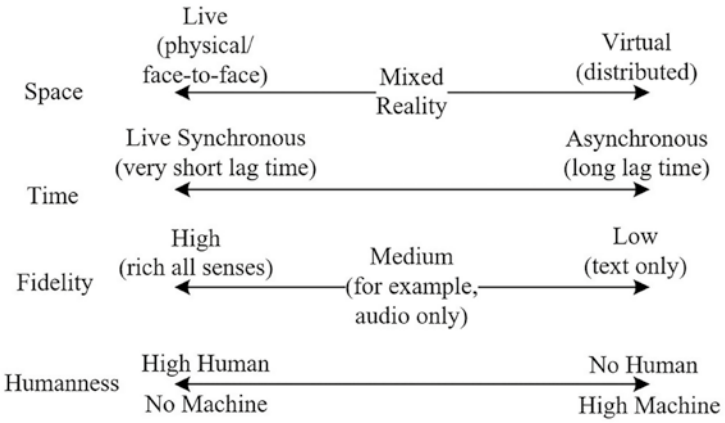

Figure 2. Four dimensions of interactions in face-to-face and distributed learning environments ((Bonk & Graham, 2012, p. 7)

Digitalization of higher education and personal learning contexts are facing various difficulties. Ample research investigated and mapped these difficulties by using the terms *barriers*, *challenges, hurdles, preparedness*, *digital divide, digital exclusion, etc.* Khalid and Pedersen (2016, p. 614) reviewed the factors underlying the concepts of "digital exclusion" and the "digital divide" in higher education and classified them into three categories: "social exclusion (i.e., low income, ICT-avoidance as the norm, lack of motivation and commitment, and physical or mental disability), digital exclusion (i.e., lack of hardware devices and Internet services) and accessibility (which include the division between rural and urban areas, as well as disparities in ICT literacy and information literacy)". The study summarizes that the factors are overlapping across the multiple levels of education and de-emphasizes the potential individual blame bias. It further concludes that the studies on the digital divide, digital exclusion, and barriers to ICT adoption in higher education deal with similar factors, which people experience differently in different contexts.

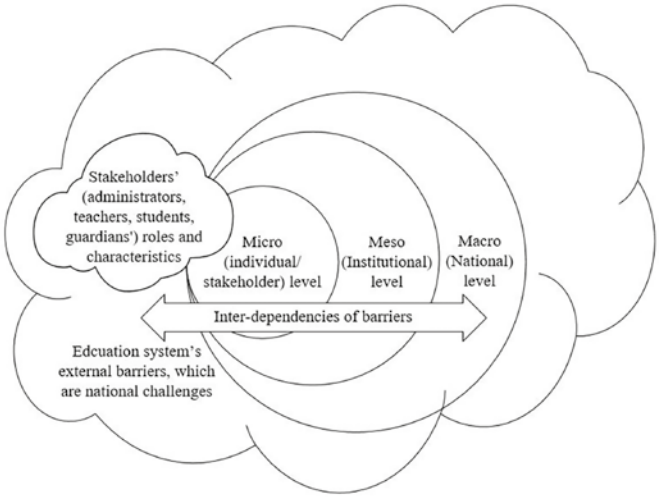

Figure 3. A framework of barriers in educational technology integration and adoption (Khalid & Nyvang, 2013, p. 123)

From a systems perspective, Khalid and Nyvang (2013) developed a framework of barriers in educational technology integration and adoption (see Figure 3). The framework provides stakeholder and ecological perspectives for understanding the complex inter-dependent barriers to blended learning.

Khalid and Buus (2014) conducted a systematic literature review and mapped the barriers to adopting educational technology by applying the macro-meso-micro and external factors as the framework established by Khalid and Nyvang (2013). Some of the other existing categorizations of barriers they identified are (1) Teacher level, school level and system level, (2) Extrinsic or first-order and intrinsic or second-order (3) Material and non-material barriers, (4) Teacher-level barriers (confidence, competence,

and resistance to change & negative attitude) and school-level barriers (time, training, accessibility, technical support), (5) Resources, knowledge and skills, institution, attitudes and beliefs, assessment, and subject culture, and (6) Direct and Indirect.

Although the review papers extensively and sufficiently report the barriers to blended learning, it is important to understand how the inter-dependencies of the factors are experienced in the context of this research so that the policy and practice can be informed. This study investigates if and how some of the recent strategies addressed or circumvented some of the barriers and if some of the barriers restrict some of the blended learning initiatives.

3. Context of Research

The people's republic of Bangladesh is a South Asian country with an estimated population of the country stood at 162.7 million on 1 July 2017, by applying Sample Vital Registration System (SVRS) for an inter-censual period (Bangladesh Bureau of Statistics, 2017). The Bangladesh University Grants Commission (UGC) is the highest autonomous institution of higher education, established on 16 December 1972, later legalized in 1973 by Presidential Order No. 10. UGC provides necessary allocation for public universities, assists in the development of the higher education system in Bangladesh to improve the quality of teaching and learning system, encourages the most innovative research and development, and promotes issues related to good governance in universities. UGC also formulates higher education policy and quality assurance policy to reach international standards and advises the government accordingly. According to the list of universities published by UGC, there are 46 public universities, 105 private universities, and 3 international universities in Bangladesh (Bangladesh University Grants Commission, 2020). Due to a high number of applicants for each place or seat at public universities, the law titled 'Private University Act of Bangladesh' was passed in the Bangladesh National Parliament in 1992 (Islam, 2011). There are approximately one million students enrolled in the various study programs in the higher educational institutions of Bangladesh.

4. Methods

4.1 Method for Data Collection

This research is designed as a multiple-case study (i.e. each university as a case) with embedded units (i.e. respondents) in each (Stake, 1995) and situated in the universities of Bangladesh. During the COVID-19 lockdown in Bangladesh during 2020, the experience of the teachers, students, and administrative roles of the universities regarding the use of digital learning and communication technologies are inquired during 30-min interviews (See Table 1). The universities selected for this study are based on the location (i.e. located in the capital Dhaka and outside), type (i.e. public and private), and convenience of reaching out to relevant interviewees. Zoom is used for conducting and recording the interviews.

The authors invited 20 individuals affiliated with the University Grants Commission of Bangladesh, three public universities and three private universities to attend the interviews. Nine interviews were conducted and one of the respondents sent the response over email. Table 1 shows a summary of the institutions and interviewees. The respondents hold the roles of Assistant/Associate/Professor, head of the department, dean, registrar, and pro-vice-chancellor.

Table 1. Affiliation of Interview Participants

Name of the University	Type	Location	Year Estd.	Interviewee (Code)
Dhaka University (DU)	Public	Dhaka	1921	1DU, 2DU
Begum Rokeya University (BRU)	Public	Rangpur	2008	3BRU
Independent University, Bangladesh (IUB)	Private	Dhaka	1993	4IUB
Feni University (FU)	Private	Feni	2012	5FU
Open University (OU)	Public	Dhaka	1992	6OU, 7OU, 8OU, 9OU
Asian University for Women	International	Chattagram	2008	10AUW

Table 1 shows the participants interviewed from three public (govt. funded) universities, two private universities (self-funded) and one international university for understanding the integration and adoption of blended learning. Among the public universities, Dhaka University is the oldest and Begum Rokeya University is one of the youngest and was founded in 2008 (12 years). Similarly, private universities are selected considering age and location. While the oldest universities are located in the urban area, the newest universities selected for this study are located in relatively rural areas. For each of the institutions, policy-level persons are identified for the interviews along with teachers and students selected according to convenience.

Interview questions
1. What is the decision given by the university administration to tackle the restrictions of face-to-face teaching caused by the COVID-19 pandemic?
2. How did the university administration come to make the decision(s) regarding the integration of digital learning technologies as an alternative to teaching and assessment activities?
3. The COVID-19 appears to be staying for longer than expected. What decisions and actions have the university administration taken to gradually re-open?
4. The COVID-19 appears to be staying for longer than expected. How is the university administration preparing for potential alternative ways of doing teaching, exam and other administrative activities?

For establishing internal validity, a strong effort was given to reach multiple respondents from each of the universities but the rate of response was 50%.

4.2 Method for Data Analysis

This research is positioned within the category of "discursive phenomenography" (Hasselgren & Beach, 1997), which includes the steps: conversation, transcription, compilation, analysis, and conceptions. The transcribed text is analyzed by application of the phenomenographic methodology (Larsson & Holmström, 2007; Marton, 1981) as follows.

1. Read the whole text.
2. Read again and mark where the interviewee gave answers to the main interview questions.
3. In these passages, look for what the focus of the interviewee's attention is and how she/he describes her/his way of deciding or doing. Make a preliminary description of each respondent's predominant way of experiencing the phenomenon.
4. Group the descriptions into categories based on similarities and differences. Formulate categories of description.

5. Look for non-dominant ways of understanding.
6. Find a structure in the outcome space.
7. Assign a metaphor to each category of description.

Interview transcription is practised in different ways, among which this study uses denaturalism, "in which grammar is corrected, interview noise (e.g., stutters, pauses, etc.) is removed and non-standard accents (i.e., non-majority) are standardized" (Oliver et al., 2005, p. 1273). In this way, the transcription process involved two phases. First, one of the authors transcribed and translated the interviews from Bengali to English, if required. Secondly, both authors carefully selected text from the transcriptions. The authors shared the role of conducting the interviews, translation, transcription and methodological analysis.

5. Data Analysis and Results

In this section, we attempt to find the answers to the question: According to the stakeholders, what are the perceived decision-making and action-taking factors regarding the adoption of blended learning in the universities of Bangladesh?

Firstly, we will try to find out from the interviews, what problems, challenges and obstacles they are facing if they start blended learning and e-learning. At the same time, what steps have they taken to overcome those challenges? Secondly, the study will try to put light on what are the infrastructural barriers of e-learning access between new and old universities. Finally, this study put light on what kind of initiative can be taken by the University Grants Commission of Bangladesh to improve blended learning in the Higher education of Bangladesh.

The six themes summarizing the categories of factors influencing decisions to adopt digital learning technologies in implementing distance or blended learning amidst lockdown of physical facilities during the COVID-19 pandemic. The themes are: 1) institution type and governing system, 2) role of power and participation, 3) location of the university and student profiles, 4) need for financial support and strategy, 5) technological knowledge, and 6) adoption of teaching and assessment methods.

5.1 Institution Type and Governing System

There are three types of universities in Bangladesh: Public, Private and International. Most of the interviewees began by stating how the type of institution and the governing system result in the way university's teachers and students were involved in the decision-making and action-taking processes. To achieve the desired level of understanding regarding the governing system, online sources are studied to supplement the information collected from the interviews.

In Bangladesh, four public universities are autonomous and they are governed by the 1973 Ordinance. The rest of the public universities are governed by their acts. On the other hand, the Private Universities Act 2010 governs private universities. The government funds each public university. However, this fund comes through the University Grants Commission (UGC). All public universities have Chancellors and he appoints Vice-Chancellor, Pro-Vice-Chancellor.
Private universities first started in Bangladesh in 1992. At that time, it started operating through a special act; in 1998, the act was updated. However, the Private University Act 2010 was passed to improve the quality of education and facilities for students. In their case also, the Vice-Chancellor, Pro-Vice-Chancellor, Treasurer is appointed by the Chancellor.

The University Grant Commission monitors the quality and facilities of all private universities. At the same time, if they want to change any course or curriculum, private universities need approval from the University Grant Commission. The private universities somewhat depend on the UGC to make any decision. For example, On March 8, the first Covid-19 patient was identified in Bangladesh. Then on March 17, the government announced the closure of all educational institutions [1]. At the same time, a general holiday was declared across the country from March 26[2]. At that time, about all the universities had a semester running. Many did not expect that the educational activities to be closed for a long time. In a few weeks, the universities started discussing alternative ways to continue educational activities. Especially, private universities are seen to be ahead but they also had to go through some discussions with the University Regulatory Authority- University Grant Commission (UGC). Students' tuition fees are

fundamental to the continued operation of private universities and private universities have higher accountability to students and their sponsors. For example, UGC initially decided that online educational activities could be conducted. Later, in a subsequent notification, UGC stated that online education activities can be conducted but examinations should not be held. Later, by the initiative of the Ministry of Education, it was decided that both online classes and examinations could be conducted. It took more than three months for reaching the macro-level decision that digital technology blended classes and examinations can be conducted by allowing a high level of autonomy to the institutions, study programs, and the teachers to take actions according to the conditions at stake.

> 4IUB: IUB as a private university follows the guidance and instructions of UGC. Instead of just asking what is possible for IUB, it was important to see that what kind of guidelines did IUB get from the UGC. For example, IUB was ready to go online in March to continue the teaching activities but the UGC was not sure what to do. Initially, UGC declared that no online teaching can be done. Later, they decided that online teaching can be done but examinations cannot be conducted online. Eventually, they told us that we can also conduct online examinations.

International universities work closely with the UGC but they have the autonomy like an UN-affiliated organization. These universities have considerable freedom in taking their own decisions. "10AUW: Asian University for Women has a special constitution and gives it sufficient autonomy. It gets the rights like an agency of the UN and has freedom for curriculum as well."

The open university of Bangladesh is a special case as they are the only university in Bangladesh with a long history of distance and multi-channel learning activities. BOU has activities all over the country. Open University plays a role not only in higher education but also in non-formal education in the secondary and higher secondary examination.

5.2 Flexibility to Circumvent the Barriers: Participation and Power

The interviewees informed that the universities conducted surveys to understand the barriers and resources the teachers and students have for continuing teaching activities online. The only exception was the respondent from Begum Rokeya University, Rangpur, who did not mention conducting any survey. The surveys showed significant diversity of barriers in about all the universities. So, the universities, irrespective of type, gave flexibility to the departments and individual teachers to choose appropriate digital means of communication for sharing the learning content, providing feedback, conducting exams or submitting assignments and postponing deadlines for activities. The private universities are prompt and ahead in taking decisions including the process of involving the participants. Based on the interviews, we cannot provide evidence on whether the dependency and accountability associated with students' tuition fees in the private universities or the difference in the culture of participation or power played a strong role.

The University of Dhaka began by surveying to understand whether the teachers and students have the resources and the intention to continue education through online means. Despite the barriers of low bandwidth, weak mobile network signal, access to a personal computer, absence of a learning management system, and lack of required technology knowledge, online teaching was initiated. In July 2020, DU began online classes by allowing flexibility to teachers and students to support each other in solving and circumventing the barriers to online teaching-learning activities.

> 1DU: Faculties checked two things, are they capable of conducting classes online and are the students ready? A survey was conducted by the initiative of VC and Pro VC's Office in June to understand the advantages and disadvantages of conducting the classes online. The authorities did not force it on the teachers as well as students. Teachers took feedback from students and university authorities surveyed teachers regarding the online class.

Bangladesh Open University has a long history of conducting some of the largest distance learning programs in the country. However, the sheer diversity of the programs, population of students and teachers, and the number of offices required to be coordinated for continuing online education for all took time despite giving the flexibility. BOU has 12 regional offices, 80 sub-regional offices, and 1800 study centres across the country. For many of the programs, the video content and e-content, in general, was already

created because they have been doing distance learning. The procedure to get approval to conduct the classes online was to get a decision from the Academic Council, the Board of Governors. Contrary to other universities, the exception in the case of BOU is that the teachers take the initiative and send proposals to the Academic Council for online classes. It has a bottom-up approach and not a top-down approach.

> 9OU: The proposal of BOU faculty members to go completely online for teaching was taken to the Academic Council in May and was approved. There are 10 government nominees in the Academic Council. They are professors from different universities and faculties of Open University as per law.

Feni University authorities met with all the teachers in the last week of March and decided to continue online classes. The private university with comparatively less student population investigated students' preparedness and allowed flexibility to the teachers. The Asian University for Women (AUW) made the fastest decision with a relatively lower student population of about 900. In just 36 hours, they shifted their classes online. AUW has greater autonomy than public and private universities as it is an international university supported by donors.

5.3 Location of the University and Diversity of Students' Profiles

The location of the university, associated mobile and Internet infrastructure and the students' socio-economic condition associated with access to high-speed Internet-connected devices are the fundamental factors reemphasized during the university-wide online teaching adoption in Bangladesh. Offering near-equal opportunities to all institutions and affiliated members is extremely difficult. For example, students of public universities come to study from all over the country. There are major economic, social, and cultural differences among the students in the public universities and within the same study program. They are from all socioeconomic classes, namely upper, middle, lower-middle, lower, and poor. Without any support from the state, it is very difficult to ensure that every individual has access to a smartphone and Internet connectivity for gaining access to the content and communicate through online channels. The scenario is the same in the case of both public and private universities, especially those located outside the capital city of Dhaka. For example, some of the students of Feni University have expressed inability to attend classes as it has become very difficult for them to buy required devices and Internet data packages. Furthermore, many parents have a hard time accepting online as a formal means of educational communication as is considered distracting. Resistance to online teaching as an undesired means of communication is prevalent in the capital and other major cities. "5FU: Feni University is located in a semi-urban area, where many families are conservative and socially, many of them do not accept online classes. This is a big problem too."

Asian University for Women has a significant number of students who are refugees, which is a different type of profile. Most of the students at AUW are studying on full scholarships.

Regional conditions also constitute the profile of students that has a relationship with blended learning adoption. For example, there was a flood in Bangladesh from July 2020. Students in many districts are unable to attend classes due to various challenges caused by flood and some of the students attended online classes while staying on a boat. Electricity supply is interrupted in the flood-affected areas and has constrained the scope of using digital devices. Some of the students have gone to a market far away from their home to getting access to a computer, internet, and electricity for joining the classes online or getting access to online content.

> 2DU: Even during the flood, many students took part in classes sitting on a boat. We recorded that about 70% of the students could join the class. The underlying causes can be due to the lack of electricity or Internet connection or living in flooded areas, among others. Our survey shows that about 80% of DU students live outside the cities.

Many students of Feni University live outside the city and experience problems with internet connection. The university also planned to provide broadband connections to the students. There are only two Internet service providers in Feni and they can't cover the whole of Feni.

> 5FU: Feni University also plans to provide free data or arrange broadband connections for needy students. The main problem is there are only two internet providers in Feni. They can't give coverage to remote areas.

Begum Rokeya University could not come to any conclusion regarding online classes while the research interview was conducted in mid-July.

> 3BRU: Begum Rokeya University, Rangpur is located in the northern part of Bangladesh. The socio-economic condition of this region is relatively bad. It is one of the most economically disadvantaged regions of the country, which has a bad effect on the students of this university. The region's economy collapsed during the COVID-19 pandemic. As a newly established university, this institution also has various limitations. This university is still young in terms of age. It is established in 2009. The university is closed from March 2020. Almost all the students are staying at home instead of the university campus. Educational activities are completely stopped. Class, examination, nothing is going on. I do not know if my university administration has yet taken any decision to normalize the educational process or to address the limitations now. There have been only a few meetings to overcome the situation. No decision has been taken in that meeting as far as I know.

5.4 Financial Support and Strategy

Some of the universities have offered financial support to students to survive during the total lock-down of institutions and restrictions on mobility. Many of the students are not solvent enough to buy a smartphone or computer and internet data package. So, Dhaka University, Feni University, BRAC University, Asian University for Women and Open University has provided various forms of support and taken strategic initiatives.

The teachers of Dhaka University have raised and disseminated funds for supporting students in need. Through class representatives, surveys were conducted to identify the need for support and at the department level supports were coordinated. These initiatives were done by the members of the faculty and staff – does not include state or other kinds of funding or initiative.

Asian University for Women communicated with about all the 900 students to find out what kind of support they need. Although 75% of the students get full scholarships and the students live at the university-managed accommodation, the university offered financial support to purchase a smartphone, computer and subscribe to the Internet. Some of the foreign students are given financial support for returning to their home countries after the announcement of the closure of the university.

> 10AUW: Within the first week, every student was reached through individual and group interviews to understand their needs. Some students from Cambodia were provided financial support for returning to their home country as the duration of the lock-down is unknown.

Among private universities, BRAC University allocated separate funds to support students and decided to reduce tuition fees by 10%. The Open University also allocated separate funds in the new annual budget for providing support to students. Feni University is discussing the potential allocation of budget for supporting the purchase of Internet data packages but considering whether the use of data packages for educational purposes can be ascertained.

> 9OU: Many students have complained that they are unable to attend classes due to the lack of Internet connectivity and access to an Internet-accessible device. To address these issues, the university has allocated funds in its new budget for providing support to the students.

5.5 Technological Knowledge and Institutional Technological Resources

The respondents expressed that the Covid-19 pandemic created the conditions for adopting digital learning technologies in higher education institutions. Bangladesh is lagging in terms of online education; everyone is now trying to enrich himself or herself technologically. For example, Open University has taken the initiative to establish itself as the first digital university in Bangladesh. As per law, only Open University

had the approval to carry on distance learning. According to the recently obtained data obtained, the student attendance rate has increased from 30-40% to 70-80%.

> 2DU: The University Grants Commission hosts the Bangladesh Research and Education Network (BDREN), which offers the national Zoom access for educational institutions. Universities will be able to use all the services if the teachers send requests from their institutional email. Dhaka University administration also suggested the teachers to use Zoom.

Open University has recently launched IP TV and it is running test broadcasting now. From August 2020, OU students are expected to take the required classes from any device through IP TV.

> 9OU: IP TV was set up in Gazipur in July so that around 1,200 lectures could be watched by students from any device. It is still being piloted and expected to be fully open from August 2020. The government's Access to Information (a2i) initiative has also developed a virtual class. Virtual classes of about 150 teachers have been shown to date as part of the test transmission. The advantage here is that both classes and exams can be conducted in this environment. One of the problems with the IP TV is that its infrastructure can support fewer students than we currently need to reach. Work is underway on how to reach all students via IP TV or web TV.

About all the universities that are continuing their educational activities are using Zoom or Google Classroom. BRAC University created an online platform 'BUX' as their learning management system. Independent University, Bangladesh has customized Google Classroom in collaboration with Google India. They even started mock spring semester classes before the start of the summer semester. The trial round gave both the teachers and the students an idea of how to do the online classes, and what the process is.

> 4IUB: IUB was preparing for teaching via online platforms like Zoom and Google classroom. However, IUB institutionally stepped away from Zoom because at times there are some concerns about the Zoom platform as it may compromise network security. So, IUB decided to use Google classroom. It was a collective decision. IUB also considered Moodle LMS. Google India helped us to optimize the IUB network. Right now, 61 classes are using Google Classroom simultaneously and at least 700 students are attending the classes simultaneously.

5.6 Adoption of Teaching and Assessment Methods

Adopting digital technologies in teaching activities like online classes and conducting an assessment (for example, online oral exam) involve various types of technologies and teaching methods. Universities had little or no experience in conducting online teaching before the COVID-19 lockdown. According to the interview responses, for most universities, the decision of conducting online classes or disseminating learning resources online is much easier than the process for examination. Online classes require internet connectivity, digital devices, uninterrupted power connections — access to learning resources can be achieved through some alternative means. On the contrary, exams are typically time-bound, requires certain rules for the use of the communication channels, and certain formats are pre-requisite. Given the fundamental barriers to access, a significant number of students may feel deprived of achieving desired performance and even attending the exams in the worst case. So, public universities in particular have not yet made any decision about the exams.
Private universities are more conscious and serious about setting up technological infrastructure to run online classes and exams. Because, if private universities are not able to switch to online classes, students are unlikely to show interest to register for courses and pay tuition fees. Moreover, private universities have a significant proportion of financially solvent students.

The Independent University, Bangladesh and Feni University have strong similarities in examination methods in the blended form. They have conducted online oral exams and advised the teachers to be creative in designing examination methods considering the circumstances of the students and other factors. Feni University already developed guidelines for conducting exams and IUB administration planned to announce guidelines.

> 4IUB: University asked faculties to use their creativity to take the exams and then faculties exchange their experiences with each other. Later, faculties will decide what they will do. Therefore, the assessment procedure is right now is an open platform. Before the midterm exam, IUB will give the central guidelines for the online exam.
>
> *5FU: The UGC gave guidelines for conducting assessment formats they will approve. The university decided that the final examination will be held according to the guidelines. In June, oral exams were conducted by Feni University according to some defined assessment policies.*

Since DU have a large number of students living in the residential halls, the task will not be easy for Dhaka University. So, Dhaka University focused on teaching and some of the departments have taken the tests in different ways. DU faculty members are waiting for the new exam date to be announced at the end of September, in anticipation of better condition.

> 2DU: Some departments of DU initiated on their own to take online exams. Access to Information (A2i) of the Bangladesh Government made a platform named 'Muktapath'. Using this platform Institute of Business Administration (IBA) of Dhaka University has taken the exams. The Institute of Education and Research is conducting tests using Moodle software. The Department of Computer Science and Engineering and the Department of Electrical and Electronic Engineering are also using Moodle for conducting online exams. The main concern is that now we are not thinking of taking the exams. Now, the main goal is to reach the students with the curriculum.

6. Conclusion

Based on the online interviews with senior academics and administrative roles of six universities of Bangladesh, this chapter reports the perceived decision-making and action-taking factors regarding the adoption of blended learning in the universities of Bangladesh. The factors identified are categorized into

1) institution type and governing system,
2) flexibility to circumvent the barriers: participation and power,
3) location of the university and diversity of the students' profiles
4) financial need of students and strategy to address the need
5) technological knowledge and institutional technological resources
6) adoption of teaching and assessment methods

At the macro-level, the universities are responsible for maintaining consistency and standard in close collaboration with the university grants commission (UGC) of Bangladesh, which is responsible for public, private and international universities that operate with different types of funding mechanisms. The decisions and initiatives by the UGC, regarding approval for teaching and conducting online, and support provided for Zoom access to universities have influenced the integration and adoption of digital technologies for teaching online.

At the meso-level, the university administrations have given flexibilities to the teachers – adopt suitable technologies, convenient channels and formats for giving access to the teaching resources. The teachers were given the flexibility to address the situation in participation with others and with access the all the resources in their power.

The external factors, the location of the university and students' socio-economic profiles, play a significant role in the successful adoption of digitally blended learning. The universities and students located outside the major cities in the country are disadvantaged due to insufficient infrastructure for electricity, internet, social attitude towards Internet as educational media, and the average income level. Every year, parts of the country become submerged and the access to electricity, internet, and restrictions of commuter services are also barriers to blended learning in Bangladesh.

The financial needs of students, especially for a significant proportion of students in the public universities and some of the international universities, is a major external barrier. The students without the affordability

to purchase a smartphone, computer and Internet subscription need social support and the faculty members and student communities of some of the universities have offered support.

Technological knowledge at the micro/individual level and technological resources including infrastructure at the meso- or university level are both required for a successful digital blend. While some of the universities are developing infrastructure, the need for continuous support for both teachers and students are prerequisites to quality education.

Adopting ad-hoc methods for conducting teaching and assessment by giving flexibility to the teachers is an indication of a strong ability to tackle the difficult situation. To maintain quality education, further research should investigate the teaching and assessment methods that are considered good experiences. The subject culture often governs how professional identity should be established and it is important to conduct further research in the complex and diverse conditions of students in Bangladeshi universities.

The qualitative insights from ten interviews representing six universities out of more than 150 universities in Bangladesh provide a partial understanding and narrative of the phenomena. Insufficient response and lack of participants from each of the universities restricted the scope of intra-university validation. Therefore, in future studies, an extensive qualitative study might be conducted for the inclusion of more universities and participants from each of the universities. The factors identified in this study paves the foundation for developing questionnaires for conducting quantitative studies identifying the decision-making and action-taking factors regarding the adoption of blended learning in the universities of Bangladesh.

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Blended Learning Models for Teacher Education and Training Programs of Bangladesh Open University

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This chapter presents three blended learning (BL) models for Bangladesh Open University (BOU) teacher education and training programs (TETPs). The models, which are intended for the university's Master of Education (M.Ed), Bachelor of Education (B.Ed) and short-term teacher training programs, are proposed based on interview data and a study of secondary resources, particularly, case studies referenced from Ukraine and Vietnam. Strategic approaches to overcome weaknesses and to manage threats based on a SWOT analysis are suggested to ensure the feasibility of the models.

Keywords: Teacher education, Ukraine, Vietnam, wot analysis, Bangladesh Open University

1. Introduction

Teacher education and training both involve procedures that aim to accelerate teachers' professional skills and development (Jovanović & Filipović, 2013; Pradhan, 2016; Tapilouw, Firman, Redjeki, & Chandra, 2017) towards teaching excellence (Ulla & Winitkun, 2018). Both can be done through in-service training (Shanmugavelu, 2017) and pre-service training (Pillay, Muttaqi, Pant & Herath, 2017), offered by established teacher training institutes and unique departments (Ulla, 2018).

With the advent of technology and ICT, the integration of both in TETPs curriculum is a precondition to successful programs (Tondeur, Van, Sang, Voogt, Fisser & Ottenbreit-Leftwich, 2012). One of the ways in which technology integration can occur in TETPs is via BL, an instructional approach which integrates online educational technologies with face-to-face (F2F) mode (Graham, 2013; Syamsuddin & Jimi, 2019; Moore, Robinson, Sheffield & Phillips, 2017). The effectiveness of BL has led to its comprehensive and expansive use as an instructional strategy for adult education (Cocquyt, Zhu, Diep, De Greef & Vanwing, 2019), nursing education (Li, He, Yuan, Chen & Sun, 2019), in higher education (Medina, 2018; Porter, Graham, Spring & Welch, 2014) and in teacher education (Atmacasoy & Aksu, 2018; Keengwe & Kang, 2013; Halverson, Graham, Spring, Drysdale & Henrie, 2014).

In recognizing the role of ICT in the development of the country, Bangladesh formulated its National ICT Policy and National Educational Policy in 2009 and 2010 respectively. In addition, a program "Access to Information" (a2i) was established with the purpose of ICT training for teachers (Hasan, Khan & Clement, 2015). However, instructional approaches of TETPs in Bangladesh are mostly in the F2F mode (Akhter & Alam, 2016; Parvin, 2017; Pillay et al., 2017). Studies have shown that opportunities abound for the integration and implementation of BL in TETPs (Atmacasoy & Aksu, 2018; Keengwe & Kang, 2013; Kim, Baylen, Leh & Lin, 2015; Hasan et al., 2015; Khan, 2014; Mahruf, Shohel & Banks, 2012). To that end, it is imperative that models are explored in terms of their feasibility, which will eventually serve as blueprint for BOU, in particular for its B.Ed, M.Ed and short-term teacher training programs.

2. Background

BL is an educational innovation that removes drawbacks of both the conventional F2F and fully online mode (Kang & Seomun, 2018), acting as a substitute mode of learning (Syamsuddin & Jimi, 2019). A quick search on Google Scholar shows that the term BL is used for the first time in the year 2000. Early documented studies on BL include that of Garrison and Kanuka (2004) who explored the prospects, challenges and benefits of BL in higher education, forecasting that BL will the focal catalyst of higher education transformation due to its learner-

centred learning facilities. In 2006, Graham published a book containing details about BL. Since then, a remarkable number of studies and literature have emerged on BL. For example, there are 15800 scholarly works with the keyword "BL" in its title between the years 2000 to 2019.

BL is conceptualized in various ways; as an instructional mode in educational programs that cautiously integrates F2F learning and e-learning (Atmacasoy & Aksu, 2018; Keengwe & Kang, 2013), as hybrid learning (Abrami, 2014; Bernard, Borokhovski, Schmid, Tamim & Abrami, 2014; Moskal, Dziuban & Hartman, 2013), and an "amalgamation of traditional learning with web-based on-line approaches" (Oliver and Trigwell, 2005, p.17). In the latter, 'traditional learning' refers to F2F classroom teaching-learning and 'web-based on-line approaches' as the application of educational technologies such as Interactive Virtual Classroom Room (IVCR), blackboard and modules run synchronously and asynchronously (Sharma, 2010).

BL however, is not simply integrating educational technologies into a course (Moskal et al., 2013) but rather a methodical combination of contexts, media, learning resources, pedagogical approaches and learning outcomes (Keengwe & Kang, 2013; Oliver & Trigwell, 2005). In sum, BL is thoroughly-planned instructional blueprint that combines online learning, F2F learning, instructional methods and media in a unified way, considering the contexts as well as learners' access to synchronous and asynchronous learning facilities. This definition echoes that of several researchers (Keengwe & Kang, 2013; Moore et al., 2017).

2.1 Benefits and challenges of BL

Numerous studies have reported on the advantages of BL in contemporary education. For example, Medina (2018) suggests that BL increases learners' engagement as it allows them the freedom to assemble resources from online and offline sources, and the opportunity for collaborative and self-paced learning. Moore et al. (2017) argue that BL enables learners to learn independently which enhance the rate of achieving learning outcomes compared to F2F learning (Bernard et al., 2014) and entirely online learning (Atmacasoy & Aksu, 2018; Keengwe & Kang, 2013). Besides, Atmacasoy and Aksu (2018) found that F2F part of a blended course has a positive and constructive impact on learners' social connection while the online part ensures quick feedback, and allows for diverse resources. BL also provides learners with a pleasant, economical and flexible learning experience (Joosten, Barth, Harness & Weber, 2014) due to synchronous and asynchronous learning facilities (Keengwe & Kang, 2013). Different pedagogical approaches in BL such as collaborative learning, community learning and individual learning contribute to learner enthusiasm (Medina, 2018), transforming the teaching-learning process from teacher-centred to student-centred (Syamsuddin & Jimi, 2019).

Due to its overwhelming benefits, BL is currently gaining increased application in different areas of education, such as in pre-service teacher education where BL has been found to be more fruitful compared to traditional and online learning separately (Atmacasoy & Aksu, 2018). Positive impact of BL has also been found in teacher education (Keengwe & Kang, 2013), and nursing education (Li et al., 2019). With regard to skills, teaching listening has benefited from BL (Syamsuddin and Jimi, 2019). Higher education has also benefited from BL (Bernard et al.,2014; Ma'arop & Embi, 2016; Medina, 2018; Porter et al., 2014), as well as engineering education (Alkhatib, 2018), vocational education (Bliuc, Casey, Bachfischer, Goodyear & Ellis, 2012), executive education (Dakduk, Santalla-Banderali & Van Der Woude, 2018) and continuing medical education (Greil, Stralendorff & Mandl, 2011).

This is not to say that BL is without challenges. Due to it being technology-based in nature (Cocquyt et al. 2019), general challenges are ICT-related, such as inadequate internet and ICT infrastructure (Yağcı, Çınarbaş & Hoş, 2016), the provision of uninterrupted technical support to learners, ensuring appropriate online resources and upgrades of latest educational technologies (Medina, 2018). Other issues are capacity-related, such as developing learners' knowledge of online resources, staff and learners' training on the use of online resources for self-learning (Medina, 2018), and learners' deficient ICT resources, skills and motivation (Güler & Şahin, in Atmacasoy & Aksu, 2018). Continuous monitoring of learner engagement and learner assessment have also proven to be a challenge (Medina, 2018). Boelens, Wever & Voet (2017) meanwhile cite four areas of challenges, comprising degree of flexibility, balancing interaction among the learners, and the instructors and learners, supporting learner's learning process and ensuring affective domain in learning.

Successful implementation of BL will require overcoming challenges related to ICT, institutions and learners, addressed through institutional strategic action plan, which has to include implementation timeframe (Medina, 2018).

2.2 BL in TETPs

The dynamic nature of the advancement of digitalization demands that nations possess human resource who have sound technical knowledge, skills and positive attitude towards technology (Guemide, Benachaiba & Bouzar, 2012). To that end, it is now commonplace to find Massive Open Online Courses (MOOCs), e-learning, and flipped learning being adopted as instructional approaches in educational programs (Atmacasoy & Aksu, 2018). These may also include teacher education programs, which are similar to other educational programs in instructional designs and pedagogical approaches (Keengwe and Kang, 2013). Thus, to empower teachers as a change agent and ensuring they possess ICT knowledge and skills, teacher education should adopt BL (Kim et al., 2015).

Several studies have explored the benefits of adopting BL in TETPs. For the program itself, such benefits include resulting in programs that are convenient, flexible and accessible (Kocoglu, Ozek & Kesli, 2011) and having realistic applicability, such that it is now usual practice for conducting teacher education programs using BL (Hunt, 2015). In terms of capacity building, BL helps in the enhancement of teachers' skills in using educational technologies, improved academic performance, development of positive attitude of the technologies (Atmacasoy & Aksu, 2018), and the acquisition of sufficient knowledge and skills on pedagogy and content (Admiraal, Van Vugt, Kranenburg, Koster, Smit, Weijers & Lockhorst, 2017; Atmacasoy & Aksu, 2018). BL also provides opportunities for students and teachers to build their own learning network, and to engage in peer learning, inquiry-based learning, self-learning, and hence developing the learner as a lifelong learner (Hunt, 2015).

However, as with the use of BL in other programs, potential challenges in TETPs include lack of empirical studies which could be referred to, the issue of fine-tuning programs based on contexts, lack of acceptable conceptual framework and standards in a virtual world (Keengwe & Kang, 2013). Similarly, poor internet facility, fear and inaptness of using ICT by the teachers are also challenges reported by Atmacasoy and Aksu (2018).
Few studies have suggested ways in which BL can be implemented, such as customizations of teacher education programs according to teachers' online and F2F learning environment as well as integrating different pedagogical approaches such as collaborative learning, fieldwork and problem-based learning (Keengwe and Kang, 2013). Redesigning teacher education programs based on learners' perspective is also a possibility (Hunt, 2015). Furthermore, to meet the challenges of the lack of acceptable conceptual framework and standards, suggestions for implementation include integrating ICT in the teacher education curriculum (Atmacasoy & Aksu, 2018) and using standard rubric (Moore et al., 2017). These suggestions can contribute as guidelines for implementing BL in TETPs.

2.3 BL in Bangladesh's TETPs

Studies show that BL is utilized in the TETPs in various countries, some of which share contexts similar to Bangladesh, such as Turkey (see Keengwe & Kang, 2013), Egypt (see El-Deghaidy & Nouby, 2008), Algeria (see Guemide et al., 2012) and Ukraine (see Byrka, 2017). To date, none of Bangladesh's 216 institutes and 5 universities that conduct TETPs adopt BL (Bangladesh University Grants Commission of Bangladesh, 2017). Although Bangladesh has already acknowledged the need for using ICT in education and has made ICT courses compulsory for all education levels, its TETPs still run on the F2F mode (Khan, 2014). ICT-related courses in teacher education curricula of Bangladesh (Akhter & Alam, 2016; Parvin, 2017; Pillay et al., 2017) include ICT in Education Paper I, II and III, Fundamental Skills of Computer, Teaching ICT Paper I and II (Bangladesh. Ministry of Education, 2016). However, preparing teachers to be adequately skilled to use ICT in teaching-learning, teacher education should be conducted through BL in addition to the inclusion of the ICT courses (Atmacasoy & Aksu, 2018). In addition, Bangladesh needs to redesign its teacher training programs to cater for the large number of untrained teachers across the country (Hansson et al., 2018) in a relatively shorter time compared to the conventional F2F mode. The use of BL will assist in providing the required training and will benefit the teachers in its extensiveness, cost and time effectiveness, opportunities for peer as well as collaborative learning, making BL an attractive and practical solution.

Latest statistics suggest that Bangladesh is progressing well in terms of ICT infrastructure and resources, and access to the internet. At present 97 percent of the country is covered by mobile network, with mobile subscribers tallying at 151 million (nearly 92% of the total population) and internet users at 87.7 million (nearly 53% of total population). 20 million (nearly 12% of total population) Bangladeshis have access to Smartphones, and 4G technology. In addition, the Government of Bangladesh has provided broadband internet in some rural areas, reduced bandwidth price and average bandwidth speed of 1200 GBPS. Bangladesh has also recently launched its satellite named 'Bangabandhu Satellite-1' (Bangladesh. Bangladesh Telecommunication Regulatory Commission, 2019).

In addition to its commitment to ICT access and infrastructure, the Bangladeshi government has drawn up a master plan and projects with the aim of producing skilled human resource and digitalizing the education system (Bangladesh. Ministry of Education, 2016). Examples include the higher education quality enhancement project, college education development project, teaching quality improvement project and access to information program (a2i) (Akhter & Alam, 2016). 38331 Multimedia Classrooms (MMC), which are technology-enabled with internet facility, have been set up across the country with A2i providing the country's first online educational resources sharing portal (teachers.gov.bd) called "Shikkhok Batayon" (Hansson et al., 2018). As of December 6, 2019, the portal has 396212 members and 243263 digital contents ("Shikkhok Batayon", n.d.). A2i has also introduced short term fully online-based teacher training course called "Basic Teacher Training Course" through their own LMS called "Muktopaath" ("Muktopaath", n.d.).

However, there is limited study regarding TETPs through BL in Bangladesh, and certainly none from BOU perspective. In order to propose models for BL implementation, we explore case studies on BL in other parts of the world.

3. BL Good Practices

This section describes two contexts in which BL has been implemented successfully, with the aim of guiding the models that are feasible for the use at BOU. We detail ways in which BL is used in teacher training programs (TTPs) in Ukraine, followed by the same in Vietnam. We also detail the implementation of BL within the Bangladeshi context, in particular, within BOU, as a backdrop against which suggestions of good practices derived from the Ukrainian and Vietnamese context can be applied.

3.1 BL Practices in Ukrainian TTPs

Overwhelming usage of ICT in Ukrainian higher education places demands on teachers who must possess communication and networking skills, and who are sufficiently equipped and ready to use the latest technologies in teaching. Byrka (2017) contends that neither the conventional F2F classroom-based nor fully online TTPs on their own are able to produce teachers such as these. The notion leads to the argument that to cope, TTPs should be conducted through BL. Rationale put forth by Byrka (2017) includes the idea that BL integrates both F2F and online learning opportunities, and is advantageous in relation to time and place. Using a survey of 423 teacher trainees, Byrka (2017) explored the current status and curriculum of Ukrainian TTPs teachers' perception towards modes of professional development and the use of BL. She also compared between TTPs using BL and the conventional curriculum, exploring the former's features, benefits and challenges. Details of her findings and relevant information are described in the following sections.

Ukrainian TTPs

Ukrainian Regional Institutes of Postgraduate Pedagogical Education (RIPPE) provides the TTPs, in the form of in-service training for teachers' continuous professional development. Teachers must attend the training program once in every five years for the purposes of accreditation and updating of their knowledge and skills. The instructional mode utilised is conventional and F2F, on full-time basis. ICT is used for delivering lectures in the classroom and for presenting teaching aids. The duration of TTPs depends on the category of teachers. Teachers are placed in any one of the five categories, based on their specialization. RIPPE also recognizes teachers' experience, offering a special three-month TTP through distance mode, which is open only for 'senior teachers' and those in 'teacher-methodologists' position.

The TTP curriculum has the following as its objectives: to enhance teachers' professional skills, to acquaint them with educational innovation, pedagogy and technology, to familiarize them with the education system and the Ukrainian society. It comprises three modules, with each divided into two parts, invariant and a variable part. For the latter, teachers are given the flexibility to choose topics according to their preference and interest. The invariant part contains topics on professionalism, education and technology, which teachers must take.

The findings of the survey on teachers' perception toward likeable modes of professional development reveal that most of the teachers are willing to develop their professional skills through technology-integrated TTP, signaling that offering TTP through BL is a viable option in Ukraine.

Current Status of BL in Ukrainian TTPs

BL affords the opportunity for a redesign of Ukrainian TTP so as to be more flexible, individualized and economical, among others, Byrka (2017). Delivery modes of BL TTP are generally influenced by modern technologies. RIPPE in fact, has already implemented BL in TTP, albeit only for a very special group of teachers.

The duration of this TTP depends on the subjects offered, usually between three to four months. It is conducted in three stages, with the first and the third being F2F sessions, and the second fully online. During the first stage, learners get access to on-campus learning facilities. It is at this stage of their learning process that they are required to choose a project, which they will have to work on during the second stage with the use of a learning management system. The third stage is the assessment stage where learners will sit for a test.

Comparison between the BL and Conventional TTP Curriculum

The comparison between the BL and conventional TTP Curriculum was done based on four dimensions (see Byrka, 2017). It was concluded that for "content delivery", BL provides more alternative options than conventional TTP due to its online facilities. For "learner activities", BL engages learners better than conventional TTP through both its online and offline activities. For "materials", BL uses mostly ICT-based and ICT-related materials. Meanwhile, for "required competencies", BL requires that the user meets requirements related to ICT. The findings of the last two dimensions are hardly surprising given that BL is technology-based learning.

Benefits and Challenges of Implementing BL in TTP of Ukraine

In his paper, Byrka (2017) highlights some benefits of BL as per the context of her study, as follows:

- BL exercises diverse media for developing and disseminating the content of the study, which ultimately ensures proper utilization of learners' time, energy and resources;
- BL can involve both synchronous and asynchronous accessibility, thus having some degree of flexibility;
- Learners using BL have the opportunities for social interaction with their peers and instructors, and they can learn collaboratively.
- BL offers well-designed and sufficient educational material at learners' doorstep.
- Challenges that present themselves, which have to be managed, for successful implementation of BL include:
- The need for instructors to have both theoretical and latest ICT-related practical knowledge and skills;
- Instructional strategies and continuous assessment system should be described in the curriculum in detailed and coherent manner;
- Educational materials need to be customized according to the context of learners;
- F2F and online components need to be integrated in a balanced manner, considering the learning environment;
- Learners need to have ICT and management skills;
- Learners are able to self-learn, and are motivated in lifelong learning.

In the study, Byrka (2017) concludes that BL-oriented TTP has superiority over conventional TTP in terms of flexibility, accessibility, proximity, learners' engagement, instructional and content design as well as delivery mode, educational materials, pedagogical approach and assessment system. Nonetheless, BL sets extra preconditions for institutions and learners, described as challenges.

3.2 BL Practices in Vietnamese TTPs

Ho, Nakamori, Ho & Lim (2016) conducted a study in Vietnam to test the effectiveness of a BL model in a teacher training program of secondary level school teachers.

The HOA and V-TPD Model

HOA was introduced in Vietnam in 2011 as a teaching-learning approach for teaching science subjects in primary and secondary level. Effective implementation of HOA depends on knowledge, skills and attitude of teachers toward HOA. Thus, Vietnam introduced several in-service HOA teacher training courses, conducted via F2F. Nonetheless, it was recognized that the mode has several limitations such as it was time consuming, was costly and required huge human resource. To overcome these limitations, the V-TPD model was introduced to deliver the HOA training courses via BL.

This model has six implementation stages. The first three are development stages and the last three stages are related to execution. During the development stages, the purpose of teacher training, its contents and online interactive delivery platform are developed. In the execution stages, learners join online groups, discussion forums and share materials among peers. Learners also take part in F2F sessions and for assessment, they are required to submit assignments and sit for online tests. Upon course completion, the model offers learners an opportunity to interact among the community, sharing issues and engaging in lifelong professional development.

Effectiveness of V-TPD Model for the HOA-based training

Ho et al.'s (2016) examined the effectiveness of BL by looking at teachers' knowledge and self-efficacy, teachers' satisfaction level and factors that affect the success of BL through a quasi-experiment. 177 teacher trainees were

selected for the study, out of whom, 117 received the course via BL, and 60 via F2F mode. The BL group was the experimental group, with those having gone through F2F training group as a control group.

The experimental group began with a F2F orientation, which was followed by a pre-test. The group was then divided into smaller groups, where they did online learning. During this period, participants discussed course materials among themselves online. They received support from their facilitators and had the opportunity for self-learning and collaborative learning. At the end of the course, they had to present their assignments. Feedback for the assignment was obtained from peers and facilitators. At this stage, they also sat for post-test. The control group started off the same way as the experimental group, i.e., a F2F orientation, followed by a pre-test. However, their course took place via F2F lectures. Their assignments were assignments with the help of peers. Like the experimental group, the control group also sat for the post-test.
The instrument used for data collection was one post-test containing true/false statements and MCQs, and two questionnaires. Six items were posed in the questionnaire where respondents reported their satisfaction based on a Likert scale. In addition, a self-administrated open-ended questionnaire was used to examine factors impacting the success of BL.

The study found that the BL model increases the participants' knowledge compared to the F2F mode. Several reasons account for this finding: firstly, the flexible BL model allowed learners easy access to materials, they were able to learn at their own time and place, without hampering their own work. Secondly, the model promoted interaction among the learners. They could interact among their peers and tutors through online forums which gave them opportunity for collaborative learning. Thirdly, it provided them with the opportunity to build a strong professional development network as the group comprised trainee teachers, tutors and educationalists. The interaction enabled coaching and mentoring to happen, even after course completion, thus providing the trainees with lifelong professional support.

In terms of teachers' self-efficacy, no meaningful difference was observed between these two groups. However, the overall satisfaction of teachers in the BL model was higher than those in the F2F mode because the former was deemed convenient, organized and learners were able to get timely support and feedback from peers and tutors.

Ho et al. (2016) suggest several factors which contribute to the success of the BL model, as follows:

- The flexibility of BL in terms of time, place and autonomy of learners;
- Easy accessibility to educational resources;
- Economical, in reducing transport, counselling and education materials costs to the learners as well decreasing infrastructure and human resource costs for the institution;
- Interactivity, as learners can enrich themselves by interacting among peers, tutors and educationalists through online and F2F;
- Networking potential, as BL provides the opportunity for participants to build a strong professional network.
- Involvement of many parties in BL provides support towards understanding of content.
- Based on these findings Ho et al. (2016) recommend that Vietnam should conduct countrywide teacher training programs through BL.

3.3 BL in TETPs of Open University of Bangladesh

BOU is a prominent Bangladeshi public university offering teacher education. Every year more than 4000 students are admitted into the B.Ed program and more than 2000 into the M.Ed program. BOU conducts it programs on open and distance learning (ODL) mode, with 20 study centres across the country. It uses conventional as well as ICT-based ODL system. Students are provided with the hard copy of modules for self-study and attend weekly F2F tutorials in the study centres. As part of conventional ODL, they obtain input via television and radio programs in national TV and radio, whereas for ICT-based ODL, they have access to e-books, video and audio lectures through the university website (Ahmad & Numan, 2015; Islam & Ferdowsi, 2014; Jahan, Arif-Uz-Zaman, Hossain & Akhter, 2018; Rashid, Jahan, Islam & Ratna, 2015).

BOU's use of ICT for delivering educational materials is not tantamount to full BL utilization, as only using ICT in teaching-learning is not BL (Moskal et al., 2013). Essential elements of BL which include application of Learning Management System (LMS), IVCR, online forum discussions, e-modules, virtual seminars, online individual activities, web-based assessments system (Byrka, 2017; Ho et al., 2016; Keengwe & Kang, 2013; Sharma, 2010) are missing in BOU (Uddin, & Hossain, 2019). Moreover, the instructional design of the BOU programs described in the curriculum is conventional F2F mode (Islam & Ferdowsi, 2014). Although the

curriculum contains ICT-related courses, offering ICT courses separately in teacher education is not fruitful for teachers' professional development (Atmacasoy and Aksu, 2018).

Currently, TETPs offered at BOU University are B.Ed and M.Ed. The B.Ed program runs on two semesters, with each semester comprising six courses including teaching practice component. After completing F2F tutorial sessions of each semester every student has to sit for a conventional three-hour written examination. In addition, students have to submit assignments conventionally for every course; they are required to attend a viva voce and sit for practical exams for teaching practice and ICT related courses; and they have to submit an action research report in the second semester. The instructional design and assessment procedure of the TETPs remain largely conventional. Similar design and requirements apply for the M.Ed program. The only differences are, there are no teaching practice and ICT-related practical exams and duration of the conventional written exam is four hours (Islam & Ferdowsi, 2014; Uddin, & Hossain, 2019). However, Bangladesh has gained rapid advancement in technology and teachers are ready to take TETPs through BL (Hansson et al., 2018; Khan, 2014) hence, BOU should offer these programs through BL.

Implementing BL in TETPs can greatly contribute to achieving BOU objectives, which are as follow:

- to expand education and knowledge at all levels in a multi-dimensional way through the use of communication technologies;
- to enhance the quality of education;
- to make education accessible to the masses, and
- to create skilled manpower (Jahan, Arif-Uz-Zaman, Hossain & Akhter, 2018; Rashid, Jahan, Islam & Ratna, 2015).

Based on literature reviewed and the case studies presented, we contend that BL can positively contribute to the achievement of all of the said objectives. By implementing BL in TETPs, BOU will be a BL pioneer in Bangladeshi higher education, supporting the digitalization of the nation's higher education system (Bangladesh. Ministry of Education, 2016) and putting it one step ahead of others. The move will also enhance the university's brand image at home and abroad. It is also economically viable and profitable, as using BL will contribute to additional revenue since more students can enrol in TETPs (Byrka, 2017). Furthermore, it will decrease operational costs involved with the offer of programs via conventional mode, as seen in one of the case studies (see Ho et al., 2016).

4 A proposal for BL implementation at BOU

This paper suggests the implementation of BL in three programs at BOU – the B.Ed program, the M.Ed program and the short term training programs. We first present the respective models. This is followed by a report on a SWOT analysis, which is a prerequisite to the actual implementation, so as to ensure that BOU addresses all issues and leverage its strengths and opportunities for the smooth implementation of BL at the university.

4.1 BL Model for B.Ed Program

Table (1) illustrates the way in which the B.Ed program will be conducted via BL. The proposed BL-integrated B.Ed curriculum will be conducted in three semesters, with each semester running for six months. Each semester comprises three stages containing different activities (Byrka, 2017). In Stage 1 of the First Semester, learners will begin their studies via F2F tutorial sessions, which will be conducted by tutors in the country's study centers. During this stage, they will also go through practical sessions i.e., the teaching practice. In Stage 2 of the same semester, learners will be using the BOU LMS. Here, they will engage in online tutorial sessions. Students will submit assignments in LMS and also take part in online quizzes and tests in Stage 3 of the semester, as their formative assessment. The semester focuses largely on the development of cognitive domains.

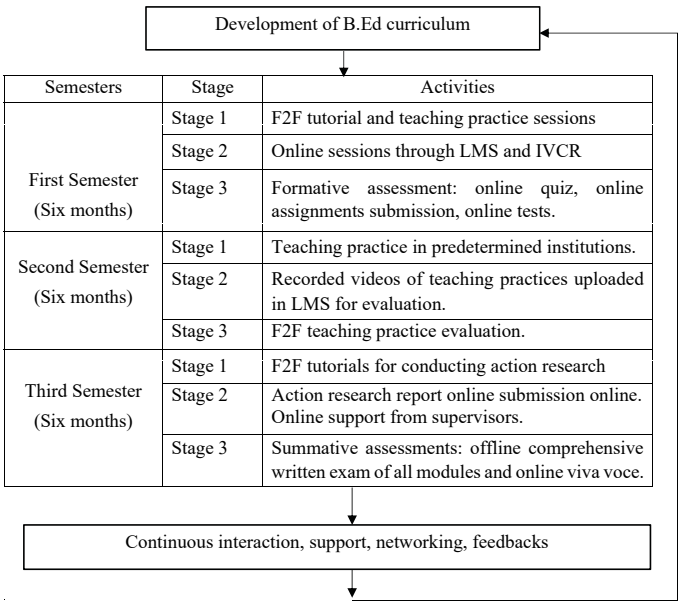
In line with the importance of teaching practice in the B.Ed program, the Second Semester will be entirely dedicated for this purpose. In Stage 1 of this semester, learners will do their teaching practice in predetermined educational institutions. In Stage 2 they will be required to upload their recorded teaching practice sessions to BOU LMS for evaluation. In stage 3 their teaching practice will be evaluated through F2F evaluation system. The semester focuses on the development of learners' psychomotor domains.

For enhancing learners' application of knowledge, the Third Semester will be dedicated for action research. In Stage 1 of this semester, F2F tutorial sessions will focus on how to conduct action research effectively. In Stage 2 learners will have to carry out action research, submitting the report to the LMS for evaluation. Learners will obtain continuous support from their supervisors online. In Stage 3 they sit for comprehensive written exam of all

modules, as well as be assessed in an online viva voce. Modules in this semester develop learners' affective and psychomotor domain. Stage 3 of every semester will be the assessment stage (Byrka, 2017) comprising formative, practical and summative assessment.

After completing the third semester, learners will get lifelong access to online platform through which they are able to connect with their peers, tutors and academics. This facility will support teachers' continuous professional development, leading to a community of teaching professionals (Ho et al., 2016). In addition, learners will be able to provide feedback on the courses they sat for, which will be considered carefully for further development of the B.Ed curriculum.

Table 1: Model of B.Ed program through BL

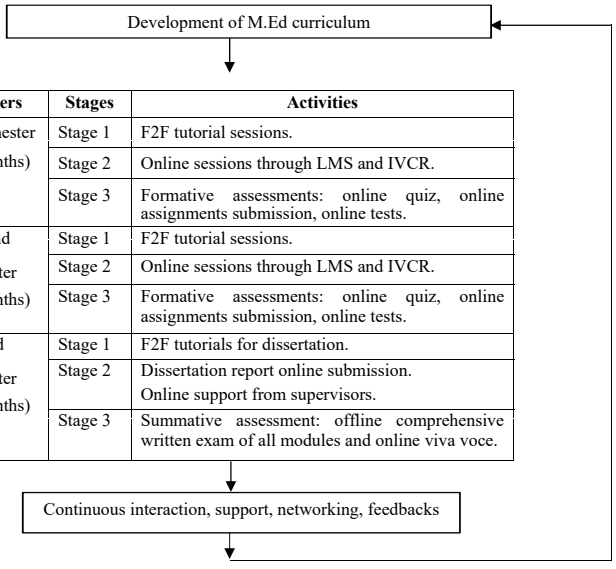


Semesters	Stage	Activities
First Semester (Six months)	Stage 1	F2F tutorial and teaching practice sessions
	Stage 2	Online sessions through LMS and IVCR
	Stage 3	Formative assessment: online quiz, online assignments submission, online tests.
Second Semester (Six months)	Stage 1	Teaching practice in predetermined institutions.
	Stage 2	Recorded videos of teaching practices uploaded in LMS for evaluation.
	Stage 3	F2F teaching practice evaluation.
Third Semester (Six months)	Stage 1	F2F tutorials for conducting action research
	Stage 2	Action research report online submission online. Online support from supervisors.
	Stage 3	Summative assessments: offline comprehensive written exam of all modules and online viva voce.

4.2 BL Model for M.Ed Program

Model for the M.Ed program via BL is similar to the one for the B.Ed program. The only difference is that for the former, there will be no teaching practice. In addition, learners will have to submit a dissertation instead of an action research report in the Third Semester. Table (2) illustrates the Model for the M.Ed program through BL.

Table 2: Model of M.Ed program through BL.



Semesters	**Stages**	**Activities**
First Semester (Six months)	Stage 1	F2F tutorial sessions.
	Stage 2	Online sessions through LMS and IVCR.
	Stage 3	Formative assessments: online quiz, online assignments submission, online tests.
Second Semester (Six months)	Stage 1	F2F tutorial sessions.
	Stage 2	Online sessions through LMS and IVCR.
	Stage 3	Formative assessments: online quiz, online assignments submission, online tests.
Third Semester (Six months)	Stage 1	F2F tutorials for dissertation.
	Stage 2	Dissertation report online submission. Online support from supervisors.
	Stage 3	Summative assessment: offline comprehensive written exam of all modules and online viva voce.

4.3 BL Model for Short Term TTPs

Besides the B.Ed and M.Ed programs, BOU can offer short-term certificate courses on teacher training. Figure (1) illustrates a model for short term certificate courses for teacher training via BL.

A training manual will have to developed according to the needs and context of each cohort (Ho et al., 2016). It will run in three stages (Byrka, 2017) with a total duration of 90 days. Training will begin with a pre-assessment of the participants. The First Stage will be the F2F stage for 15 days, with activities comprising lectures, demonstrations, micro-teaching, simulation and practical sessions (Byrka, 2017). The Second Stage is online learning stage for 60 days. In this stage, learners will get online learning facilities where at the end of it, they will have to upload their recorded teaching practice classes on the LMS for evaluation. The Third Stage will again be the F2F stage for 15 days, during which their teaching practice sessions will be evaluated. Quizzes will also be held during this time for assessment. After completing the Third Stage participants' post-assessment will be done, after which information of their achievement will be obtained. Participants' will get lifelong access to online platform through which they are able to connect with others. Their feedback will also be considered carefully for continuous improvement of the training content.

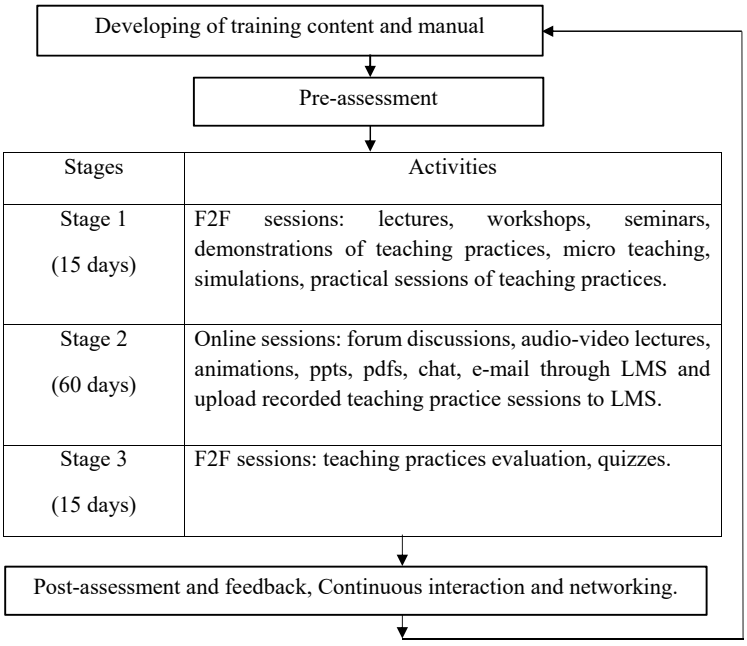


Figure 1: Model of short-term certificate course via BL

4.4 Implementation prerequisites: SWOT analysis

SWOT is a powerful visual tool for constructing an organisation's strategic plan for the purpose of a paradigm shift (Phadermrod, Crowder & Wills, 2019). Organizations including universities exercise SWOT analysis, to identify their strengths and weaknesses (internal factors) and their opportunities and threats (external factors) (Romero-Gutierrez, Jimenez-Liso & Martinez-Chico, 2016). The strengths and opportunities indicate positive dimensions, while the weaknesses and threats indicate negative dimensions (Ali, Buruga & Habibu, 2019). The results of a SWOT analysis provide a comprehensive picture of an organization towards the formulation of its strategic plan (Phadermrod, Crowder & Wills, 2019). A SWOT analysis was run to ascertain the viability and potential issues in the implementation of BL at BOU. Personal interviews were conducted with five BOU staff at the level of policy maker and document analysis was carried out for the analysis. The results of the analysis are presented in Table 4.

Strengths

BOU is in the process of digitalizing its operations, which has paved the way for implementing the proposed BL models relatively easily. For example, it has already established e-learning centres, five IVCRs around the country, e-platform for online training, developed its own customized LMS, among others (see Table 4 for more). These are ICT-related strengths that will ensure the smooth running of BL models effectively (Atmacasoy & Aksu, 2018; Byrka, 2017; Ho et al., 2016; Keengwe & Kang, 2013; Yağcı, Çınarbaş & Hoş, 2016).

In addition, this university has a sound infrastructure, human resource and countrywide network. For example, it has more than 150 full-time faculty members, more than 1000 supporting staff, countrywide 82 regional offices, libraries, internet facility, well-furnished media centre which has live broadcasting facility, Quality Assurance

Cell, 1502 study centres across the country and 2500 tutors for several programs. Therefore, based on the argument of Byrka (2017) and guidelines of implementing BL (Osguthorpe & Graham, 2003 in Atmacasoy & Aksu, 2018) all of these strengths will contribute to sound implementation of BL models.

Table 4: SWOT analysis of BOU implementation of BL in TETPs

	Positive	**Negative**
Internal factors	Strengths	Weaknesses
	● e-Learning centre. ● Five IVCRs throughout the country. ● e-Platform for online training. ● Customized LMS. ● Audio and video lectures. ● Self-study modules. ● You Tube channel. ● Web TV and web radio. ● IPR TV ● Educational mobile apps. ● Educational memory cards. ● Open educational resource repository. ● 450 e-books. ● Social media integrated dynamic website. ● Software for university management. ● Software for online admission and payment. ● Result processing software. ● 150 full-time faculty members. ● More than 1000 supporting staffs. ● Countrywide 82 regional offices. ● Well-furnished media centre. ● Quality assurance cell. ● Countrywide 1502 study centres and 2500 tutors for several programs.	<u>Pre-implementation weakness</u> ● Insufficient empirical study about the readiness of learners, faculty members, tutors and supporting staff. ● Scarcity of BL model in the context of BOU. ● Assessment procedures of the learners are off-line based and mostly summative. ● Unstable internet with low bandwidth. ● Inadequate capacity of LMS. <u>Post-implementation weakness</u> ● Absence of plagiarism checking software. ● Lack of a framework to monitor the countrywide face-to-face and online tutorials. ● Lack of a framework to ensure ICT services, updated open-access educational resources to learners. ● Lack of effective maintaining of academic calendar and prevailing of bureaucratic complexity.
External factors	Opportunities	Threats
	● Policy and management support from the government. ● Rapid digitalization of the national education system. ● Significant number of learners' enrollment irrespective of location, age, race, ethnicity, nationality, gender, class, caste, creed and sex. ● High demand from all over the country. ● Positive attitude of learners. ● Competitive advantages. ● International affiliations. ● International collaboration.	● Unstable and interrupted supply of electricity in the rural area. ● Insufficient internet facility in rural area. ● Absence of speedy bandwidth ● Costly internet services. ● Inadequate of ICT resources for learners. ● Absence of software related to plagiarism checking in local language. ● Absence of national BL policy and framework. ● Accreditation from the national and international accreditation council. ● Absence of provision for external monitoring system.

Weaknesses

Weaknesses we found can be divided into pre- and post-implementation weaknesses. For pre-implementation, the lack of empirical study about learner readiness for BL, building awareness among the learners is also a challenge (Atmacasoy & Aksu, 2018; Medina, 2018). Besides, there is a lack of study about the readiness of faculty members, tutors and supporting staff, similar to that highlighted by Byrka (2017). The absence of a BL model also makes instruction challenging, for example, in designing instructional approach, customizing learning materials in according to the online learning environment of Bangladesh, balancing F2F sessions with online sessions and also balancing formative and summative assessments (Boelens et al., 2017; Medina, 2018). In terms of infrastructure, BOU faces difficulties on the matter of LMS capacity and internet facilities.

With regard to post-implementation, there is an absence of plagiarism checking software and lack of a framework to monitor the countrywide F2F and online tutorial sessions, and learner engagement. Besides, BOU is struggling somewhat with regard to the provision of students support services such as providing continuous ICT services,

ensuring accessibility to customized educational resources, updating curriculum timely and also maintaining bureaucratic complexity and academic calendar strictly (Uddin, & Hossain, 2019).

Opportunities

According to the Bangladesh National Education Policy 2010, this University will develop into a truly digital university (Bangladesh. Ministry of Education, 2016). Hence, BOU enjoys full support from the government, with the digitalization agenda opening up opportunities for BOU. BOU should grab the opportunity of huge enrollment by offering TETPs, especially considering that there is high demand for TETPs, and BOU is regarded in a positive light generally. BOU also ha competitive advantage because it is the only Bangladeshi public university that offers education programs through open and distance learning basis. In addition, it has international affiliations with 12 international organizations and collaborations with three international universities.

Threats

Scarcity of electricity and internet in rural and hill-tract area as well as the high price of internet and ICT resources are the external threatening factors for BOU. The absence of a national BL policy and plagiarism software in local language are also threat factors for BOU. Besides, getting accreditation from national and international accreditation council is also a challenge.

In sum, the SWOT analysis should provide some pointers for BOU on the strategies, initiatives and actions it should take for the successful development and implementation of BL in its program.

5. Conclusion

Studies reviewed in this paper suggest that BL has a positive impact on TETPs. In the present context of Bangladesh, BOU should offer TETPs by adopting the BL models proposed in this study. Opportunities for improvement will avail once the programs are run. A SWOT analysis is useful in helping identify internal and external factors that BOU will have to manage if it is serious about BL. Once implemented, BOU will be a key player contributing to the development of the nation's human resources, specifically via teacher's professional development. Indirectly too, BOU's effort will help develop the nation.

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The Ergonomic Evaluation of Computer Use and Related Health Problems in RUB Constituent Colleges

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Computers have become a workmate and helper of humankind for modern society. Bhutanese have adapted to working with computers ever since its introduction in the country decades ago. Although the intensity of computer usage in offices is no less than any other developed agencies, not much of studies were conducted regarding users' knowledge and implementation of computer ergonomics among the staff of Royal University of Bhutan (RUB). This study is conducted mainly to examine the current practice of computer and related health problems among the staff of 10 constituent colleges under RUB, based on computer ergonomics. The study adopted convergent parallel design using mixed methods study involving a total of 254 computer user staff for survey and 17 computer user staff for structured interview questionnaires. The results of the survey instrument, structured questionnaire and physical observation were merged and discussed based on the research sub questions. Although the study has established that there were no exceeding significant health problems, majority of the computer user staff (CUS) have suffered between slight discomfort to moderate discomfort with eye strain, back pain, neck pain and shoulder pain which pertain to the type of staff, type of personal computer use and frequency of computer use among others, and neck pain was the common significant difference in relation to the above associated factors. It is recommended that the RUB colleges initiate computer ergonomic arrangement and implementation by adopting computer ergonomic assessment policy and guidelines.

Keywords: Constituent colleges, Royal University of Bhutan (RUB), current practice of computer, computer user staff (CUS), computer ergonomics.

1. Introduction

Royal University of Bhutan (RUB) was established in 2003 and it constitutes ten colleges specialized in different disciplines which are dispersed across the country (RUB,2017). Although the institution is young, its growth in terms of function and development are improving rapidly and technology such as computers are no exception. While the staff of RUB can be broadly categorized into teaching and non-teaching, the focus of this study was given to those staff who use computers. Since the establishment of computer facilities in the RUB constituent colleges, non-teaching staff are found in front of the computer doing administrative tasks almost throughout the day between 8:30 AM to 4:30 PM, official working hours except for an hour break and short tea break in between. Similar cases are found among the teaching staff except during face-to-face classroom teaching which happens on an average two-three hours in a day across the colleges. The (computer user staff) CUS vary in terms of age, competencies, abilities and health status, and some of them have used computers since the deployment of the computer facilities in their colleges. As a result of prolonged computer use, a research conducted at Samtse College of Education (SCE) found out that computer user staff were exposed to certain ergonomic hazards and associated health problems (Dorji, Kinley & Rinchen, 2019). Ergonomics is a field of study that attempts to reduce strain, fatigue, and injuries by improving product design and workspace arrangement (Michigan University, n.d.). According to the Centre for Bhutan Studies and GNH, 2017, one of the country's objectives is to prioritise people's health and wellbeing and therefore, there was a need to expand the study from one college to 10 constituent colleges under RUB, primarily to generate empirical knowledge that would consequently improve the ergonomic practices leading to improved efficacy and good health of the RUB CUS. Dorji et al. (2019) has also recommended to carry out a large scale study involving all the RUB colleges to determine the current practices of computer usage among RUB staff.

Therefore, the main objective of the study was to examine current practice of computer and related health problems among RUB staff, based on computer ergonomics. This study had addressed the following questions:
What are current practices of computers and related health problems among RUB computer user staff?
Sub Questions**:**

How are the current practices of computers in relation to type of staff? What are the health problems among computer user staff?
Is there a statistically significant difference of health concerns in relation to type of staff, type of computer use and average single seating time?

2. Literature review

Ergonomics is a field of study which aims to reduce the effects of working at a computer for an extended period of time by improving the product design and workspace arrangement (Feldman, 2014). An exceeding number of people spend hours a day in front of computers without thinking about its impact on their bodies which can result in stress and pain. In order to enhance certain physical and mental wellbeing of the people at the computer workplace, computer ergonomic guidelines and practice was implemented among the computer users of Michigan University (University of Michigan, n.d). The desktop computer is one which was ergonomically designed whereas laptop computer is not ergonomically designed for prolonged use and therefore, it is recommended to place a laptop on books so the top of the screen is at eye level and have a separate external keyboard so that the elbows can rest at 90° by the side (University of Michigan n.d).To protect from the strain and pain, it is important to consider aspects of ergonomics such as a) types of personal computer, b) frequency of computer use, c) computer table, d) chair, e) type of computer works and f) sitting posture (Hedge, n.d).While working at a computer for prolonged period of time, due to the poorly executed physical workstation characteristics, many staff and workers had actually suffered from health related issues. This statement is well supported by Liu et al. (2013) who found out that 57% of their study participants suffered discomfort on the body parts such as neck, shoulders, hands/wrist, upper back and lower back. In their study, they could see that the seating posture while working with a computer were different for each individual, while 47.7% of the participants often sat in a neutral working posture which is an effective implementation of ergonomics, 37.7% leaned forward and 9.3% bent backwards which can lead to discomfort according to ergonomics. Despite the different environment (cubicle and office workstations) 57.4% of the overall staff experienced discomfort which was greatly affected by their seating postures. In this regard, Chayda et al. (2013) also concluded that the various musculoskeletal problems faced by medical students were due to prolonged ergonomically improper posture such as improper body alignment and lack of breaks. Physical characteristics of the hardware restrains the way one works as computers and laptops tend to make one's posture more tight and the movement of the eyes are busier which leads to the musculoskeletal disorder (Sotoyama et al., 2002). In a similar manner, Shrivastava and Bobhate concluded that 89% of software professionals suffered from computer related morbidity. Furthermore, a study conducted by Gavgani et al. (2013) found that 52.6% of their staff suffered from musculoskeletal symptoms and disorder which was caused by ergonomic factors. Issues of health problems persist in every work place. Gavgani et al. (2013), indicated that 52.6% of the staff in their study had some kinds of musculoskeletal symptoms and disorders; the greatest complications were yet again on neck and back discomfort caused by working improperly with the working tools. According to Saadat et al. (2006), the use of computers and its equipment greatly depended on the nature of the subject. Here 25% of the participants also sorted to the posture where they leaned forward which makes the back too round hence, increasing the back discomfort. In order to make themselves comfortable again, 71% of the participants took breaks every hour and 11% of them took no breaks at all. Similarly, Kumah et al. (2016), found out that 85% of their respondents were suffering from neck, back and shoulder pain and 73% were from eye strain. Moreover, a study conducted by Suman and Wadhawa (2017) found out that among 30 computer operators of Udaipur district, India, majority of the respondents experienced eye related trouble such as itching, burning, irritation and strain due to prolonged time spent in front of the monitor. The survey not just found out the different health problems associated with computers but also indicated that the workstation arrangement for 90% of the participants falls in the average category, which needs improvement. Due to regulatory deficiencies and lack of awareness, cases of work related injuries go unreported in developing countries such as Pakistan (Khan et al., (2012). The same research also reported that among 344 participants ranging from age group 21 to 59, only 52.3% heard about ergonomics. From the total, rating of their knowledge regarding ergonomics on a Likert scale revealed that only 10% had excellent knowledge and 20% rated it as good, suggesting the need of awareness.

3. Methodology

A convergent parallel design using mixed methods was employed to study awareness and practices of ergonomic guidelines by the staff of 10 constituent colleges of RUB, from 1st July, 2019 to 1st July, 2020. Qualitative and quantitative data were collected simultaneously as per the practice in convergent parallel research design of mixed methods research.

A survey instrument was adapted referring to the items developed by (Poochada & Chaiklieng, 2015; University of Delaware, n.d) to collect quantitative data of the study. The survey instrument included details about

demographics, type of staff, type of computer use, time spent with computers doing office work, details regarding computer users' behaviors, experiences of any health concerns that are believed to be related to computer work and any safety measures undertaken. Questions concerning computer user's behaviors had 23 items presented using Likert scale (1-5) indicating the level they behave i.e. never, rarely, sometimes, often and always. Questions concerning only the various physical health had 10 items presented using Likert scale (1-4) indicating the level of discomfort, i.e. no discomfort, slight discomfort, moderate discomfort and significant pain. The survey was developed using google forms and administered online via RUB common email id staff@rub.edu.bt as well as through printed copies. A total of 254 CUS had participated in this survey out of around 600 staff working under the 10 colleges of RUB who use computers in their office. Further, raw data was gathered through structured questionnaire and physical observation to explore in-depth knowledge and also to triangulate the data using different tools of the study. A total of 17 staff from 10 constituent colleges of RUB were randomly selected and interviewed using structured questionnaires for the qualitative data. The sample constituted both teaching and non-teaching staff excluding non-users of computers, and of mixed gender. The random pictures of computer office arrangement were collected through physical observation from teaching staff as well as from administrative staff to evaluate how the computer offices are arranged by the CUS and also to see what kind of working table and chair are used in their offices. The data collected from the survey instrument was entered to the SPSS 22 for statistical analysis. The data screening, missing value analysis and recording for some categorical items across the survey instrument were carried out. After that, descriptive statistics such as frequencies, crosstabs and explore analysis were used to describe and summarize the demographics characteristics.

A chi-square analysis was conducted to establish whether there was a significant relationship between the type of staff in terms of average time spent in a single seating with the computer and average time spent on a computer during an average workday (α=0.05).

Principal component analysis was conducted on the computer users' behavior (23 scale data) to condense the number of observed items into a smaller number of composite variables.The independent sample t-test was conducted to check whether there was a statistically significant difference between the type of staff to computer users behavior and related health concerns (α=0.05).

Analysis of variance (ANOVA) was conducted to see whether there was a statistically significant difference in computer users behavior of RUB staff to type of computer use, health concern due to type of computer used and health concerns due to average time spent in a single seating (α=0.05). Raw data gathered from structured questionnaires were coded and categorized into various themes generated for the interpretation of the qualitative component of the data.

4. Results

This section presents the results generated from the analysis of the quantitative and qualitative data. The results of the survey instrument, structured questionnaire and physical observation were merged and discussed based on the research sub questions.

4.1 Demographics characteristics

A total of 254 staff (CUS) from 10 RUB constituent colleges participated in the survey out of 600, which consists of dominantly 174(68.5%) male. Half of the participants were aged 35 & below i.e., a total of 132 (52%). From the total, 163(64.2%) were from teaching staff and 90 (35.4%) were from administrative staff. Table 1 below shows the type of computer used in the office by the different types of staff. A total of 119 (73.0%) teaching staff were using laptop computers out of (n=163) laptop computer users and 47 (52.8%) of the administrative staff were using desktop computers out of (n=89). While qualitative data analysis indicated that, 59% of the participants use laptop computers while 41% of them use desktop computers when working in the office. This reveals that most laptop computer users were teaching staff and desktop users were administrative staff and only few staff were using both types of computers in their office.

Table 1. Type of Computer Use in the Office by the Teaching Staff and Administrative Staff

			Type of computer used in the office		
			Laptop	Desktop	**Both**
Type of staff	**Teaching staff**	Count	119	9	35
		% within type of staff	73.0%	5.5%	21.5%
	Administrative staff	Count	21	47	21
		% within type of staff	23.6%	52.8%	23.6%
Total		Count	140	56	56
		% within type of staff	55.6%	22.2%	22.2%

In terms of number of years of computer use, 83(50.9%) of the teaching staff have been using computers for more than a decade, whereas administrative staff have almost equal distribution of number of years of computer use ranging from 3 years and below to 10 years and above. While qualitative data analysis indicated that the participants used computers ranging from 6 months to 16 years with an average experience of 5 to 6 years.

Frequency of computer usage

Quantitative data analysis on an average time spent during workdays by the CUS indicated that 97(38.2%) spent 6 hours and above while 94(37%) spent 4-6 hours and remaining 63(24.8%) spent 4 hours and below. When further looked at the average time spent in a single seating by the staff, it indicated that 163(64.2%) of the staff spent 2 hours & above while 41(16.1%) spent 1.5-2 hours and remaining 50(19.7) spent 1.5 hours & below.

The qualitative data analysis revealed that 76% of participants spent the whole day with computers except for breaks such as tea time and lunch breaks during the working days while 2(11%) use it for 3 to 5 hours daily. This concludes that the majority of the staff spent 4 hours and above with computers on a daily basis during average workdays.

A contingency table analysis was conducted to establish whether there was a significant relationship between types of staff in terms of average time spent in a single seating with the computer. There was no significant relationship between these two variables, (χ 2) (DF=2, n=253) = 2.994, p>.05, as expected, the count of all the cells was not different enough from the observed counts. However, it was found that 66.3% of the teaching staff and 60.0% of the administrative staff spent 2 hours and above. This concludes that both the groups spent more time with computers in a single seating. Further, contingency table analysis was conducted to establish whether there was a significant relationship between the types of staff in terms of average time spent on a computer during an average workday. There was also no significant relationship between these two variables, (χ 2) (DF=2, n=253) = .898, p>.05, as expected, the count of all the cells was not different enough from the observed counts.

Table 2. Rotated component matrix

	Component			
	Exercise at Computer	**Adjustment with physical interaction with computer**	**Sitting posture in front of computer**	**Combine computer with non-computer work**
Do feet exercises in between	.903			
Do arm relaxation exercises in between	.897			
Do hand and wrist exercises in between	.896			
Do back exercises in between	.890			
Do neck and shoulder rotation exercises in between	.869			
Do eye exercises in between	.774			
Take your hands off the mouse during breaks		.787		
Break work into smaller segments and switch between tasks that use different motions. For example, alternate use of mouse with reading and searching the web		.736		
Reduce prolonged computer time whenever possible		.680		
Wear eyeglasses when you use computer		.409		
Keep elbows at a 90° angle, with elbows close to the body and forearms parallel to the floor			.831	
Sit on the chair with upright position without bending the back			.670	
Keep wrists straight, supported by a foam pad or chair armrests			.638	
Keep upper legs parallel to the floor with feet flat			.569	
Combine computer work with writing paper work				.912
Combine computer work with reading paper work				.909

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. [A]
a. Rotation converged in 5 iterations

4.2 Principal Component Analysis (PCA) on Computer users' behavior

PCA was conducted on the computer user's behavior items in order to delete all non-performing items and to produce a refined solution. The final solution for a number of items produced four valid components. Exercise at computer component comprises 6 items, Adjustment with physical interaction with computer component comprises 4 items, Sitting posture in front of computer component comprises 4 items and Combine computer with non-computer work component comprises 2 items. These four components accounted for a substantive 67.6% of the total variance explained. Each of the four components correlated moderately and weakly to each other, and each component demonstrated acceptable reliability with Cronbach's Alpha .634 when the lower limit reduced to .60 since the measurement scale was adapted. Table 2 below is the modified rotated component matrix of the computer users' behavior items.

4.3 Computer office arrangement

Qualitative data analysis revealed that the majority of the participants apprised of having their office neatly furnished, nearly one percent complained about inadequate working space. The participants also said that they arrange their office as per convenience as one said, "No specific arrangement as such, I arrange it in any ways as per my convenience." Among the desktop users, one arranged desktop on the table and CPU under the table, one arranged desktop, CPU, printer and keyboard on a single table. Below figures 1, 2, 3, & 4 are the typical example of how the computer offices are arranged by the staff.

Figure 1-4 Computer offices

Figure 1 -Office a

Figure 2- Office b

Figure 3 – Office c

Figure 4- Office d

4.4 Sitting posture in front of the Computer

Majority of the participants from the qualitative data analysis used the word 'straight' to describe their sitting posture. Two of the participants also mentioned that they maintain 120 degrees between eyes and the computer screen while few mentioned that they don't have a particular position, rather they sit as per their convenience. Around 60% of the participants sit parallel to the computers on a chair facing computer either straight to their eyes or chest. Few respondents of the safety measures undertaken, 43(16.9%) from the quantitative data analysis also expressed that they make sure to straighten their body and the spinal cord, while the others shared that

maintaining a proper poster is hindered by the type of furniture allocated in their offices. Among the 4 items which represent this composite variable "Sitting posture", the item "Keep elbows at a 90° angle, with elbows close to the body and forearms parallel to the floor" was the heaviest loading while "Keep upper legs parallel to the floor with feet flat" was the least loading. The descriptive analysis on this composite variable has mean score (M=3.10; SD=0.82), which indicates that it is just above the average side of the five point Likert scale with less variability among the staff. Further, the independent sample t-test was conducted to see whether there was any difference between the types of staff in terms of sitting posture in front of the computer. The teaching staff has mean score (M=3.05, SD=.85) which was not statistically significantly different (t=-1.223, df=251), two tailed (p=.222) than administrative staff on the same variable (M=3.19, SD=.78).

4.5 Adjustment of physical interaction with the Computer work

Some common adjustment methods adopted by the respondents were reducing the brightness of the computer screen, using an anti-glare screen, maintaining distance between the screen and eyes and 66.6% of those who adjust physical interaction with the computer use glasses. Among the 4 items which represent this composite variable "Adjustment_physical interaction", the item "Take your hands off the mouse during breaks" was the heaviest loading while "wear eyeglasses when you use computer" was the least loading. The descriptive analysis on this composite variable has mean score (M=3.43; SD=1.14), indicating just above the average side of the five point Liker scale but more variability among the staff. When further looked at whether there was any difference between the types of staff in terms of adjustment of physical interaction with the computer work, the independent sample t-test revealed that there was no statistically significantly different (t=-1.562, df=235), two tailed (p=.120) between the teaching staff which has mean score (M=3.51, SD=1.26) to administrative staff on the same variable (M=3.29, SD=.90).

4.6 Computer work with non-computer work

The nature of the work performed on computers can be classified based on the two widely notable categories such as teaching and non-teaching. Teaching staff, which constitutes around 40% of the sample population used computers to respond to emails, prepare PowerPoint slides for teaching, access VLE, assess assignments, and maintain records such as students' marks and attendance. They also use computers to browse teaching materials and other information. On the other hand, non-teaching staff which consist of 60% of the participants use computer to perform task related to their designated sections such as managing online and internet related jobs for IT personnel, the staff in finance related works they use computers to access tally, Epems and other financial software as well as for record keeping in excel and words. For other general office workers, they use computers to document official letters, check emails and to browse information. The participants presume to spend a maximum of three hours on non-desktop works, while the majority estimated around 1 to 2 hours from the total working hours. Time spent depended on the types of work assigned out of which most of them can be performed on a desktop including reading and writing. Between the 2 items which represent this composite variable "combine computer work with reading paper work", the item "combine computer work with writing paper work" has heavier loading than "combine computer work with reading paper work". The descriptive analysis on this composite has mean score (M=3.18, SD=1.13), which indicates that it is just above the average side of the five point Likert scale with more variability among the staff. Further, the independent sample t-test was conducted to see whether there was any difference between the types of staff in terms of computer work with non-computer work. The teaching staff has mean score (M=3.24, SD=1.20), which was not statistically significantly different (t=1.141, df=251), two tailed (p=.225) than administrative staff on the same variable (M=3.07, SD=1.03).

4.7 Exercise at Computer

Physical fitness includes neck, shoulder, back, eye, hand and feet which can help to avoid and treat problems related to computer use. Some respondents of the safety measures undertaken, 43(16.9%) from the quantitative data analysis reported that they performed simple exercises between 20 to 30 minutes, do yoga at home, exercise for 10 to 15 minutes after working for more than 30 minutes and body stretching. Among the 6 items which represent this composite variable, "Do feet exercises in between" items was the heaviest loading while "Do eye exercise in between" was the least loading. The variable "Body parts exercise at Computer" has mean score (M=2.47; SD=1.10), indicating on the lower side of the five point Liker scale with more variability among the staff. Further, the independent sample t-test was conducted to see whether there was any difference between the types of staff in terms of exercise at the computer. The teaching staff has mean score (M=2.41, SD=1.03) which was not statistically significantly different (t=-1.158, df =251), two tailed (p=.248) than administrative staff on the same variable (M=2.58, SD=1.20).

4.8 Health Concerns among Computer User Staff

The descriptive analysis indicated that top four body parts reported to suffer the most were eyes (M=2.71, SD=.964), back (M=2.41, SD=.919), neck (M=2.34, SD=.924), and shoulders (M=2.14, SD=.907) which were all scored between slight discomfort to moderate discomfort. Qualitative data analysis revealed that 65% of the partaker staff experienced health issues such as headache, eye strain, muscle pain, backache and neck pain in various intensities, while few of them also experienced fatigue due to prolonged sitting posture while working with the computer. However, the remaining 35% claimed that they did not experience any health issues related to computers.

4.9 Health concerns in relation to type of staff, type of computer use and average single seating time

The independent sample t-test was conducted to see whether there was any difference between the types of staff in terms of top four health concerns of the descriptive analysis. Among four, neck body part of the teaching staff which has mean score (M=2.46, SD=.957) was statistically significantly different (t=2.737, df =205), two tailed (p=.007) than administrative staff on the same variable (M=2.15, SD=.820). This result indicated that teaching staff have more neck pain than administrative staff. Further, Analysis of variance (ANOVA) was conducted to see whether there was a statistically significant difference in top four health problems due to types of computer use. Among the top four health problems, neck health concern found to be statistically different between laptop computer and desktop computer ($F = 5.582$, $p < .05$). The Posthoc Tukey multiple comparisons test found that the mean for the laptop computer ($M = 2.51$) and desktop computer ($M = 2.09$) were statistically significantly different ($p = .010$). Furthermore, analysis of variance (ANOVA) was conducted to see whether there was a statistically significant difference in the top four health problems due to average single seating time spent with the computer. Among the top four health problems, there was a statistically significant difference in eye health problem in RUB staff between 1.5 hour & below and 2 hours & above ($F = 5.055$, $p < .05$). The Posthoc Tukey multiple comparisons test found that the means for RUB staff from 1.5 hours & below ($M = 2.41$) and 2 hours & above ($M = 2.85$) were statistically significantly different ($p = .014$). Similarly, there was also a statistically significant difference in neck health problem in RUB staff between 1.5 hours & below and 2 hours & above ($F = 3.006$, $p < .05$). The Posthoc Tukey multiple comparisons test found that the means for RUB staff from 1.5 hours & below ($M = 2.06$) and 2 hours & above ($M = 2.42$) were statistically significantly different ($p = .042$).

5. Discussion

Through this study, it was possible to examine the current practice of computers and related health problems of teaching staff and administrative staff of 10 RUB constituent colleges based on ergonomics. The result of the health problems of CUS from both the quantitative and qualitative analysis indicated that there were not much significant health problems. However, the majority of the CUS have suffered between slight discomfort to moderate discomfort with eye strain, back pain, neck pain and shoulder pain. This finding was consistent with the finding of (Dorji et al, 2019; Kumah et al, 2016).

The result of the health problems in relation to type of staff indicated that teaching staff have suffered more in neck pain than the administrative staff among other health problems. Additionally, the health problems were examined in relation to type of computer use. The result indicated that, yet again, neck health problem was found to be a significant difference between laptop computer and desktop computer. Furthermore, the health problems were examined in relation to average single seating in front of the computers. The result indicated that there were eye health problems between 1.5 hour & below and 2 hours & above. Similarly, there was also a neck health problem between 1.5 hours & below and 2 hours & above. This study revealed that neck pain was the single most common significant difference in relation to type of staff, type of computer use and average single seating with computer. However, eye pain was found common only in the prolonged use of the computer. One reason for these pains was teaching staff being laptop computer users with the number 119 (73.0%) out of (n=163) computer users where it was not ergonomically designed for prolonged use, which means laptop are not positioned at eye level with arm's length from the eye (University of Michigan. n.d). Due to this poor practice, it had resulted in neck and eye pain, particularly the teaching staff of RUB colleges.

Another reason was, the result of the average time spent during workdays which indicated that most of the staff spent 4 hour & above with computers which was confirmed by the qualitative data analysis. In addition to that they spent 2 hours & above with computers in a single seating. According to (Hedge, n.d), if people spent more than 4 hours working on computers, then they should consider implementing an ergonomic arrangement which is a good practice yet not seen in the RUB colleges. Other reasons that supported the finding was while evaluating

the computer user's behavior in terms of a)computer office arrangement, b)sitting posture in front of the computer, c)adjustment of physical interaction with the computer work, d)computer work with non-computer work and e)exercise at computer. It was found as poor practice as per the ergonomic guidelines (University of Michigan. n.d). Multiple studies have also found that ergonomic related health problems are associated with: time spent on the computer, workload characteristics, working posture and human behavior while using the computer in their workstation (Chavda et al, 2013; Liu et al, 2013; University of Delaware, n.d).

6. Limitation

This study has addressed only the research questions stated. The result of the health concerns may likely to change if other health factors are considered such as health history, number of years of computer use and mental health of the computer user. However, such analysis was not done in the study since it doesn't fall under the stated research question. Therefore, future researchers may consider those factors to get richer data pertaining to the health concerns.

7. Conclusion

This study has found that there were no exceeding significant health problems due to computer use. However, the majority of the CUS from the sample population reported having suffered slight discomfort to moderate discomfort with eye strain, back pain, neck pain, and shoulder pain. The study has also uncovered the variation and intensity of computer related health hazards in association to types of staff, workload characteristics, type of computer use and average single seating with computer. These variations were some of the main reasons for the above four health discomfort among others, and neck pain was the common significant difference in relation to the above associated factors, while eye pain was also found common in relation with the prolonged use of computers.

Since the RUB constituent colleges' staff were exposed to certain ergonomic hazards and associated health problems, there is a need to create awareness of computer ergonomics practice particularly in terms of; a) frequency of computer usage, b) type of personal computer used and c) workload characteristics among staff of RUB colleges. It is recommended that the RUB colleges may initiate computer ergonomic arrangement and implementation by adopting computer ergonomic assessment policy and guidelines.

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Satisfaction of Teachers and Students with Blended Learning

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In the area of higher education, not only in the USA and Europe but also in Asian countries, the emergence, practice and development of bent learning techniques have become a top trend. This technique is catalyzing change in the field of education as it is providing great assistance to higher education institutions to meet the challenges of globalization and the 21st century. This technique is offering ample opportunities for all educational stakeholders to become familiar with emerging trends/global innovations in their respective areas. Teachers are students who are considered key stakeholders of education; both have become technologically smart and active users of this technique. In the area of teacher education, blended learning has brought about extraordinary innovations and supports teachers a lot to ensure their continuous professional development. Along with teachers, blended learning has also enhanced students' involvement, motivation, perseverance and commitment to the learning process. As the main focus of this chapter was to explore teachers and students' satisfaction at higher education institutions regarding the practice of blended learning, therefore key determinants of teachers and students satisfaction have been discussed in detail. Research studies reflected that teachers' willingness towards the use of technology during teaching, the relationship between technology and teacher's identity, the relationship between technology use and pedagogical knowledge, and the role of culture and context in employing the technology in the teaching-learning process are strong predictors of teacher's satisfaction. It has been explored that regarding blended learning, workload management, learners' attitudes and learners' interaction were significant determinants of students' satisfaction. This chapter also highlights various factors that are affecting teachers and students satisfaction regarding blended learning. Consequently, at the end of the chapter, various recommendations have been also put forwarded to ensure successful implementation of blended learning technique as it is significantly correlated with higher level satisfaction of teachers and students.

Keywords: higher education, Blended Learning

1. Introduction

With the rapid development of ICT, a convergence between technology-mediated learning and face to face traditional has been introduced in recent decades, which is being termed as hybrid/blended learning. In the area of higher education, not only in the USA and Europe but also in Asian countries, the emergence and development of hybrid/blended learning have been exotically highlighted in various research studies. Efficient as well as effective use of technology through Blended Learning (BL) is catalyzing change in the field of education as it is providing great assistance to higher education institutions to meet the challenges of globalization and the 21st century. In face to face classrooms, the idea of blended learning is serving as additional support for students' better understanding and concept clarification. It has been reported by Alontaga (2012) that the idea of incorporating blended learning in the delivery of instruction is not only enhancing learners' satisfaction but it is also enjoying pedagogical richness, cost-effectiveness and enriched personal as well as social interaction.

It has been explored by various researchers (Dziuban, Hartman, & Moskal, 2004; Garrison & Vaughan, 2008; Graham, 2006; Osguthorpe & Graham, 2003; Shea, 2007) that the use of blended learning is rapidly growing in higher education institutions. Furthermore, Gomez and Igado (2008) have highlighted that an excellent boost has been evinced in the core of teaching and learning through the practice of blended learning. It has been also explored by Garrison and Kanuka (2004) that blended learning has proved very supportive for offering higher levels of learning to students. It has been reflected by various researchers (Balci & Soran, 2009; Deperlioglu & Kose, 2010; Munson, 2010) that over the past few years, blended learning has been proved very effective as it has yielded better results as compared to traditional methods of learning. Significant improvements have been ensured across the education sector in terms of satisfaction and the achievement of information retention with the appropriate use of blended learning in the instructional process. So, it has been suggested by Garrison and Kanuka (2004) and Bransford et al. (2000) that BL is not only an acceptable pedagogical approach but has also great potential to transform the whole system of higher education.

Substantial development in the improvement of learning has been viewed in campus courses by the introduction of asynchronous learning networks (Hiltz & Turoff, 2005). It has been described by Thorne (2003) that blended learning is one of the most important advancements of this century and has been viewed as a natural evolution in the teaching-learning agenda. Day by day, in instructional practice, BL has become so integrated and commonplace that if someone simply enters the prefix "blended" in search engines, it will immediately connect it with "learning" (Larsen, 2012). Blended learning has also brought about extraordinary innovation in the area of teacher education and teacher satisfaction. Undoubtedly, the quality of teachers in future will be determined by the quality of pre-service teachers. Pre-service teachers can acquaint themselves with a diversity of pedagogies in instruction and global educational trends, specifically if they are practising emerging technologies such as blended learning at higher education institutions. These practices will result in the preparation of a globally competitive and ideal teacher graduate sporting a mastery of knowledge and 21st-century skills.

Keeping in view the above-mentioned role, importance and practice of blended learning, the main focus of this chapter is teachers and students' satisfaction at higher education institutions regarding the practice of blended learning. The satisfaction of teachers and students regarding blended learning may be effectively explored by considering various dimensions of satisfaction proposed by the HELAM model of Ozkan and Koseler's (2009). The various dimensions of this model involved instructor attitudes, learners' perspective, information and content quality as well as the quality of system and support. The baseline purpose of this investigation is to examine facilities and opportunities being provided at higher education institutions for practising blended learning as these have a strong impact on various dimensions of teachers and students satisfaction. The results of this discussion may prove helpful in developing guidelines for teacher education institutions and higher education institutions in both European and Asian contexts to ensure a successful implementation of blended learning. In the following text, a detailed discussion has been provided regarding their satisfaction as one of the key predictors of the effectiveness of blended learning from the perspective of various researchers. As the major variables of this chapter are students and teachers satisfaction, the authors have firstly provided a brief description of both variables; afterwards related literature and the existing situation regarding these variables have been discussed along with practicable recommendations.

2. Students' satisfaction

According to Moore (2009), students' satisfaction has been defined by Sloan Consortium as the success, pleasure and fruitful experiences of students. Students' satisfaction has been defined by Wu, Tennyson, and Hsia (2010) as a sum of students' attitudes and their feelings that result from a combination of all the expectations that are being met by the BL system/environment. There may be three reasons of interest to explore students' satisfaction (Sinclaire, 2011). Firstly, five pillars of quality online education presented by the Sloan Consortium have declared students' satisfaction the key factor to successful learning (Sloan, 2011). Secondly, according to Booker and Rebman (2005), learner satisfaction is positively related to their retention and decision to take one or more additional online courses. Thirdly, for representing a public relation asset for a school or university, the factor of students' satisfaction is of key importance. Therefore, there is a need for a greater understanding of factors that affect student satisfaction with blended learning.

In the same scenario, the possibility of blended learning has been investigated in Ugandan universities by Kintu and Zhu (2016). They have explored whether students' characteristics (such as self-regulation, technological competence and their attitudes towards blended learning) and student background (such as management of workload, social support and family support) were influencing students outcomes (such as satisfaction, motivation, knowledge construction and performance). Students' characteristics and background were studied along with features of blended learning design such as the quality of available technological devices and learners' interaction with Moodle, its tools as well as its resources. The researchers explored that regarding blended learning, workload management, learners' attitudes and learners' interaction were significant factors that contributed to their satisfaction. For a successful implementation of the learning approach, students' satisfaction is a baseline requirement as it is a key factor measuring the quality of blended learning. Therefore, at higher education institutions, administrators are required to pay special attention to students' satisfaction in BL programs. It has been explored by Naaj, Nachouki, and Ankit (2012) that there is a combination of factors that determine students' satisfaction. These factors include instructor attitude, technological tools, classroom management, student interaction, instructional strategies and activities regarding the learning management system.

Some additional significant factors are highlighted by Bollinger and Martindale (2004) which they considered as key factors in determining the student teachers' satisfaction in the blended teaching and learning environment such as technology, instructor, and interactivity. Some other related factors about the satisfaction of student teachers in the blended learning environment are highlighted in some researches including course management

and instruction'. This variable (student teachers' satisfaction) has been reported as one of the essential components for determining the success or failure of any innovation taking place in a teaching and learning environment especially in a blended learning (BL) course (Chang & Fisher, 2003). The people who are related to the field of blended learning considered the 'students' satisfaction' as a prerequisite requirement for the successful execution of a BL program and its successful completion as well. The researcher argued that to measure the quality of a blended learning program, we have to determine the satisfaction of the students of that program because this factor could ensure the effectiveness of any blended learning program.

A Singaporean researcher emphasized that there could be numerous advantages of a blended learning environment but if the end-users (students) are not satisfied with it, it could be a wastage of time, resources and efforts and the whole activity would be a failure (So, 2009). Furthermore, the satisfaction and perception of student teachers about their learning are recognized as key factors for evaluating the effectiveness of methods used in blended learning education setup (Akkoyunlu & Soylu, 2008). In this perspective the understanding of students' satisfaction is the main factor that supplies important insight about their perception of learning in a blended environment, therefore, it would be significant to explore the satisfaction of student teachers as a factor of any blended learning program determining its effectiveness in higher education (Karimi & Ahmad, 2013).

2.1 Teachers' satisfaction

Many studies have attempted to explore the teachers' perception and satisfaction towards the implications of the blended learning program. They perceived that teachers hold different perceptions and attitudes towards the use of technology in the teaching-learning process. There are four major areas highlighted concerning the satisfaction of teachers about the use of the blended learning approach including teachers willingness towards the use of technology during teaching, the relationship between technology and teachers identity, the relationship between technology use and pedagogical knowledge, and the role of culture and context in employing technology in the teaching-learning process.

Some studies explored the value that teachers give to the use of technology e.g. Ottenbreit Leftwich et al. (2010) emphasized that teachers are important figures who evaluate how technology could more effectively enable them to attain their goals related to educational work and in this regard teachers are the main decision-makers to decide when and how to use technology. Some studies supported the fact that these are only teachers who decide about the worth of an approach or tool to be employed in their teaching. Karimi and Ahmad (2013) discussed that a high degree of correspondence between subjects, the focus of learning and satisfaction about the use of technology is required if the blended learning approach is to be adopted. Teachers may value the use of technology in several ways e.g. Smarkola (2008) recommended that there are two main reasons due to which teachers value the use of technology in the instructional process; the first is the internal motivation that is to stimulate the children's learning and the second is the external motivation that is determined by how other people perceive the utilization of the technology.

Ottenbreit-Leftwich et al. (2010) identified two types of value beliefs of teachers; the first set of value beliefs includes their 'professional needs' involving creating resources, facilitating organization and improving efficacy; and the other is related to the 'needs of students' involving their preferences for the use of technology and their improved comprehension etc. However, it is important to explore the perception of individuals about the use of technology because these evaluations could be used as a starting point to determine the extent to which these factors influence technology adaptation (Smarkola, 2008).

Many researchers have presented the idea that many university teachers usually express positive feelings about the use of the blended learning approach (Brill and Galloway, 2007; Nicholson and Sanber, 2007) and this observation was mostly communicated by their students. As Bakioglu and Hacifazlioglu (2007) explored the opinion of some university students about the attitude of their teachers towards the use of technology during the teaching-learning process and it was revealed that most of the students revealed that their teachers has a positive attitude towards blended learning. However, some of the students conveyed the resistance and fear of their teachers about the use of technology and suggested that these teachers should be provided with specialized training for the effective use of technology and blended learning in their classrooms.

Venkatesh et al. (2003) analyzed a model related to technology acceptance including the themes: technology acceptance, the theory of reasoned action, the theory of planned behaviour, the motivational model, the model of PC utilization, a model of combining the technology acceptance model, social cognitive theory, and the innovation diffusion theory (Venkatesh, Morris, Davis, & Davis, 2003). This research came up with a 'Unified Theory of Acceptance and Use of Technology (UTAUT) and has identified four main areas that influence the attitude and

intention for the use of technology by teachers: a) 'effort expectancy' that is the general attitude towards the ease of technology use; b) 'performance expectancy' which involve the confidence that the use of technology would help to improve their job performance; c) 'social influence' which is about their belief regarding how much others consider it important to use the technology for better performance; d) facilitating conditions that involve their confidence about the availability of technical and organizational infrastructure for the effective use of technology.

Sumak and Pusnik (2011) expressed that the most popular approaches to investigating the teachers' satisfaction and attitude towards the technology have been presented by Bagozzi and Warshaw's 'Technology Acceptance Model'. In the global knowledge world, the idea of merging online learning and face to face teaching that becomes 'blended learning' has become the most popular approach of delivering knowledge to the learners of the 21st century. Blended learning involves multiple instructional methods (online and face to face) and it does not only offers a variety of instructional modes of delivering content to students but it also claims to be most effective and satisfactory for its users (Farahiza, 2010). Graham (2006) explained the term 'blended learning' as arrangement and combinations of different instructional techniques such as face to face teaching-learning process and online delivery of instructional content and assessments. Many studies have supported the fact that to evaluate the usability and appropriateness of the blended learning approach in the teaching-learning process one has to determine the satisfaction level of its user (teachers and students) (Arbaugh, 2004). Some researchers have supported the idea that students and teachers' satisfaction could serve as a crucial parameter to assess the effectiveness of any teaching-learning process especially involving some innovative changes in traditional instructional approaches such as blended learning. The variable degrees of 'satisfaction' of students or teachers regarding the blended learning approach is defined in terms of their attitude and feelings, which are a subsequent result of enjoying the benefits and profits that they expect from the use of the blended learning system. Therefore, it is realized to be pertinent to explore learning effectiveness in form of identifying the users' satisfaction (Wu, Tennyson, & Hsia, 2010).

2.2 Researches related to BL in European countries

Though the concept of blended learning has become very common in higher education institutions of developed countries, its successful implementation depends upon the vision and mission of the institution. Engaging personnel having the required technological skills, the availability of financial resources, support from senior management and seamless connection between online and face to face learning sessions are key factors that have been explored by researchers (Garrison & Vaughan, 2008) for the successful implementation of blended learning. This is because the extent of providing online degree programs and short programs depends upon the institutional mission and type of learners it attends. It has been confirmed by the Bologna Process Implementation Report (2018) that across EHEA (European Higher Education Area), blended learning has become very common and nearly 18 European countries are offering full-fledged online degree programs and in higher education institutions of more than 39 countries blended learning sessions are being frequently organized.

Since 2014, blended learning has become a top trend as it has been found by researchers Gaebel, Kupriyanova, Morais et al. (2014) that blended learning is being offered by more than 90% of institutions and online courses are a part of degree programs in more than 80% universities. Along with these developments, an online system in universities can prove very helpful for university administrators to utilize alumni services (Trends, 2015). The benefits of blended learning have been further supported by Henderikx and Jansen (2018) who described that frequent use of blended learning has resulted in the form of improved pedagogical approaches and inter-university coordination to upgrade the teaching-learning process. While blended learning has become a popular technique in the teaching-learning process of higher education institutions, the most important element that needs to be focused upon for getting quality results is to ensure "user satisfaction".

The results of many studies have reflected that frequent users (teachers and students) of the online system have both types of views: positive with good experiences (Trpkovska, 2011) and negative with a lot of challenges (Lin, 2008). Students' satisfaction regarding blended learning is dependent on various factors such as adaptability of e-learning, timely feedback from teachers, perception about its usefulness and its applicability in study courses (Wang & Liao, 2008). Furthermore, it has been reported by Wu, Tennyson, and Hsia (2010) that students' satisfaction with blended learning can be determined through various factors i.e. performance expectations, computer self-efficacy, system functionality, interaction with e-learning tools, learning climate and content features etc. It has been also explored that performance expectations and learning climate are key determinants of students' e-learning satisfaction.

The social environment is another important factor that determines students' satisfaction with blended learning (Wu et al., 2010). Furthermore, it has been explored by Owston et al. (2013) that personal preferences of students

about e-learning have a strong effect on students' satisfaction regarding blended learning. Students and teachers specific competencies for dealing with blended learning also determine students' satisfaction, positive perception and experience with blended learning (Jeffrey et al., 2014; Meltem, 2015). It has been explored by researchers Larson & Sung (2009) that the frequent usage of the blended learning model has a positive effect on the effectiveness of the learning environment, students and teachers satisfaction.

Undoubtedly, blended learning yields various advantages for teachers and students, but studies conducted by various researchers (Donnelly, 2010; Sharpe et al., 2006; Wang, Shen, Novak, & Pan, 2009; Woltering, Herrler, Spitzer, & Spreckelsen, 2009) reflect that according to students' perception, the top three advantages of blended learning are: flexibility of completing assigned tasks anywhere/any time, minimum visits to campus and ease of joining online sessions while managing simultaneously job related or personal commitments. It has been asserted by many researchers (Donnelly, 2010; Sharpe et al., 2006; Wang, Shen, Novak, & Pan, 2009; Woltering, Herrler, Spitzer, & Spreckelsen, 2009) that blended learning has not only promoted students satisfaction but it has also enhanced students' involvement, motivation, perseverance and commitment towards the learning process. Frequent use of blended learning has contributed a lot to developing critical thinking skills among students.

Researchers (such as Dziuban et al., 2004; Owston et al., 2008; Twigg, 2003) have explored that blended learning is beneficial not only for students but also for institutions, as students' satisfaction in blended learning courses is relatively higher as compared to courses based on face to face sessions. The direct behaviour of teachers in an online learning environment is also the main determinant of students' satisfaction (Arbaugh, 2000). Blended learning is not only a new trend; it has become a basic necessity of higher education institutions. It enables teachers to overcome learning challenges and strengthen their instructional process by utilizing online learning resources (Cheung & Hew, 2011). Its frequent use has increased learners satisfaction as it enables teachers to incorporate technological innovations with the traditional methods of teaching for fulfilling the diverse learning needs of students (Cheung & Hew, 2011; Graham, 2006). The results of a study conducted by Zhu (2017) to explore students' satisfaction about blended learning courses and their perceived effectiveness reflected that the various factors that are affecting students' satisfaction and perceptions about blended learning. These factors include student competence in dealing with blended learning courses, their preference for learning mode, teacher competence in designing blended learning courses and teacher feedback/support in a blended learning environment.

Along with providing ample facilities for students, blended learning is playing an important role in ensuring the teachers' continuous professional development and teachers have declared positive feedback and higher satisfaction about its effectiveness (Kocoglu & Kesli, 2011). Researchers (Mouzakis & Bourletidis, 2010) have evaluated that blended learning courses have been proved to be very effective in optimizing teachers' professional development during in-service teacher education programs. Teachers have reflected a higher satisfaction with blended learning courses, as they contain a higher level of adaptability and flexibility. According to Hellmig (2008) with enriched opportunities of collegial interaction, blended learning has enabled teachers to become more competent by knowledge and experience sharing. With the frequent practice of blended learning techniques, teachers have become technologically smart and now they are utilizing online learning resources creatively in their classrooms.

In the era of blended learning, teachers have become more self-confident and comfortable with adequate knowledge of accessible online learning materials and resources. Now, they can reconstruct their instructional practices and create online learning platforms by using assumptions of blended learning (Kocoglu & Kesli, 2011). To share their concerns regarding students' diverse behaviour, management related problems, content related complexities and other learning issues; teachers are now participating in online learning communities of practitioners on regular basis (Wenger et al. 2002). According to Stacey & Gerbic (2008), as compared to individual efforts, collaborative work in these communities support teachers a lot to develop professionally.

Just as with students' satisfaction, various factors are affecting teachers' satisfaction with blended learning. It has been stated by Medina (2008) that two key factors are affecting teachers' perception and satisfaction with blended learning: the first is related to learning spaces, the pedagogical value of units and the content material that is to be selected, designed and delivered according to the learning needs of students and the set rules of institutions regarding assessment and curriculum goals. The second factor is related to inter-disciplinary partnerships or joint ventures by which researchers, faculty members, curriculum developers and instructional designers practice their expertise and experiences to improve design, development and evaluation of content, communication skills as well as, teaching and learning experiences in a blended learning course.

For measuring students' satisfaction with blended learning programs, there are many factors involved; however,

some factors are considered strong predictors of satisfaction i.e. online collaboration, students' prior experiences, support and timely feedback from teachers along with teacher competence in implementing blended learning. Though most of the researchers have explored the higher satisfaction of teachers and students with blended learning techniques, however, this area still requires adequate attention from educational administrators for producing the expected outcomes (Dzakiria, Mustafa, & Bakar, 2006). In this regard, Dennen & Wieland's research (2007) has highlighted that students who are involved in the blended learning processes and courses are facing serious problems due to inadequate support from teachers and a lack of social connections.

2.3 Researches showing BL satisfaction among Asian students and teachers

In Asia, higher education institutions are also adopting blended learning parallel their western colleagues. The assumptions underlying the adoption of the blended learning approach include the assimilation of technologies in instructional courses and offering the students with flexible timing which consequently improves their learning. Apart from the traditional face to face teaching, the blended learning approach allows students and teachers to have more extensive learning experiences. Blended learning assists faculty and teachers members to have more interactive instructional techniques, offers flexibility in the teaching-learning environment, promote opportunities for students' learning and contributes to the overall improvement of the instructional process. Through the advancements in technology and the development of various gadgets, higher education institutions across the world have been enabled to offer a greater variety of courses based on face to face and online instructional activities (Tham & Tham, 2011).

Several researchers tried to determine the effectiveness and usefulness of blended learning instruction through investigating the gratification of Asian teachers members and students (Waheed, Kaur, Ain, & Hussain, 2016; Zhu, 2017; Shantakumari & Sajith, 2016). Henrie et al. (2015) worked on longitudinal researches and identified that the students' satisfaction with blended learning was significantly due to the effective learning experience, clearer instruction and multiple options for learning tasks that enhance their motivation and thus improve their achievement (Henrie, Bodily, Manwaring, & Graham, 2015). Ho et al. (2016) highlighted the dissimilarity in blended learning and face-to-face instructional approaches and revealed that the students showed more satisfaction, better understanding, knowledge implementation, and self-efficacy as a result of blended learning instruction (Ho, Nakamori, Ho, & Lim, 2016).

Another study conducted in Hong Kong by Cheng and Chau (2016) discovered that blended learning courses have a stronger relationship with improved learning styles, course satisfaction and the overall achievement of students. Similarly, various researches conducted in other regions of Asia have also revealed that the learning management system (LMS) has a very positive influence on students' academic achievement (Cheng & Chau, 2016). Waheed et al. (2016) projected the idea that in Pakistan the students' academic performance, achievement and motivation is greatly influenced by the use of LMS with the traditional face-to-face method of teaching and the blended learning approach is considered a very productive instructional strategy that has pronouncedly positive effects on these variables (Waheed, Kaur, Ain, & Hussain, 2016).

Chang Zhu and Edmond Kagambe (2017) investigated the ways which impact the effectiveness of blended learning and its impact on East- Central African students' learning outcomes, characteristics, background and overall satisfaction. The results of this study exposed the positive effect of blended learning on students' outcomes. It is concluded that blended learning, like traditional face-to-face teaching, makes teaching learning environment more personalized. The students can learn on their own with flexible timing and at convenient places. The teachers make the courses more interesting and the contents are available online all the time and everyone can access them at their comfort. In blended learning each individual can perceive learning in a different way irrespective of their age; teachers have to bring innovation in their instructional strategies and integrate technology innovatively to improve students' learning.

Hyo-Jeong and Thomas (2008) examined the relationship between social occurrence collaborative learning and the level of satisfaction in a blended teaching-learning setup. In this study, 48 students in higher education participated and it was revealed that the participants were highly satisfied with blended learning as compared to the students who were provided only with the distance education program. Atkins, et al. evaluated the experience of some students who participated in the Asian Regional Capacity Development (ARCADE) blended learning courses which were collaboratively executed in various higher education institutions of Asia, Africa, and Europe (Atkins, et al., 2016). The students were asked to rate the overall satisfaction and effectiveness of blended learning in their studies and it was revealed that students had a very positive perception of the blended learning approach in their studies. Results of the study showed that the blended learning courses have no technical problem and discussions forums could be adequately associated with the practicality of blended learning courses. It was

concluded that the functioning discussion forums and absence of technical problems are very important for an effective and successful blended learning program. It also emphasized that higher education institutions need to focus on these aspects to enhance students' satisfaction with blended learning (Atkins, et al., 2016).

Ismail' (2018) conducted a study in Bahrain to explore the effect of blended learning strategy on the satisfaction of higher education students. This research investigated certain components of blended instruction such as the instructor, course content, and teaching methods; and how these components relate to the satisfaction of teachers and students. It also explored the impact of the blended learning approach on the course of learning theories and its relation with students' satisfaction at the Arabian Gulf University. The participants of the study showed enhanced satisfaction with the blended learning experiences and their constituent units, i.e., course, content, instructors and teaching strategies (Ismail, 2018). Vaksalla, et al. (2019) highlighted in their research that most of the blended learning programs boost students' motivation and encourage them to participate actively in-class activities that resulted in good academic achievement. Vasantha (2018) also worked on some factors related to blended learning that can enhance learners' satisfaction such as BL contains e-Learning that enables students to access information and material at their own pace and convenience; it also offers flexibility in time for learning. The students prefer their choice of learning and respond to various learning activities according to their skills and interests; numerous learning gadgets and technologies motivate them for longer time study and provide practical exposures through web-based modules.

Check, Wong, Fauzi, and Rosnainiemphasized that some key factors could be very significant for the end user's satisfaction with blended learning and need to be investigated properly. To understand the phenomenon, it is essential to discuss and identify some important determinants of satisfaction of the various stakeholders. Some studies explored other determinants of students' and teachers' satisfaction related to blended learning which include internet facilities, attitude towards technology-based instruction and learning, technology anxiety, perception about the easiness of its use, belief about its usefulness, flexibility in designing activities, training in ICT usage and related support, self-efficacy, and the support of the related management. Among these, some teacher-related factors are computer anxiety, attitude towards technology, and internet self-efficacy. However, to promote the positive growth of blended learning in Asian countries, it is necessary to give equal importance to all components including intangible things such as teachers and students' perception and satisfaction with the blended learning programs (Cheok, Wong, Fauzi, & Rosnaini, 2017).

Rahman, Hussein, and Aluwi'sstudy aimed to explore the relationship between factors that influence the individuals' satisfaction and overall learners' satisfaction with the blended learning approach. The results of the study discovered a positive and significant correlation between the dependent variable, i.e., satisfaction with blended learning, and all independent variables i.e., perceived value, ease of use, teachers' and students' interaction, and learning environment. It highlighted that students feel more satisfied if they perceive blended learning to be more beneficial and are offered certain advantages for their learning (Rahman, Hussein, & Aluwi, 2015). Small et al (2012) revealed that some other key factors which improve students' satisfaction with blended learning are course structure, peers interactions, self-motivation, facilitation, and feedback from instructors.

Karimi and Ahmad, (2013)reported the results of a survey that investigated the correlation between satisfaction with blended learning offered in the teacher education program and the perceived learning of three groups from the Institute of Education, International Islamic University Malaysia (IIUM). It was concluded that the participants were highly satisfied and perceived learning more positively via the blended learning approach. A majority of the participants showed a positive response to the statements related to the satisfaction of their learning experiences and the effectiveness of the instructors for implementing the blended learning program.

Muthuraman, Veerasamy, and Nabila(2020) conducted a study in Oman that reviewed related researches based on students' perceptions about blended learning and its effectiveness for improving the students' learning process and their achievement. The results revealed that many researchers found students as encouraged and gratified with the blended learning courses. Students showed a positive attitude towards the policies of BL courses and teachers' support that is assumed to be a key factor in their enhanced learning and overall achievement. Many researchers also highlighted a positive perception of teachers and students towards the use of technology in the teaching-learning process and the blended learning approach due to its many benefits.

A study in the Philippines examines the teachers' and students' responses regarding the use of the blended learning approach in their classrooms. The results of the study showed positive responses of a majority of participants towards the use of online components of instruction along with face-to-face teaching. It was also revealed that participants found an alignment between traditional instructions ways, online instruction, the provision of related resources, a proper environment for performing blended learning tasks and the availability of pre-requisite skills

especially for technology-related tasks (Tayag, 2020). This piece of research also provided a deep discussion and suggestions for higher education institutions regarding how they can engage in the successful implementation of blended learning programs. The students realized the assistances of the blended learning approach in their learning process and emphasized that technology-related issues must be resolved so that they can avail the maximum benefits of this approach. The teacher, on the other hand, stressed proper training related to the development of new pedagogies suitable for blended learning, the provision of related skills, and ample time for developing effective instructional materials and activities following the blended learning method (Tayag, 2020).

Mustary (2019) researched Japan and Bangladesh, and the main aim of this study was to determine some specific means that could help in maintaining the quality of blended learning programs. This study exposed that in Bangladesh, students and teachers were not satisfied with the current condition of blended learning usage in educational institutions and the unavailability of related facilities such as lack of internet farcicalities, poor infrastructure, weak electricity supply and the lack of proper computer knowledge and related training on the part of the teachers. Nonetheless, in Japan teachers and students feel dissatisfaction with blended learning due to lack of collaboration among various stakeholders, the demands of students for more recreational activities and mainly the incongruity among teachers, parents and government (Mustary, 2019)? The study also came up with the conclusion that overall blended learning programs are of great value for students, teachers and the community at larger levels. According to the results of this study, it is realized that the government is the key agent which needs to play a significant part in exterminating all obstacles and providing maximum facilitation for the successful implementations of blended learning programs in all educational institutions.

3. Discussion and Conclusion

The above discussion on the usefulness of blended learning and the satisfaction of students and teachers revealed that this approach has been placed a very positive impact on the overall teaching-learning process all over the world. As Sharpe et al. (2006) explained that blended learning enhances learners' enriched experiences and offer students many opportunities which would enable them to control their learning process, improve their understanding and search for new ways for improving their knowledge. The blended learning approach encourages learner-centred instruction and allows them to learn and gain knowledge at their own pace as it provides students with more flexibility in timings, space and experiences and results lead to greater accomplishment (King & Arnold, 2012; Sharpe, Benfield, & Roberts, 2006). It is also found that some researchers highlighted the dissatisfaction of the teachers and students with blended learning due to certain issues related to it, e.g., a study discussed that students identified problems with the quality of online available content, disturbance during chats and discussion on LMS forums, delayed feedback regarding their assignments, and the lack of LMS training sessions. These issues create many challenges for higher education institutions to adopt this approach properly (Jumani, Malik, & Akram, 2018). A study in Saudi Arabia showed that changing the culture of traditional instruction into blended learning requires a great amount of time and efforts especially in developing countries (Vaksalla, et al., 2019). Vasantha (2018) pointed out that the development of technology and the advancement of digital operations has brought about vital changes in every field of life, particularly in the teaching-learning process. Due to the rapid growth of the digital world, numerous changes have been taken place in educational environments as students and teachers spend a lot of time on the internet to accomplish various tasks. Vaksalla et al. (2019) also pointed out that many people complain of becoming socially isolated of the wastage of their time due to such extensive use of technology and the internet. This sometimes disturbs their social life and leads to the development of antisocial behaviour. So, it is important to ensure a balance among all activities and implement good management of time to bring a balance in their personal and social lives.

4. Recommendations

Based on the above-mentioned content, it is recommended that the development of an active blended learning environment may be ensured by university administrators for the promotion of student-centred learning activities. All educational stakeholders including the government and non-government departments, higher education commissions, teacher and student unions may put in deliberate efforts for the promotion of an online learning platform with enriched learning experiences. For supporting students' learning as well as ensuring their higher level of satisfaction and motivation for learning, it is recommended that higher education institutions may adopt and utilize available online social communication tools. As has been asserted by Ismail (2018) faculties may create a balance between traditional and innovative learning strategies for making the learning process enjoyable and a source of fun with the major aim of supporting students' learning.

The common problems that arise in blended learning programs are related to the internet connection and a greater

number of online assignments. University authorities may take initiatives for minimizing the effects of these problems on blended learning programs. It has been suggested by researchers (Vaksalla, et al., 2019) that for making blended learning successful, attractive and effective, directions regarding its easy usage may be provided in the curriculum itself and a chatbox may be created for students. For getting expected outcomes, students may be equipped with adequate knowledge and skills to navigate the various tasks that are being assigned to them. From the available literature, it has been explored that due to the improper alignment between face to face and online learning sessions, the inadequate spacing of activities, and the lack of consideration for the provision of prerequisite skills, students' satisfaction remains low with blended learning courses. Students are also facing problems regarding multiple online tasks to be done at a time, the feedback of teachers and the skills required for the completion of online tasks. For ensuring students satisfaction, an alignment between online and face to face learning tasks may be ensured so that students may easily share their concerns regarding learning tasks.

Along with students' related concerns, it has been also reported by researchers that in blended learning courses teachers are facing problems related to the availability of sufficient time for the preparation of instructional materials, training for new pedagogy and inadequacy of technical skills. Though, teachers are aware of the fact that for the successful implementation of the blended learning technique, it is required to get adequate training a specific set of learning paradigms and strategies. But, unfortunately, training regarding these aspects remains superficial and educational administrators cannot ensure the development of the required competence among teachers. For the successful implementation of the blended learning technique, it is recommended that concerned educational authorities may take initiative for providing ICT infrastructure to all higher education institutions, restructure the curriculum and assessment system and ensure continuous professional development of the teachers with the major of making them technologically smart. It has become the need of the hour to provide adequate ongoing pedagogical and technical support not only for teachers but also for students of blended learning programs, so that they may overcome problems that are creating hurdles to thrive in a blended learning classroom.

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Impact of Blended Learning on Teacher Education for Tutors at Bangladesh Open University

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Bangladesh is a developing country with rapid economic growth for the last few years and it has made tremendous development in the adoption of internet and mobile technologies at affordable prices. Technology-enabled learning (TEL) is becoming a motive force of the pedagogical innovations in higher education institutions around the globe. In line with this, institutes in Bangladesh are implementing blended learning for uplifting the quality of education at all levels. Bangladesh Open University (BOU) – the only distance educational institution in the country – runs programs using open and distance learning (ODL) system where TEL and open educational resources (OER) play a vital role in the delivery of courses. For tutors' professional development in the aspect of TEL, BOU implements teacher education courses using a blended learning approach. This paper presents the implementation of the blended "teacher education course" under European Union-funded BLTeae project using Moodle Learning Management System (LMS) and discusses the impact on teacher education in Bangladesh from 2018 to 2019. At the end of the implementation, the tutors' blended learning (BL) experience was studied by focus group discussion and qualitative analysis. Results show that tutors' blended instruction could achieve better learning experiences than a traditional class with a higher satisfaction score. The outcome of the research shows that BL can improve quality in higher education, has the potential to improve teacher education, and should be recommended to the mainstream teacher education in Bangladesh although there are challenges to implementing blended learning as the IT infrastructure is relatively limited.

Keywords: blended-learning, open learning, teacher education, tutor, e-learning, technology, flipped classroom, technology-enabled learning, collaborative teaching, BOU teachers and tutors, professional development, pedagogy.

1. Introduction

E-Learning has been a driving force of pedagogical and technological innovations in higher education institutions around the globe, and the most practised form of e-Learning is blended learning (BL) which means integrating traditional face-to-face (F2F) with online instruction (Ward and La Branche, 2003; Garrison & Vaughan, 2008; Jachin and Usagawa, 2017). BL creates opportunities for engaging both tutors and learners online. Kjærgaard (2017) states that BL focuses on technology-mediated activities and reduce F2F activities. BL has received increasing attention globally (Arbaugh, 2014; O'Flaherty & Phillips, 2015) as it is proved to be convenient, supportive, user friendly, and cost-effective. Although BL preceded modern instructional technologies, its evolution will intimately be bound to contemporary ICTs (Dziuban, et al. 2018). Technology provides a platform for interactions similar to what teachers and students do in the F2F settings, and the electronic devices with the support of ICT and internet connectivity help in facilitating relevant knowledge sharing, learning materials and course contents, conducting an online assessment of learners by teachers. The BL method has promoted scope for discussion and helped to create a new learning community (Lord and Lomicka, 2008). This is why, BL is getting popular around the world especially as a mode of delivery in higher education (Dziuban, et al. 2016). With the support of advanced technologies, mobile learning as part of blended learning is moving very fast in Bangladesh by using social media, open-source platforms, and the already adopted personal digital technologies. In addition, there are some institutional initiatives for using BL instructions in higher education where Bangladesh Open University (BOU) has been the pioneer and it already implemented a project titled 'Blended Learning for Teacher Education for Asia and Europe' (in short: BLTeae) with Erasmus+ KA2 grant. The project generated 20 modules, and teacher educators were trained using the modules through the Moodle platform. This chapter discusses the impact of virtual training on blended learning for BOU tutors and also highlights the nature of the challenges of

using digital technologies at a university in Bangladesh, where the adoption of digital learning approaches are constrained by institutional and individual-level barriers.

2. Background

While numerous studies on the use of technology-enabled learning (TEL) activities in higher education in developed countries have been conducted, there is relatively scanty empirical research on how various barriers are manifested during the adoption of technologies in higher education.

In Bangladesh, much is expected from the adoption of blended learning in higher education as the country has a "digital Bangladesh" vision (came into existence in 2002), which was revised from time to time considering contemporary issues in ICT in general and ICT in education in particular, and the National Education Policy 2010 (NEP2010). Based on these policies, the Ministry of Education (MoE) developed a plan for ICT in Education 2012-21. Policies and plans are in place, and implementation of the TEL-based programme has been challenging. The present study explores how technology-supported blended learning contribute to the existing teaching and learning process for teacher educators in Bangladesh.

In 1986, the Bangladesh Institute of Distance Education (BIDE) merged with Bangladesh Open University (BOU). In 1992, BOU launched teacher education for in-service teachers through open and distance learning (ODL) mode by using broadcast technologies. ICT was in place for teacher education in Bangladesh for a long (Dey, 2003), and the impact of technology was very high in the development of teacher education in Bangladesh because it drew the attention of the policy-makers. BOU continued the teacher education programmes using the same modus operandi through the School of Education (SOE) where broadcast technology was the main technology (Hossain and Muttaqi, 2006).

To turn the country fully digitized by 2021 (Siddiqi, 2009), and to implement the Master Plan for ICT in education (2012-2021) (MoE, 2013) megaproject titled "Access to Information (a2i)" is being implemented from 2007 which has created a healthy environment for the TEL for teacher education. But most of the TEL initiatives are project-based, for example, the Education Ministry implemented a project on Teaching Quality Improvement (TQI), BOU did a project on e-learning with the Commonwealth of Learning (COL), and BLTeae project with EU. All these happened because of having felt the benefits of TEL for teacher education. Face-to-face contacts at the School of Education are run through the formal teachers from the teachers' training colleges who are designated as 'tutors' at BOU, and TEL is highly regarded within them. Tutors' who are trained in TEL are also known as teacher educators because they teach the TEL application to other teachers of their institutes. Digitalized classrooms and TEL are more productive and interactive than traditional classrooms (Keengwe, 2008; Kessy, 2006). Capitalizing on the digitalized classroom, Bangladesh began to adopt TEL, but there have been barriers, including but not limited to the lack of trained teachers in the country in general and in the rural areas in particular (Ashraf et al., 2011, Khalid, 2014). However, Bangladesh is adopting technologies in its teacher training programs for uplifting the quality of education. There is a low rate of adoption of TEL practice in Bangladesh, and changing teachers' negative attitudes is crucial for improving their computer skills and in-service training to the teachers is needed (Sultana and Haque, 2018; Khan, et al., 2012). Therefore, there is an increasing demand for professional development programs on TEL and Technology Pedagogy Content knowledge (TPCK) model, and at the same time, there are challenges of using ICT in professional development programs in Bangladesh (Khan, 2014). The aforementioned issues are major concerns for the teachers, trainers, policymakers and other educators who are directly and indirectly accountable for teachers' professional development programs for introducing ICT in Bangladesh.

This chapter, therefore, focuses on assessing the use of technology in blended learning to support professional development for in-service teachers. We looked at the intervention and impact of – BLTeae project at BOU – and examined the challenges and difficulties associated with using technology to aid teacher education in the Bangladesh context. The current study has two contexts – the BLTeae project and the TEL-based teacher education.

3. Blended Learning in Bangladesh: Issues, Challenges and Problems

This research was conducted in the context of a developing country – Bangladesh, where adoption of technologies in academic institutes for blended learning is mostly facilitated through a top-down approach that is how the national policy has been formulated for adopting a blended approach in programme delivery. Certainly, there are problems in implementing a blended learning programme because all teachers are not well-trained and the infrastructure for TEL is not well-established. In this situation, BLTeae gave a thrust in experiencing the TEL

programme in the field of teacher education through the blended programme, and it impacted policy consideration for mainstream blended learning in the education sector. Intervention by the BLTeae project was the blended-learning for teacher education through Bangladesh Open University was the use of Moodle learning management system (LMS) as a medium of e-learning. Such innovation in the context of Bangladesh where the resources constraints are certainly expected to bring something new to teacher education for enhancing the quality of education

It achieves the following objectives:

1. to assess the reflection of stakeholders (academics, teacher educators and tutors) on the blended teacher education;
2. to ascertain the perceptions towards the use of technology-enabled learning (TEL) by the teachers and tutors for improving the learners' engagements;
3. to identify the use of the personal digital practice (for instance, social media) in the promotion of blended learning;
4. to suggest, based on i) to iii), for effective use of technologies in teaching-learning activities in Bangladesh.

5. Methodology

5.1 Tools and Techniques

BOU has more than 2600 tutors who facilitate educational activities countrywide. The focus group discussion (FGD) was conducted with teacher educators and was selected these teachers from different regional and sub-regional areas of Bangladesh. For this research, a qualitative approach was followed to get the ground realities of introducing the blended mode of teaching and learning for the BOU learners. The advantage of this qualitative approach was it helped to understand details of social issues through obtaining in-depth information from purposely selected teachers educators groups, who are treated as tutors rather than from a statistically representative sample of a broader population. Conservation strategy was also extensively followed in conducting FGDs for understanding the in-depth ground realities of blended learning situations (Ochieng et al. 2017). The FGDs were held by a series of dissemination workshops conducted region-wise by the 2nd author of this research who was also the BLTeae Layer. On the other hand, the 1st author and 3rd author conducted individual focus group discussion which was based on interactive discussion with all participants. This is the most convenient type of focus group discussion as mentioned by Morgan (1996). The FGD is sometimes seen as synonymous with interviews, especially the semi-structured "one to one" and "group interviews" (Parker & Tritter, 2006). In this study, the FGDs are adopted to uncover the ground realities, especially the tutor's experiences, perceptions and values, and the same is supported by Mac and Ghaill (1994); Sewell (1997); and Skeggs (1997). This study developed a standard checklist reflecting the knowledge, practice and implementation of blended learning with special emphasis to ICT supported online teaching and learning at BOU, the role of BOU Media Center for promoting online educational programmes through Web-Cam TV and Radio, BOU Tube, YouTube, Television and Face book stream, recording of lectures and transferring it into audio and video etc. Moreover, how the Open Education Resource (OER) repository created by BOU helped the tutors and learners, VIC, m-learning, social media, LMS, CEP, and required software. In addition, how the promotional material, press releases, articles, leaflets, newsletters, etc. were helping the BOU learners as all these were supported by BOU administration and tutors country-wide. In addition, how BOU was able to synchronize the text-based classroom review classes with online educational programmes was also discussed in all these FGD sessions. Finally, this research adopted cluster units (Regional Centres) for the collection of data from the tutors/teacher educators/ teacher coordinators from TTCs and BOU tutors.

5.2 Regional Centre Sample

From the existing 12 Regional Centres (RCs) of BOU, 5 RCs were randomly selected for the current study. 5 RCs are Sylhet, Rangpur, Chattogram, Jessore, and Rajshahi for dissemination workshops followed by the single focus group discussion with the participants, who were faculty members of Teachers Training Colleges (TTCs), Tutors of BOU academic programs, and teacher coordinators of BOU. Pro-Vice Chancellor, Registrar, and BLTeae members delivered speeches in the inaugural sessions of the workshops held in the Regional Centres of the University to inform the activities done throughout the project lifetime and FGDs were held after the inaugural sessions.

The regional Centres could be visualized for their location in Figure 1. For this study, BEd and BA/BSS programmes of the BOU were considered and respondents were both teacher educators and tutors. The data were collected in 2019.

Figure 1: BOU Intervention Source: BOU PPD Department

5.3 Tutor Sample

A total of 227 tutors/teacher educators/ teacher coordinators of the BEd and BA/BSS programmes were randomly selected, of which 43 were from Sylhet, 47 from Rangpur, 54 from Chattogram, 45 from Jessore and 38 from Rajshahi (Table 1).

Table 1: No. of participants

RCs	Sylhet	Rangpur	Chattogram	Jassore	Rajshahi
Teacher Educator	5	4	6	3	2
Teacher Coordinator	3	5	4	4	3
BOU Tutors	35	38	44	38	33
Total Participants	**43**	**47**	**54**	**45**	**38**

The age group of the participants was 35 to 55 years.

5.4 Instruments

The instrument was a comprehensive checklist used to gain an understanding of the perspectives of teachers about key aspects of TEL in the HE institutes and the impacts of the BL in education. The checklist comprised aspects of technology infrastructure, policy and its subsequent initiatives towards TEL, digital divide amongst institutes, internet connectivity and affordability, access to social media, and tutors' digital connectivity with students. An assigned note-taker recorded what was being said and observed. Responses to questions were documented in a notebook. Interpretations of the responses were not recorded during the note-taking. Recorded the responses of the majority of the answers provided by the group, and focused responses were transcribed. Leading comments comprised the major findings of the current research.

6. Major Findings

Despite these constraints, the students and teachers have a positive attitude towards using the LMS in the FGD. There are also some technical problems such as poor Internet connection which restrict access to e-learning

platforms (Sarker et al, 2019). Our interview extracts show the BOU tutors' attitudes towards the use of the LMS for their own professional and personal development. The data have been analyzed and discussed using a qualitative framework which allows an impact of BL using e-learning technologies the teacher education in Bangladesh. This was interesting to talk to the tutors during the dissemination workshops in each cluster. Major findings from FGDs were as follows.

All institutes have ICT supported devices like computers, multi-media, internet connectivity through broadband for supporting blended academic programmes but some of the tutors are not well trained

With the support of ICT and broadband internet connectivity, devices such as computers, laptops, tab, and smartphones are playing important role in the blended approach for the teachers' education and professional development. Computer technology and mobile phones have been a part of life in Bangladesh during the last decade because of the implementation of the digital Bangladesh agenda by the government. Whether it is institutional or self-managed or adopted technology is already with the teachers.

> Respondent [1] said:'ICT supported devices is not a problem in the institutes. Most of the institutes have computers and teachers also do have laptops, computers and smartphones. Even students have smartphones, Therefore conducting a blended mode of educational activities is not a problem'. [1]

The adoption of personalized technologies, especially mobile, has positively impacted teachers' personal and professional development.

> One of the teachers educators [2] said how personalized technologies are helping him: 'Most of the teachers' have access to computer devices. Some of them are using these devices for personal and professional tasks and activities, on the other hand, others especially those who are trained in ICT, are using both for personal and educational purposes. There is a huge gap in the attitude of trained and untrained tutors and teachers educators because skilled teachers are already blending their teaching and learning through adopting mobile technology where videos related to lectures and documentaries are of dominating materials'.

Most of the ICT-based initiatives have been taken by the Ministry of Education (MoE)

Application and deployment of educational advanced technologies in Bangladesh are being executed through a top-down approach as the Education Ministry implement it according to its plan, support and strategies to be followed. Two tutor respondents opined that ministerial interventions have advantages over deployment and connectivity of technologies in the educational institutes of Bangladesh: Four tutor respondents said how their institutes have been connected through ICT supported devices for teaching-learning purposes:

> The tutor [3] from Bamondi- Nishipur School & College, Meherpur said, 'my college is located in the remote most area of Meherpur district of north-south Bangladesh, where using ICT was almost absurd to even until a couple of years ago. As part of recent development, the College Principal shared this challenge with the ministerial high officials. As a consequence, the instant positive intervention was taken place by the appropriate authorities for constructing the ICT room equipped with computers, facilities of multi-media and PowerPoint presentation with the support of broadband internet facilities and finally, we became benefited from it.

> The tutor [4] from the Government Teacher's Training College, Rangpur passed the remarks that 'it is the Ministry of Education personnel who facilitated training on the application of ICT in conducting educational activities, and subsequently some of the trained teachers became the master trainer. With the support of a master trainer, most of the local teachers shared the skill and most of them are highly motivated to facilitate and conduct the ICT supported classes for BOU learners'.

> The tutor [5] from the K.B.M. College, Dinajpur pointed out that 'some of the teachers of K.B.M College have access to BOU Tube and YouTube. These accessibilities help them to supply various academic contents and materials to the learners. The learners very often download the required educational materials. Some of the teachers have already received training organized by the concerned Ministry'.

> The tutor [6] from Pairabandha Begum Rokeya Smirity Degree College, Rangpur said, 'ICT-supported facilities facilitated by the Education Ministry has been very impactful in the ICT-enabled learning and development at my college, and the Principal of the College launched the SMS technology for communicating learners' attendance in the class room'.

The government-run institutes are given priority through government-approved projects with the help of the World Bank and Asian Development Bank to develop ICT infrastructure constitutes by both hardware and software including laptops and multimedia supported classroom

> A teacher [7] from Chottagram Teacher Training College passed the following remarks: 'I believe my success as teacher's educator happened due to my hands-on practical training by the ministerial project. It would never happen in my institution due to limited resources as there is very limited access to teachers of private academic institutions. I raised this challenging point in the ministerial training workshop where the concerned professional who is also the facilitator, informed me that most of the ICT training is run through different projects, funded by the World Bank and ADB. I believe that in near future, all the private and public academic institutions would be within the coverage of modern training equipment and well-trained teachers' support'.

However, many of these training activities focus mainly on computer literacy instead of enabling teachers to integrate ICT in their day-to-day teaching activities and master the use of ICT as an effective tool to improve TEL. Capacity building of teachers is therefore increasingly being recognized in Bangladesh and critical to the success of BLTeae supported TEL-based teacher education initiatives and this initiative has helped BOU tutors to be the part of teacher education and training.

When the tutors were asked whether they are connected through Wi-Fi, about 50% of tutors reported that they have internet connectivity and all the tutors reported that they use both the broadband supported internet and Wi-Fi.

Mobile coverage reaches 90 per cent of the population in Bangladesh though there is still scope to increase mobile usage. Despite having extremely affordable mobile services, Internet costs for the users are relatively high within the South and South Asian regions, and this is why the Internet usage rate is relatively low in Bangladesh (Rahman and Aziz, 2019). But the positive aspect is that Mobile technology has been flourished at a reasonable rate in the countrysides of Bangladesh, and tutors take support of Mobile services including supports of various apps for personal, educational and professional connectivity and development purposes. The mobile device enables BOU tutors to use audio and video resources at their convenient times. Almost half of BOU tutors use Wi-Fi at schools and at home.

> A tutor [8] of Govt. Haji Md. Mohsin College, Chattogram said, "I have limited scope to use Wi-Fi at the college campus, but I use mobile data but again it is bit expensive and uploading the educational resources costs additional money to back-up, sometimes become beyond my capacity. Moreover, it is difficult to use mobile data at home as kids are also inclined with different kinds of mobile games".

The smartphone has become the most affordable means and most of the teachers/tutors can afford it

Smartphones are portable, socially interactive, contextually sensitive, and powerful connective means. Therefore, it has not been only a culture of nowadays, but this has been also an option to teachers as it helps to channelize different kinds of information and connectivity with learners. Sometimes it creates more options and facilitates many apps and provision through updated software and hardware support. The mobile devices have some particular and distinct features which are very supportive for facilitating mobile learning, and most of the tutors and learners of BOU are progressively recognizing the support of this useful device. Mobile learning has helped tutors to get connected to their learners/students. This has also helped the tutors and learners to change their attitudes towards the use of handy devices with all kinds of technologies and means of connectivity (Ismail et al., 2013; Wentzel et al., 2005). The smartphones also help the teachers to interact with their learners outside of classrooms and also help to connect their students for providing different contents, lecture materials, submitting assignments and many relevant academic activities. Teachers feel very convenient to use smartphones in teaching and learning to create teaching more attractive for their students. For example, the tutors often share their lecture materials in the form of PowerPoint presentations through smartphones (Anshari et al, 2017). Teachers also interact with their learners in case of all kinds of consultation including social, psychological and economic hardships. Some teachers are also very effective in providing support in the form of counselling during all kinds of depression, anxiety, uncertainty, sadness, insecurity etc. For example, during COVID-19, many teachers were very helpful for students especially those who were suffering from anxiety, trauma, social stigma and many kinds of depression especially those students who were not part of the classroom teaching and learning system. Many teachers were so generous in addressing, mitigating or at least minimizing distractions that can upset many learners during any kind of crisis. Three respondents said how it is beneficial to them.

The tutor [9] said, 'I have noticed that all of my colleagues use smartphones and I also use it as it is affordable along with all updated features and supports of different apps due to global competitive market.'

The tutor [10] said, 'I had an old model ordinary cell phone but subsequently I was able to replace the dated one and got a new smartphone. This phone is quite helpful to connect my students in groups and also support to provide learning materials to them. Even my other colleagues are also facilitating their students with the support of smartphone. Therefore, having a smartphone is no more luxury rather supporting for facilitating the students with all kind of academic assistance including consultation and tutoring'.

The teacher [12] said, 'an ordinary cell phone hardly costs around Tk. 1,500, on the other hand, a smartphone does cost around Tk 3,000. Therefore, it's comfortably affordable to most of the teachers and students.

It's evident that Bangladesh is digitizing itself at a fast pace, assumably for implementing 'Digital Bangladesh vision, aim and objectives. With the increase of accessibility to the internet, the advent of blended learning for teacher educators has also shown a positive signal to the country's persistent digital divide.

Most of the tutors and course coordinators have access to social media, especially Facebook

Social media have become an integral part of most of the tutors and students means of social and academic connectivity. Moreover, integrating this network with educational activities becoming more important support than before, especially for the BOU teachers/tutors and students/learners. It is also becoming important for the tutors and learners of BOU to get acquainted with different social media in facilitating educational activities. The tutors of BOU have taught the learners (sometimes with the support of colleagues and classmates) how to take advantage of this handy technology supported device for different educational activities. At least two tutors have passed their remarks about how the students gradually acclimated to social media:

The tutor [15] said, 'apparently taking help of smartphone is not the exact substitute of classroom teaching and learning, but is very useful and crucial for blending mode of open and distance learning system as the features and different apps are quite handy like a computer device'.

The tutor [16] commented, 'it is very important for us to stay connected with the students and it is the best way to connect them through different social media for sharing education-related knowledge, study materials, assessment through assignment, presentation etc. especially the Face book as almost all the students are using this social media for their socialization and connectivity'.

Most of the teachers are connected through Facebook and WhatsApp with different groups of Students

Although LMS is recognized as the most appropriate tool for blended education, many tutors have accessibility to different social networks. Therefore, apart from using LMS, many tutors connect their learners using different types of social media to share the classroom lecture materials including following the live lectures, provision for preparing assignments by the learners, presenting and submitting the assignments by the learners, tutors facilitate point of clarification with students, frequent interaction among and between tutors and learners, guiding study circles and study groups created by the learners, and many more supports for learners. Therefore with the help of different social media, tutors provide learners much more opportunities for direct communication between tutors and learners, even with guardians, who can cross-check with the tutors about the progress of their sons and daughters educational tasks that they are carrying as part of their educational attainment. Where the LMS is difficult to use, the tutors use the social network and different platforms. Following tutors said how they use different social media, especially Facebook and WhatsApp as an alternative to LMS.

The tutor [18] said, 'We, some of the tutors helped the learners to create Facebook groups against each specific course to upload our lecture materials and to make discussions with students, and to assign homework and overview the overall progress of the learners'.

The tutor [19] informed that 'I keep my students engaged in studying even during long holidays through Facebook, and it is the most convenient means of networking and connectivity, especially for conducting online classes and it is the easiest means of connectivity with students'.

The tutor [20] passed the remarks, 'I am fully satisfied using very convenient connectivity with my learners through social media, especially Face book apart from socialization and other personal connectivity.' He

further said Facebook Group is one kind of convenient means of connectivity for maintaining and performing professional tasks when most of the students do not feel comfortable with other means of connectivity'.

Most of the tutors and coordinators reported that as most of the students have smartphones and as they regularly use mobile data for social networking, this has been a tremendous opportunity for them to be successful in following the blended mode of learning of BOU.

Integrating the smartphone as a learning tool for the students has been a wise decision because there are a wide variety of features and operating systems for the use and display of information and communication on its screen (Ahmed, Everett and Turnbull, 2017). It is now accepted within the teachers and students community that the use of smartphones is helpful for effective learning (Seralidou & Douligeris, 2016). It has reduced the challenge to get access to ICT supported large digital devices (Rahman and Aziz, 2019). Three of the respondents said that the students were able to afford various social media as part of educational resources and connectivity.

Respondent [21] said, 'my students collect their study documents through various social media and help to get connected with me through WhatsApp, Facebook, and Messenger and this practice is quite applicable for other students too'.

Respondent [22] remarks, 'students those who face various challenges relating to getting educational materials and connectivity with teachers, able to do that by using mobile data and even many of them keep themselves connected with foreign friends through various social media, so how can we deny the handy and most conveniences?'

Respondent [23] said, 'Facebook is one of the most popular online social media that helps millions of students at tertiary level in Bangladesh. With the support of this popular social media, students can maintain connectivity with their classmates, consult each other relating to their courses, and able to get access to share the lecture materials and resources. They can even able to upload the relevant educational materials to various social media, i.e, Facebook pages or groups. Most of the learners use mobile data which is a bit expensive to them. I believe students cannot just stop using various social media, since various activities such as downloading learning materials and relevant study resources take place on this social media platform'.

7. Conclusion and Recommendations

The current research examined the promises of blended teacher education to uplift the quality of higher education. Blended learning in formal institutes provides high satisfaction because it creates an environment for the students and tutors to acquire the required knowledge to use ICT devices which, in turn, motivate them to adopt personalized technologies, such as social media – Facebook, YouTube, in the teaching-learning process. In addition, it provides more independent and collaborative studies and extends the flexibility of anytime-anywhere study. It creates opportunities to review before attending face-to-face classes. Tutors expressed that they would like to be more enthusiastic for blended courses in the future as personalized technologies has been growing in size because of its tremendous benefit in education. The study revealed that policy for ICT in education is in place, and despite that deployment of technologies in the institutes is low although government-run schools/colleges are getting minimal technology support from the ministry. In this situation, tutors have been very dynamic in using their self-adopted technology in education in Bangladesh. The tutors feel that students acquired more skills in the blended settings. This research result shows that implementation of blended teacher education can improve the overall quality of higher education, benefiting both students and tutors, becoming a positive impact for not only colleges but also for higher education and teacher training in Bangladesh. These findings show that blended teacher education can be used for in-service teacher training in Bangladesh to achieve better quality and more flexibility for the teachers, especially in remote areas. The prevailing challenges could minimize through better designing and implementing effective LMS and e-Learning platforms. Bangladesh is to some extent resource-constraints no doubt, but it has a culture of following personalized technology which has been tremendous opportunities for blended learning. It is therefore recommended to use personalized technology for blended learning in Bangladesh along with the open-sourced LMS.

8. Future Research Directions

The current research suggests that future research on blended learning in the context of BOU and other academic institutions should have a more balanced focus on both ICT supported online and F2F activities to support teachers, tutors and learners in higher education institutions' transition into blended learning with personalized

technologies, i.e., social media – Face book, YouTube channel, Open Educational Resources (OER), and open-sourced LMS etc.

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PARTICIPATING INSTITUTES

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A User-centred Approach To Redesigning Teaching and Learning with ICT in Samtse College of Education, Bhutan

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In the kingdom of Bhutan, education holds an important place in society and is given priority in the development of modern Bhutan. To further develop teaching and learning through the use of technology, a workshop was carried out by a research team to try out a form of professional development activity where user involvement was critical to the outcome. Teaching staff from the college participated in the workshop, and this paper presents the methodology, the outcomes, and the perspectives for further work within this type of professional and educational development. Besides contributing to the local capacity building for developing education, this study has provided insights into the impact of an intervention based workshop methodology on current and future pedagogic practices, and the level of technology use. These findings provide a guide for the planning of future intervention workshops.

Keywords: Blended learning; learning design; intervention based workshops; Bhutan

1. Introduction

In the small kingdom of Bhutan, education holds an important place in society and is given priority in the development of modern Bhutan. Also, the use of ICT for teaching and learning has attracted the attention of the country's leader, as is seen in the opening statement in a white paper on ICT in Bhutan: "ICT can have an immense impact on virtually all aspects of our lives, the Royal Government of Bhutan owns this vision and declares a strong commitment to developing and implementing a national ICT strategy and action plan, based on the ICT vision" (MoIC, 2013). The potential of ICT as a tool for both learning and teaching has long been acknowledged, both in developed and developing countries. Based on the experiences from the past 30 years, it is clear that challenges exist which need special attention when an institution or a teacher wishes to rethink the pedagogical approach with ICT.

In recent years, the traditional literacy areas of reading, writing and mathematics have been extended with information and media literacy, global and economic literacy, and civic responsibility, which are all considered to be some of the so-called 21st-century skills. In an extensive comparison of frameworks of 21st-century skills, Dede claims that education for the 21st century should encompass the following:

- 21st-century content knowledge, learning and thinking (critical-thinking and problem-solving skills, communication skills, creativity and innovation skills, collaboration skills, contextual learning skills, Information and media literacy skills)
- ICT literacy (ability to use technology to develop 21st-century content knowledge and skills), and
- life skills (Dede 2009).

To enhance teaching and learning teachers must understand the factors which influence the education culture (Wiske, 2004). The present generation of learners is very engaged with the internet and email, text messaging, and the use of social software. Beetham & Sharpe (2007) claim that this technological experience is carried into the learning space, and this should remind teachers to be aware of the learning experiences learners are exposed to to create a relevant learning environment.

While the education system in most Western countries initiated the integration of technology more than 25 years ago, in Bhutan and specifically at the Royal University of Bhutan (RUB) the attempt for implementation of educational

technology is more recent. However, the need for change has already been realised in Bhutan eg. as stated in the introductory statement in the Bhutan ICT white paper "the explosive development of information and communications technologies (ICT) and their applications are changing the way people live, learn, work and interact" (MoIC, 2013). These discussions point to the fact that educators need to rethink teaching and learning to prepare for 21st-century education. A policy for all RUB colleges to use a virtual learning environment (VLE) was formally launched in April 2011 (Kinley, Zander, Georgsen, & Choeda, 2013). However, at one Bhutanese college (Samtse College of Education, SCE), the initiation of technology use for teaching began as early as 2004 (Jamtsho & Bullen, 2007), and since then there have been parallel and simultaneous attempts with infrastructure development, skills development and integrating technology with pedagogy to harness knowledge befitting 21st-century education. However, this is a project with many challenges, one of which is the very attempt to change teaching practices and cultures. Furthermore, successful integration of ICT into existing teaching practices requires competence building in several interrelated areas: Learning design; technology (ICT); teaching and learning; materials or artefacts used in teaching and learning; and organisational development.

A leading researcher in e-learning and learning design, Grainne Conole, has proposed that teachers new to e-learning design need guidance and advice from experts, experienced peers, and users to take advantage of the affordance of the new technologies and make pedagogically informed decisions (Conole 2010). Designing courses have to be done with students at the centre of the process as they are the ultimate users in a teaching and learning context. The identity of users is defined by Abras, Maloney-Krichmar & Preece, (2004:4) as "the people who will use the final product or artefact to accomplish a task or goal". User-centred design is an approach in which the users influence the design process (Abras, Maloney-Krichmar, & Preece, 2004: Kahraman, 2010). In other words, it is an approach that actively involves users in the design process to develop a more effective and efficient teaching and learning process. In a recent study, Kahraman concludes that "the application of methodologies of user-centred design into teaching process of university education increased the effectiveness of courses and learnability and success of students" (2010: p.2076).

As part of the joint research project "ICT Integration in teaching and learning across the curriculum in the Institutions of the Royal University of Bhutan", researchers from SCE and Aalborg University in Denmark have carried out studies and workshop activities with teaching staff at SCE to pave the way for an interventionist and action-based research project. The project applied a user-centric approach in the development activities taking place, and in particular, the research team was interested in how to balance the institutional need for the introduction of ICT in the teaching practices with the current level of technological experience amongst the teaching staff. This is a well-known challenge in user-oriented design and development, and if it is not handled successfully, it can result in a reduced level of participation and minimal ownership of the design solutions developed. To initiate a long term development process, one of the aims of the project was to give rise to situated learning and to form a community of practice amongst the lecturers of SCE in the use of ICT for teaching. Therefore, the research team has carried out a workshop in the form of professional development activity with teaching staff from the college, and the workshop methodology, the outcomes of it, and the perspectives for further work are the main topics of this paper. Following this introduction to the focus of the study and the institutional setting for the work in Bhutan, we give a brief state of the art concerning educational change and the use of ICT (section 2 Literature review). The literature review illustrates that the connections between the use of ICT in education, teachers' ICT teaching skills and students' learning outcomes are very complex, and as such professional development in this field is not trivial. Based on the literature, is concluded that a practice-oriented, user-involving and experimental approach shows more potential than traditional course-based approaches. In section 3, we present the empirical setting for the study and give a brief description of the methodology applied.

2. Literature review

In the following, we give a brief introduction to the state of the art to educational change with rethinking pedagogy for 21st-century teaching. The reasons for re-thinking pedagogy in the digital age have different sources of origin and relate to various aspects of education. We will mention only two here, namely the development of ICT and its potential as a tool for learning and teaching; and the emerging consensus on the importance of the so-called 21st-century skills. These two issues are in a way intertwined, as the following discussion will reveal.

Darling-Hammond & McLaughlin states that an "Educational reform agenda requires most teachers to rethink their practice, to construct new classroom roles and expectations about student outcomes, and to teach in ways they have never taught before - and probably never experienced as students" (1995:597). Brown & Duguid (1996) predicted that higher education will change with changing technology and that building technological infrastructure will be of crucial importance. The penetration of information and technology has stimulated the education system to learn and adapt to the opportunities created by technology (Beetham & Sharpe, 2007). Beetham & Sharpe (2007) mention that current technology is used most commonly for purposes like improving the quality of lecture presentations, making lecture notes

available for students online, and access to digital resources and discussions online. However, even though technology and access to the internet have become even more widespread today, to a certain degree this is also the case in 2021. During the Covid-19 lockdowns, studies show that the majority of emergency remote teaching (as defined by Hodges et al., 2020) took the form of teacher-centric, dissemination-based teaching with little use of more advanced technology-supported teaching and learning techniques (see eg. this report from Denmark: Georgsen & Qvortrup, 2021). This emphasises the difficulty in creating substantial development in teaching practices, even with technologies widely available.

Over the years, we have seen a paradigm shift like knowledge availability and the nature of learning. In the view of Arunachalam (1999) the chances are that we now - thanks to ICT - have: an enormity of information movement through a network; massive increase in the numbers of users with internet access; democratisation of information creation through eg. personal webpages, podcasts, and wikis. Beetham & Sharpe (2007) claim that the information economy today demands job seekers to have information literacy as a core requisite rather than just the stable body of knowledge. Robin (2008) argues that students now are not only gathering information but also creating it.

Holliman & Scanlon (2004) describe that one of the positives about using ICT is that it provides a wide range of communication in the teaching and learning process, not limited to the classroom but extends to the global world. However, the authors caution that teachers should implement ICT after drawing evidence from the growing body of research on the effectiveness of using ICT to facilitate learning. Holliman & Scanlon indicate that "it will be the teachers' role to align pedagogic strategies with ICT to ensure all the learners get most from the technology-facilitated approach" (2004: p.2). As indicated above and supported by a range of studies and experiences, technology in itself will make little change in teaching practices (eg. Mayer, 2010; Davidsen & Georgsen 2011). Whether using technology in teaching and learning will make a difference will – among other things - be determined by teachers' competence regarding pedagogical use of technology, as well as on training and self-exploration on the use by teachers (Robin, 2008). According to Kleiman "the key determinant of our success will not be the number of computers purchased or cables installed, but rather how we define educational visions, prepare and support teachers, design curriculum, address issues of equity and respond to the rapidly changing world" (2000:7).

More specifically, Hooper & Rieber describe five phases of technology application in education as familiarization, utilization, integration, reorientation and evolution, and they claim that "educational technology involves applying ideas from various sources to create the best learning environment possible for students" (2011:1). They argue that a traditional perspective of educational technology focus on either the technology itself or the teacher's instruction and is limited to the first three phases. The ultimate conclusion here is that the teacher's role is to establish a learning environment that supports and facilitates students as they construct and shape their knowledge. The authors recommend that teachers must venture beyond familiarization and utilization and into the phases of integration, reorientation, and evolution of technology use. The challenge teachers may face, however, is a time gap in the pedagogic training received and the emergence of the techno-savvy students and the technology-oriented classrooms (Hooper & Rieber, 2011).

When new ideas, skills, and policies are to be implemented in the education system, professional development becomes a requisite to empower teachers. Rebora defines professional development as "generally referring to on-going learning opportunities available to teachers and other education personnel through their schools and districts" (2004) or in other words it can be interpreted as a school-based effort to improve teaching. Guskey states that "every modern proposal to reform, restructure, or transform schools emphasizes professional development as a primary vehicle in efforts to bring about needed change" (1994:2). Both Guskey (1994) and Vrasidas & Glass (2004) propagate that in the education reform process professional development for teachers is a significant element in supporting change. Borko (2004) claims that professional development assists teachers in enhancing their knowledge and developing innovative pedagogic practices, which in turn enable them to participate effectively in the process of educational reform and change in classroom practices. Gallimore et al. (2009) assert that professional development is a crucial component in nearly every modern proposal for educational change and improvement.

Pianfetti (2001) propose the following key points for professional development to be successful: 1. Ability to encourage and motivate teachers to collaborate with their colleagues, 2. Access to resources, administrative support, and 3. The development of a community of teachers using technology. According to Vrasidas & Glass (2004), professional development for teachers is successful when teachers avail themselves opportunities to share knowledge, learn from peers and collaborate on real-world projects. Vrasidas & Glass (2004) also believe that the failures of the past professional development were caused by a mostly top down-approach to professional development (from policymakers to the teachers), based on which they recommend that collaboration is ensured among all stakeholders in professional development programs. In a later paper, the authors conclude that good professional development is both situated in

teachers' everyday practice and distributed among learners, teachers, and their physical, socio-political and historical worlds (Vrasidas, et al., 2010).

Pianfetti (2001) cautioned that rather than investing in hardware and software, investment should be made in the digital literacy of educators. Pianfetti defines digital literacy as the "ability to learn, comprehend, and interact with technology in a meaningful way" (2001:256). Still, Pianfetti states that "teachers, in general, have less need to teach about computers and a greater need to use technology as a learning tool that is integrated routinely into classroom practice" (2001:256). Pianfetti also believes that professional development on technology use in teaching and learning in the past has had little success because the focus was more on technological skills and less on integration. This conclusion is supported by many newer studies from all over the world.

Through studies (particularly Luckin et al. 2012; also Mishra & Koehler 2008) it is elucidated that the correlations between the use of ICT in education, teachers' ICT teaching skills and students' learning outcomes are very complex. However, in several studies of ICT use and its' value in teaching and learning it is pointed out that the skills of the teachers are extremely important (UNESCO 2003; Wagner et al. 2005; EVA 2009; Shear et al. 2011b). There are several reasons to focus on teachers' competence and freedom of action concerning the development of teaching methods, learning activities and materials. Many sources (Shear et al. 2011a; Stiegler & Hiebert 1999; Schibeci et al. 2008; EVA 2009) agree that work-based learning provides the best effect in this area.

3. Participatory ICT integration into the teaching practices at SCE

The review of literature presented above illustrates that to strengthen the qualifications of teaching staff regarding the use of ICT, a practice-oriented, user-involving and experimental approach shows more potential than traditional course-based approaches. However, we have only limited knowledge about the requisites for participating in this type of staff development, particularly in a country like Bhutan, where staff development is predominantly course-based, and often conducted by experts or resource persons who are not part of the organisation (in this case RUB). Also, the issue of transforming teaching and learning to be in concordance with the 21st Century skills is a demanding one that involves both formulation of teaching philosophies, development of practical teaching skills, re-formulation of learning goals for the students, and the issue of ICT integration. Some difficulties are to be foreseen, eg. about national regulations on education, technological infrastructure, and the cultural assumptions about what good and effective teaching are. In our research, we aim at exploring a user-involving methodology for simultaneously re-thinking pedagogy and carrying out professional development for teaching staff in Samtse College of Education (SCE). This paper presents experiences from a workshop-based intervention involving 28 faculty members from SCE. The aims of the workshop were as follows:

- to introduce staff to critical issues concerning ICT in teaching practices
- to create awareness about ways of re-thinking pedagogy
- to introduce and try out a method for creating learning designs with ICT
- to illustrate the importance of clarifying core values in teaching as part of developing new learning designs
- to identify one or more pilot studies for further development and research in the project

In this paper, we will present the workshop methodology, the results from the activity in Samtse, and discuss these further applications of user-centred and user involving the development of learning designs with ICT in Bhutan. Initially, we are curious about the scope of using an interventionist and user-centred approach in a developing country. It is claimed that a certain level of training and skill is needed to engage in user-centred development. However, recent work carried out in Dhaka University, Bangladesh, indicates that this is not necessarily the case if the methodology is shaped to the circumstances (Zander, Georgsen, & Nyvang, 2011; Georgsen & Zander, In press). The focus of this paper, which describes our first steps in developing a methodological approach suitable for the situation in Bhutan and RUB, is to describe and discuss what we have learned so far, and what the indications are for future work.

The workshop method was partly inspired by the future workshop methodology (Georgsen, Murshed, & Zander, ePolicyINPractice Report I, 2011), and also by rapid prototyping and systems development (see Nyvang & Georgsen 2007 for a full presentation of the workshop methodology). The workshop was organised into three steps, 1. Inspiration and setting the scene; 2. Defining core values; and 3. Design. Based on Hooper & Rieber (2011), we are interested in what level of technology application the participants display in their design work (familiarisation, utilisation, integration, reorientation or evolution). For this purpose, we looked into the language they used in their discussions and the descriptions of their design (poster and oral presentation). We were also interested in determining whether the participants were at the same level of knowledge, experience and imagination, or if we could identify front-runners.

A total of 28 faculty members comprising 6 females and 22 males participated in the workshop. Three sets of data collection tools were employed, and the details of the data contents are as follows: Videos—six subject representations (History - H, English - EN, Biology - BG, Chemistry - CH, Primary curriculum - PP, and Professional subject - PS); Posters—presentation charts from the respective subject groups on the new lesson design (eight posters on biology and two on primary curriculum); Photographs—value card sorting exercise, seven photographs. The text interpretation was carried out under the following thematic areas: Teacher Activity, Student Activity, Core Learning Values, and Technology. This process helps to identify the core values in teaching and learning and also describes the participants' stance on the pedagogic practices. Consequently, the empirical data provide evidence describing the state of teaching and learning aligned to a 21st-century education. The decisions on the themes are based on the instruction guidelines provided for the new lesson design activity as well as based on the outline of the lesson presented.

Incorporating all of the points mentioned above and regarding the core values outlined in their lessons has led to the conclusion that learning by doing and collaborative learning stands prominence along with cooperative learning, experiential learning, and problem-based learning and lifelong learning. This consequently provides the certification for an approach to student-centred learning. Therefore, interpretation with relatively narrowly defined context and gradually moving to higher-level definitions of the context (from the key themes developing a common concept) is to an extent contemplated.

Although it has no substantial theoretical foundation, the SAMR model is widely used by practitioners. In the present study, the SAMR model (Puentedura, 2006) was used to portray a series of levels of incremental technology integration within learning environments and to analyze the products from the groups to identify the most dominant areas of knowledge applied in the designs. The SAMR model describes four levels of technology integration that increase in complexity and effect, from simple substitution which barely changes the function to a more complex redefinition where the technology use can provide opportunities to create what would not be possible without that technology.

4. Learning designs with technology

A pre-workshop study of the use of technology among the faculty participating in the workshop shows that technology is used both for personal and professional purposes (Kinley, 2015). Online technologies are primarily used for personal use, in part due to slow and unstable internet access on campus. Among technologies used for teaching, faculty name hardware rather than software (laptop; calculator; LCD screen), and technologies are mainly used for presentation purposes.

The data material from the workshop has allowed us to closely study the process of re-thinking pedagogy for 21st-century teaching at SCE as this unfolds during the workshop and in subsequent teaching activities 28 faculty members participated in the workshop voluntarily. Participation was supported by management, and the workshop took place on campus during regular working hours. The staff were all from the teacher training program, and they represented several different subjects (chemistry; history; biology; English; primary curriculum; and professional curriculum). Data were collected in three different ways: Video recordings of oral presentations of designs developed during the workshop; posters describing the design ideas and the actual teaching and learning activities in the design; and finally photographs documenting various processes and products from the workshop. Through analysis, the data gave insight into preferred pedagogical patterns and also the range and levels of ICT usage in teaching and learning. Most of the designs portrayed the role of teachers as facilitators and guides. However, in their oral presentation of a design developed at the workshop, one lecturer says:

> *We want to have a shift in teaching; earlier we believed that teaching is the transmission of knowledge; now we want to have a shift on teaching focusing on the student rather than the teacher*.

Besides positioning the role of the teacher, the core values 'learning by doing' and 'collaborative learning' had prominence in almost all the lessons. For example, a lecturer in the primary program gave the following statement:

> *They [that is, the students/future primary school teachers] are engaged in setting up the environment for the children in the ECCD centre. Because the teacher is not setting up the environment here (on campus) we are just showing them principles of setting up a good learning environment*.

Thus, they present the teaching and learning situation where the lecturer demonstrates or explains, and the student is expected to actively carry out activities based on this. Likewise, in all the lessons it was shown that students engage in working in groups (online and face to face) with an ultimate goal to produce some outcome meant to be shared with the class. The teacher here is not central to learning rather provides a brief instruction or overview of the lesson, shares and makes resources available for the students, guides students in their task, and provides feedback on the student activity.

The learning situations from the lessons presented students as working in groups, mutually searching for information, and creating a product.

The range of ICT used for teaching was revealed from the lesson outline (poster and presentation), and in the analysis we applied Puentedura's well-known SAMR model (Hilton, 2016) to map what was done with the designs. The SAMR-model describes four levels of use of ICT, with Substitution and Augmentation as the less transforming ones, and Modification and Redefinition as the levels of more substantial redesign of teaching and learning activities. At the substitution level, the Internet was used for downloading and reading materials (text) online, VLE was used as a medium to upload learning resources by the teachers replacing printed materials, and replacing blackboard and charts PowerPoint presentation was used to share information (tutor) and findings (students), CDs and Clips replaced examples and demonstration by the teacher. A participant described as follows:

> *Traditionally what we do is we use a chart paper and we transcribe these vowels there (example on the poster) and we tell them ok this is how it is transcribed and this transcription means this, and that, but with the CDs they see the native speaker pronouncing it, how she uses the various parts of the mouth. Students can practice with the native speaker together as the person demonstrates.*

The next level from SAMR model - Augmentation – can be identified in the example of the VLE online discussion forum (post discussion, participate in discussion and tutor feedback) and online assessment using a quiz. As mentioned by one lecturer:

> *Normally this particular topic is being taught in the class at a stretch maybe taking one hour or two hours within the class itself. In our design, we are using VLE, which is a change we have brought in teaching this particular topic*.

This conveys a message on the usage of VLE for teaching and learning purposes.

5. Conclusion

The findings of this study suggest that more investment is required for the innovative use of technology in the classroom. We have mapped our data with the SAMR model and Hooper & Rieber's (2011) five phases of technology application in education - familiarization, utilization, integration, reorientation and evolution. Our findings show that the perspective of educational technology used for teaching and learning so far is focused on either the technology itself or the teacher's instruction and is limited to the first three phases. Speaking along the lines of Hooper & Rieber (2011), the teaching faculty needs to venture beyond familiarization and utilization and into the phases of integration, reorientation, and evolution of technology use.

The combined findings from analysing both the posters and the oral presentations have shown that drawbacks in rethinking teaching and learning with ICT relate to resources and the level of competency amongst the teachers. We did see, however, tentative integration of the 21st-century skills incorporated into the lesson designs, based on a limited pre-understanding of the concept of 21st-century teaching. To some extent, the workshop provided awareness of the need for rethinking pedagogy for the digital age. Overall, the new lesson designs attempt to redefine the role of the teacher, by placing more emphasis on active learning and student-centred practice. Further analysis of the empirical data confirmed that to a certain degree an interventionist approach to professional development assists teachers in rethinking and redesigning their teaching using ICT. In general, the current practice on ICT is primarily restricted to the enhancement level.

Overall, this study has provided some insights into the impact of the intervention workshop, pedagogic practices, and the level of technology use. These findings provide a guide for the planning of future intervention workshops. Consequently, this study also to a certain extent allows reflecting on the stand of SCE in particular and RUB in general on pedagogy in the 21st-century digital world.

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University Teachers' Competence in Domains of Technological, Pedagogical and Content Knowledge An Analysis

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The purpose of the present study was to analyze university teachers' competence in technological pedagogical and content knowledge (TPACK). Sample of the study comprised 350 teachers from three public sector universities located in Pakistan. The study's objectives were to assess the competence of university teachers in technological, pedagogical, and content knowledge domains and to identify gender differences in university teachers' competence in TPACK. Data for the study was collected through the administration of a questionnaire. The collected data were analyzed by applying Mean, t-test, and ANOVA. The study showed that university teachers were found competent in technological, pedagogical, and content knowledge, and male teachers were found more competent than females in technological knowledge. Teachers had 10-15 years of teaching experience, and teachers holding Ph.D. degrees had the highest mean score. The launching of blended learning educational programs in Pakistani universities can expand educational facilities for people.

Keywords: university teachers, competence, TPACK. Public Sector Universities, University Teachers' Competence, TPACK, Technological, Pedagogical, Content Knowledge, Gender Differences.

1. Introduction

Internet and technological developments have revolutionized each phase of human life in the present era. Nowadays, every individual is updated with rapid developments. These technological changes have also modernized the field of education. Due to technological expansions, changes have been occurred in managing classrooms, skills, and subject matter. This demands teachers to get training and required knowledge to assimilate technology into education; likewise, they have to choose technologies according to the content and pedagogy (Koehler, Mishra & Kereluik, 2013). Technology application in education is no more a novel concept. Many modifications in the educational system, tools, and skills have arisen due to many inventions in technology (Demirbilek, 2010, p. 238; Knolton,2014).

In the present age, due to the latest technologies and quick access to the internet, teachers can't work without these modern and well-equipped gadgets. Peklaj (2015) points out that teachers are expected to demonstrate optimum competencies in the educational field because they can improve and endorse essential competencies among students that help them succeed and meet the requirement of the 21st century in the changing society. New instructional horizons have emerged due to these technological developments for teachers and students (Larson, 2012; Mazman & Usluel, 2011). Therefore, teachers have to get mastery in blending of technology in instruction. Teachers should mix and assimilate pedagogy and subject matter with technology to enhance students' self-confidence and independence in the learning process (Mishra & Koehler, 2006).

Mishra and Koehler (2006) developed a framework of TPACK (technological, pedagogical, and content knowledge) based on Shulman's (1986) model of Pedagogical Content Knowledge (PCK). The main idea behind developing Technological Pedagogical and Content Knowledge (TPACK) by Mishra and Koehlar (2006) is the enhancement of Shulman's (1986) pedagogical and content knowledge (PCK). Lee Shulman (1986), a professor at Michigan State University, suggested a specialized kind of knowledge that teachers have, which makes them different from other occupations. According to Shulman (1986), pedagogical content knowledge (PCK) is this exceptional knowledge that remains in the center of pedagogy and subject matter. Pedagogy and content are

nothing in segregation, and PCK is the knowledge that brings a revolution in the teaching and learning process (Mishra & Koehler, 2009).
With these scenarios, the primary objectives of the present study were: To assess the competence of university teachers in terms of technological, pedagogical, and content knowledge; and To identify the difference in the competence of university teachers regarding technological, pedagogical, and content knowledge and gender in Pakistani context.

2. Background

With the latest technologies, different models started to develop (Mazman & Usluel, 2011). In the field of education, there are two main factors involved in instruction. These two factors or elements are pupils and teachers. These two factors play an extremely significant role in learning and teaching procedure. This procedure is considered adequate and fruitful when teachers and students work hard and try to achieve their desired results. Here we can say that the teachers' effort, struggle, and determination are significant. If they do not make efforts for the student's progress, the dream of achieving the required consequences or results may never come true. They are the chief source of transferring knowledge to the students, so they should focus on those methods by which they can make understanding of the students better.

A few years back, those teachers were considered competent who had command of subjects and pedagogy. But in recent years, mastering only these two competencies is not enough. Instructors should get mastery over blended and integrated technology, which is the third competence, requirement, and need of the present age. By grasping these three knowledge domains, teachers are expected to mix and assimilate these three competencies into their teaching. It means teachers must grasp three knowledge domains: content, pedagogical, and technological knowledge (Mahdum, 2015).

The technological pedagogical and content knowledge (TPACK) model is one of these names. Beaudin and Hadden (2005) explained that the student's critical thinking and self-reliance are increased due to the TPACK process of teaching. That is why teachers should mix and assimilate pedagogy and subject matter with technology (Mishra & Koehler, 2006).

TPACK demonstrates the teacher's knowledge produced from synchronized and inter-reliant comprehension of three areas: technology, subject matter, learning context, and pedagogy. By grasping these three knowledge domains, teachers are expected to mix and assimilate these three competencies into their teaching. It means teachers must grasp three knowledge domains: content, pedagogical, and technological knowledge (Mahdum, 2015). The model of TPACK stresses the association between these three fields above (Harris & Hofer, 2011).

Although Lee, S. Shulman introduced the idea of pedagogical content knowledge, which was presented in the 1985 in the American Educational Research Association meeting held yearly. Still, he found something was missing between pedagogical knowledge and content knowledge (Simsek & Boz, 2016). Koehlar, Mishra, Kereluik, Shin & Graham (2013) observed that the essential purpose of introducing the TPACK structure was to explain those main types of knowledge required in the teachers' teaching process. The technological knowledge includes simple to complex technologies including boards and books to the modern and advanced technologies include Moodle or digital boards, computers, ipads, tablets, etc. Technological content knowledge means the integration of technology, pedagogy, and content. Technological pedagogical knowledge means to teach a particular concept or idea; a teacher has to choose a tool of technology that best suits the content. The last element is the context which, As a result, their knowledge is very narrow and limited. Mishra and Koehler (2006) later on included another component in this framework known as technological knowledge. They urged teachers have to learn the use of modern technologies more than learning the use of simple tools.

According to Mishra and Koehler (2009), we live in the technological age where we have different kinds of technologies around us. We can define it as everything artificial, called technology, and it can be low or high tech. For instance, pencils, clothes, computers, cars, Smart boards, Facebook, iPhones, Wi-Fi, multimedia, emails, instagram, messenger, whatsapp, etc.

Rapid developments in technologies have made it possible to integrate technology with content and pedagogical knowledge, which became the basis of the TPACK model. It is flexible knowledge that stays between three domains of knowledge, which permits ingenious and innovative repurposing to make changes in the traditional ways of teaching. However, the problem exists that many technologies used by the teachers are not made mainly to use in education. This kind of repurposing is only probable when teachers are experts, and this expertise can be acquired through a lot of practice and training in all TPACK domains.

3. Domains of TPACK

Technological knowledge: Technological knowledge means a teacher's grip and commands over all types of old and novel technologies. These technologies can be used and assimilated into the subject matter. Digital technologies include different software programs, videos, the internet, and interactive boards, whereas low-tech books, paper, chalk, and pencil. Technological knowledge also comprises the ability to handle different digital tools. For instance, using browsers, email, spreadsheets, software programs, etc., removing and installing multiple devices is also part of technological knowledge (Koehlar et al., 2013; Mishra & Koehler, 2006; Qasem, 2016).

Pedagogical knowledge: Pedagogical knowledge means increasing students' knowledge through multiple teaching methods, approaches, techniques, and tactics. Its deep knowledge is related to teaching methods, practices and incorporates educational objectives and goals (Koehlar et al., 2013; Mishra & Koehler, 2006; Qasem, 2016).

Content knowledge: This type of knowledge denotes the content or syllabus that is taught to the students. Teachers should have an idea about the subject matter they will teach. In addition to this, they must know how different content varies (Koehlar et al., 2013; Mishra & Koehler, 2006; Qasem, 2016).

Pedagogical content knowledge: The concept of pedagogical content knowledge is similar to the idea of pedagogy presented by Shulman (1986) that can be applied to a particular type of content. Pedagogical content knowledge refers to the type of knowledge in which teacher has to choose particular strategies, techniques, tactics, and methods while keeping in mind the needs of diverse kinds of students when transferring the subject matter to them (Koehlar et al., 2013; Mishra & Koehler, 2006; Qasem, 2016).

Technological content knowledge: Technological content knowledge means using those technological devices and tools during the transference of knowledge related to the particular subject or discipline so that both things help students understand the particular lesson. A prevalent example of using subject-related tools is using SPSS (Statistical Package for Social Sciences), software used to analyze data. Teachers should have a grip on the content they teach and the way it transforms according to technology (Koehlar et al., 2013; Mishra & Koehler, 2006; Qasem, 2016).

Technological pedagogical knowledge: Technological pedagogical knowledge means expertise in technology that can be used, integrated, or incorporated in particular teaching methodologies. It means that pedagogy or teaching strategies will be automatically altered when specific technologies are added to lesson plans. For instance, how to involve pupils in diverse kinds of activities while showing them any video or multimedia. TPK also means understating and knowledge of various gadgets that are being used to complete different kinds of tasks (Koehlar et al., 2013; Mishra & Koehler, 2006; Qasem, 2016).
Technological pedagogical and content knowledge stands in the middle of the TPACK model. It discusses the intricate connection between content, pedagogy, and technology, and these mechanisms allow teachers to use them according to the context. This model suggests that teachers should have command and grip on all constituents mentioned above to arrange and organize pedagogy, content, and technology together in their teaching successfully (Qasem, 2016).

The TPACK model provides a direction to the teachers on how technology can be integrated and two other essential components such as content and pedagogy. Along with that, how successfully the TPACK model can be used for blended learning (Aguinaldo, 2016). Considering the importance of TPACK in the context of teacher's instructional competence and the lack of research conducted in the Pakistani context to assess teachers' competence in the TPACK domain, the researchers decided to research in the Pakistani context to find out teachers' competence in the TPACK domain.

4. Hypotheses and Development

Education is an enduring and lifetime process. Hence, access to all kinds of information should be within the range of every individual. Similarly, education should cater to the needs of diverse kinds of students. Thus, it is essential to introduce information and communications technology (ICT)) at all levels. The reason is that possessing technical education is the basic need of society and individuals. It is because ICT is the only way to meet all kinds of challenges and lead to success. The main goal of the national education policy (2017) was to introduce ICT at all levels. Teacher education was also emphasized in this policy. Teachers should know their 'new role' to use modern methods in teaching using ICT and involve students in appropriate and meaningful learning. Hernandez (2017) added that incorporation of ICT largely depends upon the teacher's abilities that how

successfully she structures the educational setting. According to Javed (2016), ICT has arisen as a substantial force in recent years, which comprises multiple technologies to accumulate, disseminate, create, and use information. As ICT is the future of the world, there is a dire need to incorporate technology in education because it's essential to train teachers and students in ICT to enhance learning and teaching.

Like many other countries on the globe, in Pakistan, also we can see that a transition has started in teaching methods due to transition in the life and learning styles and needs of students in the 21st century that requires teachers to be competent in technology and integration of technology in instruction. The focus of the chapter was to investigate and analyze university teachers' competence in the domains of technological pedagogical and content knowledge (TPACK) in the Pakistani context. With this intention, the primary objectives of this chapter were: to assess the competence of university teachers in terms of technological, pedagogical, and content knowledge and to identify the difference in the competence of university teachers concerning technological, pedagogical, and content knowledge domains and gender differences, if any, in TPACK competence of university teachers. The theoretical framework of the present research was based on Technological pedagogical and content knowledge (TPACK). The domain of TPACK is also given in Figure 1:

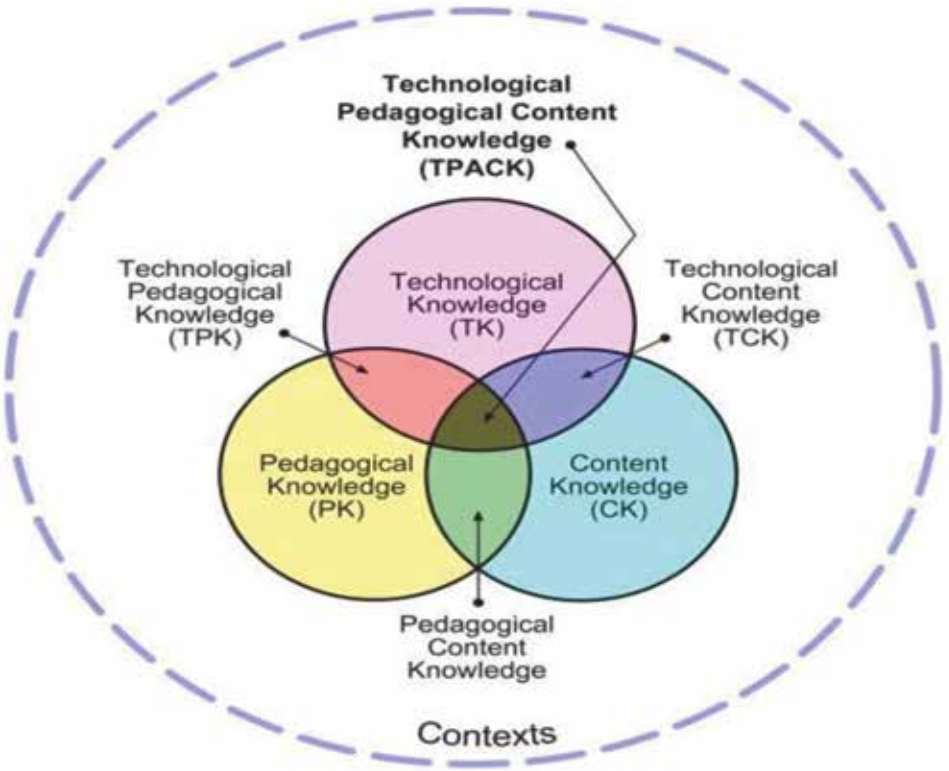

Figure 1: Technological Pedagogical Content Knowledge (TPACK)

In the context of the learning process, all the components of pedagogy, technology, and content cannot occur alone without context. The current research design was quantitative descriptive survey research as it was suitable to the research design. A TPACK based adapted questionnaire was used for data collection from university teachers for the present study used by Mahdum (2015), consisting of 33 items. The questionnaire was a field test on 35 university teachers, and these were not included in the final sample. The Cronbach's Alpha of the adapted questionnaire was calculated as .95, which was the best for data collection from the final sample. A sample of 350 university teachers was taken from six departments, e.g., Psychology, Education, Economics, Mass Communication, Computer Sciences, and Management Sciences, of three public sector universities located in Pakistan through a stratified sampling technique. The data from the sample teachers were collected through personal visits.

Hypotheses: To achieve the objectives of the study following null hypotheses were formulated, and the results of the null hypotheses are described below table 1 and 2:

Ho1: There is no significant difference in university teachers' competence in the technological knowledge domain.
Ho2: There is no significant difference in university teachers' competence in the pedagogical knowledge domain.
Ho3: There is no significance in university teachers' competence in the content knowledge domain.
Ho4: There is no significant gender difference in university teachers' competence in the pedagogical content knowledge domain.
Ho5: There is no significant gender difference in university teachers' competence in the technological content knowledge domain.
Ho6: There is no significant gender difference in terms of technological pedagogical knowledge domain competence among teachers.
Ho7: There is no significant gender difference in terms of technological pedagogical knowledge domain competence among teachers.
Ho8: There is no significant gender difference in terms of pedagogical knowledge domain competence among teachers.
Ho9: There is no significant gender difference in terms of content knowledge domain competence among teachers.
Ho10: There is no significant gender difference in terms of pedagogical content knowledge domain competence among teachers.

5. Results

In the following section, we analyzed the main results. About the research question 1-6: What is the competence level of university teachers regarding technological, pedagogical, and content knowledge?

Table 1 shows the mean score of six domains of the TPACK model. The highest mean of the means, scores 4.39, was of two knowledge domains: content knowledge and pedagogical content knowledge.

Table 1 *Mean Score of University Teachers" Competence in Technological, pedagogical and content knowledge. (N= 350)*

Statement No.	1	2	3	4	5	6	7	Mean of the Means
TK	4.21	4.18	4.09	3.95	4.45	4.40	4.48	4.21
PK	4.41	4.42	4.36	4.37	4.31	4.43	-	4.38
CK	4.46	4.48	4.41	4.35	4.27	-	-	4.39
PCK	4.39	4.39	4.39	4.42	-	-	-	4.39
TCK	4.38	4.37	4.29	4.37	-	-	-	4.35

This table shows that teachers used various ways of thinking about the content they taught and had sufficient knowledge about the subject. They selected practical teaching approaches to guide students' learning in their subject, developed their own lesson plans, and made lessons easier. Whereas the lowest mean of the means score was 4.21 of technological knowledge. It indicated that although teachers had competence in the technological domain. They had a basic knowledge of computer components, and they used the internet for communication media and teaching sources. However, not many teachers knew a lot about different technologies.

Ho_1 There is no significant gender difference in the technological knowledge domain in terms of male and female competence.

Table 2 displays a gender-wise comparison between male and female competence and domains of TPACK. It demonstrates a significant difference between male and female respondents in the technological knowledge domain (.02), indicating that males were more competent than female respondents. At the same time, there was not a significant difference found between the rest of the TPACK domains.

Table 2 Gender Wise Comparison based on University Teachers' Competence in Technological, Pedagogical and Content Knowledge Domain (N= 350)

Variables	Gender	N	Mean	SD	*t*	*df*	*Sig*
TK	Male	124	30.32	3.300	2.204	348	.02
	Female	226	29.46	3.607			
PK	Male	124	26.50	2.721	.927	348	.35
	Female	226	26.19	3.190			
CK	Male	124	21.96	2.424	-.34	348	.97
	Female	226	21.97	2.506			
PCK	Male	124	17.64	2.014	.27	348	.78
	Female	226	17.58	1.995			
TCK	Male	124	17.55	2.120	.90	348	.36
	Female	226	17.33	2.156			
TPK	Male	124	29.54	3.809	-.46	348	.64
	Female	226	29.73	3.724			

6. Conclusion

It is expected that due to current social change where females are given the freedom to use technology (Mobile phones, social media, etc.), future female teachers may have good competence in the technology domain. It was concluded that university teachers have competence in technological, pedagogical, and content knowledge. However, concerning gender differences, a significant difference was found in male and female competence.

The present research findings revealed that female teachers were less competent than male teachers in integrating technology in teaching. Therefore, it is recommended that universities and management introduce special training programs for female teachers regarding technology integration. In the present research, the contextual aspect of the TPACK model could not be explored due to certain constraints. Then the current research used only a close-ended items questionnaire as a data collection tool and did not include any interviews or observations. This study was confined to only public sector universities, and private universities were not included. Therefore, in the future, the same research can be replicated in private sector universities, and a comparison of both public and private sector universities can be carried out. The research can be carried out to determine differences in results using questionnaires, interviews, and observational tools and to conduct triangular analysis. Further, it can be investigated to the extent to which Pakistani university teachers are aware and using OERs (Open Educational Resources) to develop their knowledge repertoire.

Technology has become an integral part of our social and professional lives. Of course, in such an environment, teachers, especially university teachers, have become users of technology in their personal and professional lives. The results indicated that teachers had competence in technological, pedagogical, and content knowledge (TPACK) domains. Results depicted that most teachers were found aware of the basics of computer components, they thought about multiple ways of teaching content and kept on developing their knowledge repertoire in their subject area, made questions on their own to assess students' understanding of the subject and selected practical teaching approaches to guide students' learning in their subject, they developed their lesson plans and made lessons more accessible for the students, they knew about the technologies that they can use for enhancing understanding of their subject and also used technologies to develop learning activity and chose technologies that enhanced the teaching approaches for a lesson. They reflected critically on how to use technology in their classroom. The results indicated that teachers had competence in technological, pedagogical, and content knowledge. This competence can change teachers' attitudes, which can help them move towards blended learning and create a digital environment in the class. These results were also supported by numerous studies (Chai, Hong, & Teo, 2008; Kennewell & Morgan, 2003; Yusuf & Balogun, 2011; Doe, 2016; Mahdum, 2015). It is observed that there is an increased requirement regarding the incorporation of technology in the field of education (Abbitt & Klett, 2007; Lin, Tsai, Chai & Lee 2013; Usluel, Mumcu, & Demiraslan, 2007; Erdem, 2007; Chai, Hung & Toe, 2008;) we needed technology integration to check teachers' competence (Chai, Hung & Lee, 2008; Keser, 2015). The findings of this research are also consistent with Saltan & Arsalan (2017). The present researched observed significant gender differences between male and female competence and TPACK domains which specified that male teachers were more competent in using technology than female teachers. The findings of the present research were consistent with Erdogan and Sahin (2010); Canbolat (2011); Unal (2013); Karatas's (2014); Keser (2015);

Bas & Senturk (2018). This gender difference technological domain where males were found better than female university teachers may be due to cultural differences. In Pakistani society, males are privileged class and get maximum exposure to use technology compared to females (Bas & Senturk, 2018; Ozudogru & Ozudogru, 2019). Therefore, it is expected that with time, our social values concerning females become flexible in some practices, like using technology.

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New forms of Teacher and Teacher Educators Professional Development: From Blended Learning to Social Networks

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This paper analyses the prevailing definition of Blended Learning and the prospects of Blended Learning and a plurilingual approach for teacher and teacher educators' professional development. The typologies of professional development and the motivation that incites teachers and teacher educators to move from formal to informal modalities of professional development are also analyzed and discussed. In particular, the role of the social network on lifelong learning.

Keywords: Teacher; Teacher educators; Professional Development, Plurilingualism, Lifelong learning

1. Introduction

Teacher and teacher educators' professional development (P.D.) is becoming more complex in the current global changing society (Littlejohn & Hood, 2017), where information and knowledge are transient, and its delivery is dynamic. New opportunities are available for teacher and teacher educators' professional development due to rapid societal changes and the ubiquity of technology. In 2005, a Communication noted that too few adults participated in lifelong learning, and strategies on a national level should be urgently implemented ("Lifelong learning," 2005). More than a decade later, teacher and teacher educators' professional development is still considered stagnant, requiring new modalities and strategies. According to TALIS 2018, participation in continuous professional development is considerably lower in France, most significantly for teachers (83%). This score is the lowest of all TALIS participating countries. Amongst possible barriers that could explain this pattern are teachers in France report the lack of incentives (47%); conflicts with work schedule (45%), or lack of time due to family responsibilities (45%); but also the absence of relevant offers (40%). According to TALIS 2018: a) the barrier to their participation in professional development has increased by three percentage points in France since 2013; b) teachers report that professional development based on collaboration and collaborative approaches to teaching are among the most impactful. Hence, it is essential to note that across the OECD 2018, developing advanced ICT skills for teaching is one area in which teachers say that they need more training.

Furthermore, recent literature about P.D. stresses the role of collaboration between contexts and professionals that structure a mutual enrichment, and triggers negotiation processes, shared goals, resources, and new modalities of action (van As, 2018). At the same time, Springer & Graham (2017) reported that attention to the diversity of cultures is rare; a plurilingual approach in teacher education could be a sustainable solution to this issue. The BLTeae project addressed this need for collaboration between different contexts and cultures (Impedovo & Brandt-Pomares, 2018). Considering this situation, this paper analyses two main typologies of professional development. One formal, blended learning, and the second informal, the social network. Specifically, this paper analyses the prevailing definitions of Blended Learning and the prospects of Blended Learning and a plurilingual approach for teacher and teacher educators' professional development. Professional development typologies and the motivation that incites teachers and teacher educators to move from formal to informal modalities of professional development are also analyzed and discussed. In particular, the role of the social network on lifelong learning.

2. Which Blended Learning for teacher and teacher educators' professional development

Over the last decade, blended learning (B.L.) has become one of the more widely used instructional approaches proposed by higher education for initial and continuing training, with major international conferences dedicated to this topic. Blended learning is particularly advantageous due to features like flexibility, effectiveness, cost reduction, allowing optimization of resources by the participant and the training institute, and making possible the redesign of a traditional course. The B.L. method enhances the potential benefits of face-to-face and online

approaches for participants and educators in effective and flexible communication and collaboration adapted for adult education (Knowles, Holton, & Swanson, 2014). In a classic definition, B.L. is understood as the optimal combination of learning strategies and online presence, enhancing the potential benefits of both approaches (Graham, Allen, & Ure, 2003). A recent review of the literature (Owston, 2018) shows B.L. appears to facilitate learner empowerment more than either face-to-face or fully online courses, with a greater sense of succeeding.

Driscoll (2002, p. 54) refined the classic definition that includes:

- To combine or mix modes of Web-based technology (e.g., live virtual classroom, self-paced instruction, collaborative learning, streaming video, audio, and text) to accomplish an educational goal.
- To combine various pedagogical approaches (e.g., constructivism, behaviorism, cognitivism) to produce an optimal learning outcome with or without instructional technology.
- To combine any form of instructional technology (e.g., videotape, CD-ROM, Web-based training, film) with face-to-face instructor-led training.
- To mix or combine instructional technology with actual job tasks to create a harmonious effect of learning and working (Driscoll, 2002, p.54).

The Most Common Types of Blended Learning (according to TeachThought, 2020) are:

1. *Station Rotation Blended Learning*: Station-Rotation blended learning is a: "…model (that) allows students to rotate through stations on a fixed schedule, where at least one of the stations is an online learning station. This model is most common in elementary schools because teachers are already familiar with rotating in centers and stations.

2. *Lab Rotation Blended Learning:* 'The Lab Rotation model of blended learning, similar to "Station Rotation,' works by "allow(ing) students to rotate through stations on a fixed schedule…in a dedicated computer lab allowing for flexible scheduling arrangements with teachers…enabling schools to make use of existing computer labs."

3. *Remote Blended Learning (also referred to as Enriched Virtual):* In Enriched Virtual blended learning, the student focuses on completing online coursework while only meeting with the teacher intermittently/as-needed. This approach differs from the Flipped Classroom Model in the balance of online to face-to-face instructional time. In an Enriched Virtual blended learning model, students wouldn't see/work with/learning from a teacher daily face-to-face but would in a 'flipped' setting.

4. *Flex Blended Learning*: The 'Flex' is included in types of Blended Learning. Its model is one in which… "a course or subject in which online learning is the backbone of student learning, even if it directs students to offline activities at times. Students move on an individually customized, fluid schedule among learning modalities. The teacher of record is on-site, and students learn mostly on the brick-and-mortar campus, except for any homework assignments. The teacher of record or other adults provides face-to-face support on a flexible and adaptive as-needed basis through activities such as small-group instruction, group projects, and individual tutoring."

5. *The 'Flipped Classroom' Blended Learning*: Perhaps the most widely known version of blended learning, a 'Flipped Classroom' is one where students are introduced to content at home and practice working through it at school supported by a teacher and peers. In this way, traditional roles for each space are 'flipped.'

6. *Individual Rotation Blended Learning*: The Individual Rotation model allows students to rotate through stations on individual schedules set by a teacher or software algorithm. Unlike other rotation models, students do not necessarily rotate to every station; they rotate only to the activities scheduled on their playlists."

7. *Project-Based Blended Learning:* Blended Project-Based Learning is a model in which the student uses both online learnings—either in the form of courses or self-directed access—and face-to-face instruction and collaboration to design, iterate, and publish project-based learning assignments, products, and related artifacts.

8. *Self-Directed Blended Learning*: In Self-Directed blended learning, students use a combination of online and face-to-face learning to guide their personalized inquiry, achieve formal learning goals, connect with mentors physically and digitally, etc. As learning is self-directed, the roles of 'online learning' and physical teachers change, and there are no formal online courses to complete. In Self-Directed blended learning, one challenge for teachers is to judge the and (somehow) success of the learning experience without de-authenticating it. For students, the challenge is to seek out models of products, processes, and potential that can provide the kind of spark that can sustain learning while being self-aware enough to know what's working and why and make adjustments accordingly. Some students need very little to soar, while others need support through apparent pathways that they can guide themselves through with autonomy and self-criticism.

9. Inside-Out Blended Learning: In Inside-Out blended learning, experiences are planned to 'finish' or 'end up' beyond the physical classroom but still require and benefit from the unique advantages of physical and digital spaces. In both the Outside-In and Inside-Out models, the nature of 'online learning' is less critical than focusing on platforms, spaces, people, and opportunities beyond the school walls. (The 'online' components could be a self-directed inquiry and formal eLearning courses and curriculum.) Because the learning pattern is 'outward,' Project-Based blended learning is an excellent example of the Inside-Out model. As with Outside-In blended learning, there is a need for expert guidance, learning feedback, content teaching, and psychological and moral support from face-to-face interactions daily. Well-designed, each of the three 'areas' plays to its strengths and complements the other two.

10. Outside-In Blended Learning: In Outside-In blended learning, experiences are planned to 'start' in the non-academic physical and digital environments students use daily but finish inside a classroom. This could mean traditional letter grades and assessments forms or less traditional teaching and learning that uses the classroom as a 'closed-circuit' publishing 'platform'—a safe space to share, be creative, collaborate, and receive feedback grows student work. Well-designed, each of the three 'areas' plays to its strengths and complements the other two. While the pattern is Outside-In, unlike Remote blended learning, there is still a need for guidance, teaching, and support from face-to-face interactions daily.

11. Supplemental Blended Learning: In this model, students complete either entirely online work to supplement their day-to-day face-to-face learning or entirely face-to-face learning experiences to supplement the learning gained in online courses and activities. The big idea here is supplementing—critical learning objectives are met entirely in one space. In contrast, the 'opposite' space provides the student with specific supplementing experiences that the other did not or could not provide.

12. Mastery-Based Blended Learning: Students rotate between online and face-to-face learning (activities, assessments, projects, etc.) based on the completion of mastery-based learning objectives. Assessment design is crucial in any mastery-based learning experience; the ability to use face-to-face and digital assessment tools is either powerful or 'complicated' depending on the mindset of the learning designer.

Cronje's (2020) proposal is favored. The authors in the Owston (2018) review consider that the problem with the definition of Blended Learning is that it misses the focus of learning and suggests that the definition must go far beyond deciding between face-to-face and technology-mediated contact. A definition based on the dimensions of face-to-face and technology-mediated instruction does not provide an adequate theoretical underpinning for such complex contexts. Hence, a definition of Blended Learning should focus on learning. The context, theory, method, and technology to optimize learning in a given context have to be considered. To this end, Cronje (2006) proposed an integrated model (in Table 1) as a framework for designing blended learning.

Table 1: Cronje (2006) proposal

Context (Kurtz & Snowden)	Theory (Cronje)	Methods	Technologies
Known	Injection	Tutorial Drill	Lecture Book Video
Complex	Construction	Construction Exploration	Open-ended learning environments Construction kits and tools Spreadsheets
Knowable	Integration	Puzzle Discussion Debate	Games Discussion tools
Chaos	Immersion	Experience Field trip Apprenticeship	Blogs Logbooks Assessment tools

3. Blended learning for international professional development

The B.L. approach could be suitable for introducing innovation- and international-related added value for international teacher learning. However, in a hyper-connected world, initial and continuing teacher education

proposed by higher education institutions remains generally limited to national borders. An enhanced international teachers' exchange, designed to serve both developed and developing countries, can be a strategy to tackle common issues in a broader and more complex vision of teacher professionalization. In their review of B.L. worldwide, Spring and Graham (2017) report that there is a lack of connection between countries and regions in the educational literature. Despite the widespread use of B.L. in higher education, few accounts exist of proposed or actual blended learning courses in an international context. In addition, reports of the use of B.L. in international collaborations involving diverse cultures and groups remain scarce, especially for professional teacher learning.

Moreover, according to Snoek et al. (2011), teachers' intensive international exchange of learning will contribute to their professionalism. Therefore, teachers must also be exposed to innovative training informed by an international and intercultural perspective. A plurilingual approach for teacher and teacher educators' professional development would facilitate this exchange. Plurilingualism is a fundamental principle of the Council of Europe language education policies. It should be understood as competence (the ability to use languages to take part in intercultural action and value (positive acceptance of diversity) (Beacco, 2007).

A plurilingual approach for teacher and teacher educators professional development; given a world education culture. In a global culture where learners are required to develop language and intercultural competencies to be influential global citizens and develop an open attitude of otherness (Plurilingual and intercultural education: definition and founding principles, n.d.), competencies in language and culture are vital to the professional development of teachers and teacher educators—with the aim that they can engage and contribute as stakeholders of the learning society in the arena of global culture. A plurilingual approach could provide access to language and culture competencies in teacher and teacher educators' professionalization, facilitate opportunities for international exchange, and favor the transfer, re-interpretation, and evolution of knowledge bases.

Implementing a plurilingual approach for teacher and teacher educators' professionalization to provide access to language and culture competencies: Language policy has been at the core of teacher education for centuries, yet teachers and teacher educators have received little to no preparation in language policy (Wiley, 2008). The advent of globalization requires that the learning society adopt current language policies in education. Gajo (2013) reminds us that language is central to conveying information and elaborating knowledge. Hence, language competencies—plurilingualism—are a fundamental asset to the knowledge society. Moreover, over a decade since Spring (2009) noted that commodified education services mainly served English-speaking nations; much has not changed since then. The learning society cannot support monopolistic language and culture practices to facilitate lifelong learning in teachers and teacher educators in a world education culture.

Plurilingualism fulfills a social function in the global culture. It postures an individual to be aware and open to diversity, challenges a Eurocentrically flavored discourse (Bagga-Gupta & Surian, 2014), and is a fundamental ingredient of democratic behavior (Beacco, 2007). It is not about monolingual courses in parallel or internationalization (which often means English is the adopted language), but a fair balance between languages—in service of the knowledge society. Gajo (2013) gives us relevant examples from Switzerland: a teacher creating links between linguistic work and a reflection on the concerned discipline, which leads an individual to consider ways of being and understand that language offers variegated avenues to process information. In addition, the framework for reviewing the relationship between language policies and teacher preparation implemented in Arias & Wiley's (2013) study found that restrictive language policies provide prospective teachers with few alternatives for the instruction of students who do not speak the language sanctioned by the curriculum. In light of these findings, Arias & Wiley recommend that applied linguistics content be embedded within teacher preparation. Furthermore, Young's (2014) study reveals evidence of separate spaces for different languages, linguistic hierarchies, and ideologies unsupported by research findings in the reported discourse of 46 headteachers from northeast France. These findings underline the importance that failure to prepare teachers and teacher educators for the emergent world education culture could have devastating consequences on the learning society and hence the knowledge society.

How can a plurilingual approach be effectively implemented for teacher and teacher educators? First, there must be a decisive and public reflection on the role of language and culture in teacher and teacher educators' professional development. The BLTeae project has conducted such a reflection. Nevertheless, a robust linguistic policy for teachers and teacher educators remains to be defined. As a point of departure for recommendations, the University of Geneva's (n.d.) two dimensions (a strategic dimension and an operational dimension) and 18 measures adopted for their language policy, the results from the DYLAN (n.d.) project, as well as the FREPA and education language policies module (CARAP/FREPA, n.d.) could serve as a benchmark.

A plurilingual approach to facilitating opportunities for exchange and the transfer, re-interpretation, and evolution of knowledge bases: The Union, I.T. (2019) reported: that almost the entire world population lives within reach of a mobile network (97%); in developed countries, most people are online, with close to 87 percent of individuals using the internet; Europe is the region with the highest internet usage rates, while Africa is the region with the lowest internet usage rates; in the least developed countries (LDCs), only 19 percent of individuals were online in 2019; while 93 percent of the world's population lives within reach of a mobile broadband or internet service, only just over 53 percent uses the internet. This report confirms that infrastructure is already in place to support the learning society in its efforts to foster opportunities for plurilingual and intercultural shared learning experiences through synchronous and non-synchronous interaction (Google Drive, Facebook, Twitter, email, Skype, Moodle…). Nevertheless, there are still challenges.

The rapid increase of information in our society due to information technologies such as social media has driven the establishment of today's knowledge society. Indeed the knowledge in this society is available to all members of the society, yet all members do not have access. Either because they lack the technical, linguistic, and cultural skills needed to access the knowledge or do not have access to technologies required to access the knowledge. The Union, I.T. (2019) report indicated that an essential barrier in the uptake and effective use of the internet is a lack of ICT skills. The report stated that in 40 of 84 countries for which data was available, less than half the population possesses basic computer skills such as copying a file or sending an email with an attachment. These results show a strong need to develop digital literacy skills and confirm the OECD 2018 report, in which teachers indicated that they needed more training in ICT skills for teaching. Considering interactional patterns and ways of being in the virtual community culture, Lindner's (2014) study about teachers views on ICT about the four primary language skills (reading, writing, speaking, and listening) showed that teachers viewed ICTs as very good for writing, rather good for listening and not so good for speaking. Interestingly, only one-third of the respondents viewed ICTs as rather good acquiring reading skills. These results are worth considering as they may guide which type of activities will be most helpful in creating opportunities for plurilingual and intercultural shared learning experiences.

Language is positioned as a mediator in the exchange, transfer, re-interpretation, and evolution of knowledge in a plurilingual approach. It may be a means of quality assurance in the knowledge society. Gajo (2013) gives us another example from Switzerland where research by Borghi, Burr & Schweizer has shown that the need to formulate laws in several languages leads to better calibrated, more explicit texts—because they are negotiated to a greater extent—and as a result, perhaps to better laws. The European project DYLAN (Language dynamics and management diversity) has also shown the added value of plurilingualism, both in communicative and cognitive dimensions (DYLAN, n.d.). A plurilingual approach requires a reframing of knowledge to optimize communications; in this sense, Berthoud (2018) identifies plurilingualism as a reinforcer for the construction and communication of knowledge. Benaroyo (2013) demonstrates this concept with variations on the theme of the body and disease: he notes that in the French language, there is only one word to say disease: Maladie and only one word to designate the body inhabited by the disease: corps; in English however, three words designate disease: disease, illness, and sickness. Benaroya states that these words refer to three representations of the body in English and French inhabited by disease. However, there is only one word to designate these multiple realities: the word corps in French and the word body in English. In German, on the other hand, the body can be designated in two ways: the word Leib, which means the body proper. Leib expresses a reality quite distinct from the body object, which the German language designates as körper. These words express the semantic depth of notions of the body and disease. It is evident-—when language and culture are given the attention required for plurilingual and intercultural shared learning experiences, this perspective can foster opportunities for exchange and the transfer, re-interpretation, and evolution of knowledge bases.

4. Informal learning and new forms of augmented learning and teaching

Collaborating means working together, which implies sharing tasks, an explicit intention to "add value" to create something new or different through a deliberate and structured collaborative process, in contrast to a simple exchange of information or execution of instructions. The potential of collaboration is strengthened when it is mediated by technology, like online communications and social networks (Mora-Ruano et al., 2019). Digital technologies and social media increase continuous exchanges and collaborative actions among peers, impacting professional learning (Impedovo, Ligorio & Law, 2012; Impedovo & Khatoon, 2016).

Social networking sites, blogs, wikis, and multimedia platforms are among the applications typically included in the social media landscape (Tess, 2013). The spread of S.N. in the world is vast – there are 7.7 billion people globally, with 3.5 billion of us online. This means that one in three people globally uses social media platforms

and more than two-thirds of all internet users. Social media refers to a wide range of applications that enable users to create, share, comment, and discuss digital content. Social networks like Facebook that were primarily conceived for socialization have now become oriented towards professional use and a phenomenon called professional Facebooking (Manca & Ranieri, 2017).
The educational literature suggests that teachers are becoming engaged on social media like Twitter, Facebook, Instagram, and Snapchat (Potolia & Zourou, 2019). Thus, the use of online professional communities could have the potentiality for professional learning. Indeed, participation and collaboration on social media could be favorable for discovering, discussing, and suggesting methodologies, tools, and solutions already experimented by peers, introducing innovation (Fancera, 2019). Teacher and teacher educators regularly use technological tools and digital resources in their teaching, such as exploring various pedagogical resources, uploading documents, and receiving updates about new trends. For example, social networks have become a space to share open educational resources (OER), particularly for teachers who need to go beyond academic textbooks. Through social media communities, teachers are engaged in collegial discussions and share experiences related to their profession. At the same time, the main challenges are associated with the risks to privacy deriving from personal data disclosure, which is an inherent characteristic of social media in general.

5. Learning from Global North and Global South

Formal and informal modalities of professional learning for teacher and teacher educators need to meet the emerging challenge of increased openness and cross-institutional collaboration among higher education institutions and practitioners (Nerantzi, 2019).

Understanding how to maximize the potential of connecting other communities of teacher educators, professionals, and institutions via such media remains a significant challenge. Language policies that promote a plurilingual approach will allow teacher educators to accept external collaboration beyond national borders, incorporate new perspectives into their daily practices and develop the pedagogical practices and digital competencies necessary to face new challenges posed by the knowledge society. Furthermore, teachers must be exposed to innovative training with an international and intercultural perspective. Considering the issues of the teacher competencies for teacher and teacher educators, the attention on competencies have to be central. We proposed a reference framework of competencies required for teacher-educators to engage their professional development in the following. This is the final output of the project BLTeae (www.blteae.eu), based mainly on AMU's teaching skills reference:

1. Mastering academic knowledge: to read up on the most appropriate resources and have an epistemological view of concepts and their evolution.
2. Designing an education: Define objectives in terms of knowledge and skills; taking into account the context of the training and the diversity of the public and their achievements; Structuring the teaching content; Plan activities and teaching sequences
3. Using the different Information and Communication Technologies: Using multimedia tools; Produce adapted teaching aids
4. Transmit academic knowledge: Supervise the student in time in the development of personal work; Make yourself available to interact with the student; Assist the student in his educational choices and study pursuits; Support the student in the construction of his professional project
5. Supervise and accompany the student: Supervise the student in time in the development of personal work; Make yourself available to interact with the student; Assist the student in his educational choices and study pursuits; Support the student in the construction of his professional project.
6. Evaluate learning: Know and master the different evaluation methods; Plan and implement evaluation activities according to the objectives pursued; Inform the student of the evaluation procedures
7. Working as a team: Participating in the design, implementation, and monitoring of educational projects; Organize, communicate and collaborate with other teachers within the training schemes throughout the academic year; Work in a multidisciplinary team
8. Coordinate a university pedagogical program: Organize a training device taking into account the objectives of the training, its constraints, and, where appropriate, the multidisciplinary context in which it is pars; Structuring educational programs by ordering a coherent progression; Guide and accompany the work of the pedagogical team in the implementation of the training program; Undertake a work of continuous improvement of the training device.
9. Reflect on your teaching practice and make it evolve: Update your knowledge according to the progress of the research; Have a constant critical view of his practice and understand its impact on student learning; Share your practice with other teachers; Measure the relationship between the content of his teaching and professional integration. Define your needs for continuing education.

10. Act ethically and responsibly: Act following the fundamental, secular, and regulatory principles of the university system; Comply with the university's rules of procedure and the exam charter and make them respected by the students; Avoid all forms of devaluation and discrimination against students and other members of the university community; Respect equality between women and men; Ensure the confidentiality of individual student information. Observe the rules relating to intellectual property.
11. Be aware of the cultural differences and minority position: Be aware of the cultural influences in your interaction and others. Our action is embedded in our culture and society. Being able to self-decentralize from one's own culture to take on a new point of view of a culture different from one's own, considering the multicultural society in which we live. Respect all the minorities (religious affiliation, culture, origin, race, behavior, etc.)

6. Conclusion

In this paper, we considered the development of complex professionalism such as that of the teacher and teacher-educators and how this can allow participants to take advantage of international networking, which today's technology makes possible but is not yet fully proposed by higher institutions. Quality of teacher-educators training in different parts of the world could take advantage of a continuous connection between people, knowledge, and communities, opening new discussions and valorizing contextual educational experiences outside of the western mainstreaming in teaching and learning. We also sought to demonstrate that these shared experiences could be significantly enhanced by formulating a robust and systematic language policy allowing teachers and teacher educators to fulfill their role in the knowledge society.

At the same time, it is also essential to focus on the quality of the design of appropriate international training, which considers the possible limits and challenges of the context, including formal and informal modalities and prospects. Hence, designing a hybrid formal and informal learning space for professional development could help support a new generation of international teachers who are connected beyond national borders.

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21st Century Learning Platforms: Social Media for Teaching and Learning

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The 21st century has been marked by a whole new digital ecosystem. The use of digital technologies continues to transform and accelerate the educational approach in teaching and learning. The advancement of technologies in the 21st century has changed the traditional methods of teaching. The examples of the four social media platforms have demonstrated that organizing teaching resources and activities on one's own website and integrating technology can bring students' learning experience to a different level. Younger educators, who are from the generations Y and Z can easily adapt to 21st Century Education and will not feel stifled with the traditional classroom teaching approach.

Keywords: 21st Century Learning Platforms, Social Media, Teaching, Learning

1. Introduction

The 21st century has been marked by a whole new digital ecosystem. The use of digital technologies continues to transform and accelerate the educational approach in teaching and learning. This is to resonate with students in a tech-savvy world. Educational institutions have come to a consensus that the interaction between an educator and students is not limited to the classroom, but the learning can be extended after classes are done, taking the form of blended learning. In reality, there is the inability to adapt quickly by the education institutions across the different levels i.e. from primary schools to tertiary institutions to such a paradigm shift. However, since the World Health Organization announced the Coronavirus 19 (Covid-19) outbreak as a pandemic in March 2020, many countries implemented a lockdown or movement control order based on the recommendations to apply prevention measures. The pandemic led to the closure of schools and higher learning institutions who have to seek alternative ways to reach their students. The pandemic has unintentionally pushed the global educational system into a massive experiment of 21st century education irrespective of readiness or desire, shifting from school classrooms to virtual screens.

2. 21st century education

A 21st century education has been ushered in by the advancement of digital technology. Education in the 21st century highlights globalization and internationalization (Boholano, 2017). Students across all levels of education, therefore, need to be equipped with the skills to prepare them to succeed in the 21st century world workplace. Successful learning in 21st century learning according to Trilling and Fadel (2009, P.177), is the product of 3Rs and 7Cs skills, with 3Rs X 7Cs = 21st Century Learning. Table 1 shows the summary of skills for successful learning in the 21st century. The 7Cs skills has been further divided into 12 skills categorized into 3 categories namely: Learning and innovation skills, Digital literacy skills and Career and life skills (Trilling and Fadel, 2009, pxxvi) as in Table 2. These are skills to navigate students in the global competitive information age in the 21st century.

Table 1. Skills for successful learning in the 21st century

3Rs skills	7Cs skills
Reading W**r**iting A**r**ithmetic	**C**ritical thinking and problem solving **C**reativity and innovation **C**ollaboration, teamwork, and leadership **C**ross-cultural understanding **C**ommunications, information, and media literacy **C**omputing and ICT literacy **C**areer and learning self-reliance

Table 2. 21st Century Learning Skills

Category	Skills
Learning and innovation skills	Critical thinking and problem solving Communications Collaboration Creativity and innovation
Digital literacy skills	Information literacy Media literacy Information and communication technologies (ICT) literacy
Career and life skills	Flexibility and adaptability Initiative and self-direction Social and cross-cultural interaction Productivity and accountability Leadership and responsibility

Figure 1 shows the 21st century knowledge and skills rainbow consisting of four domains. It draws the partnership of the traditional core subjects and the three 21st learning skills as additional themes (Trilling & Fadel, 2009).

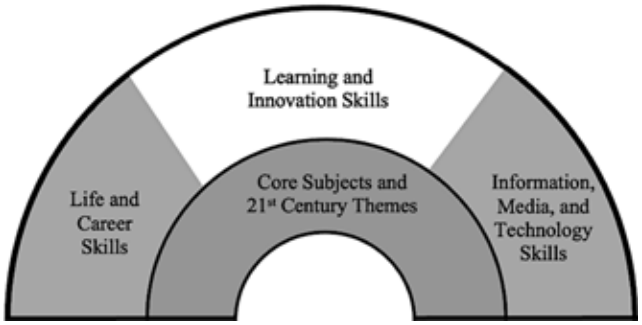

Figure 1. The 21st Century Knowledge-and-Skills Rainbow, (Trilling & Fadel, 2009, p.48)

Therefore, to prepare students for complex life and adapt themselves in the 21st century work environment, the 4Cs skills in Learning and innovation skills category are essential to bring students to the highest level of the revised Bloom Taxonomy which train them to have higher order thinking skills (Figure 2).

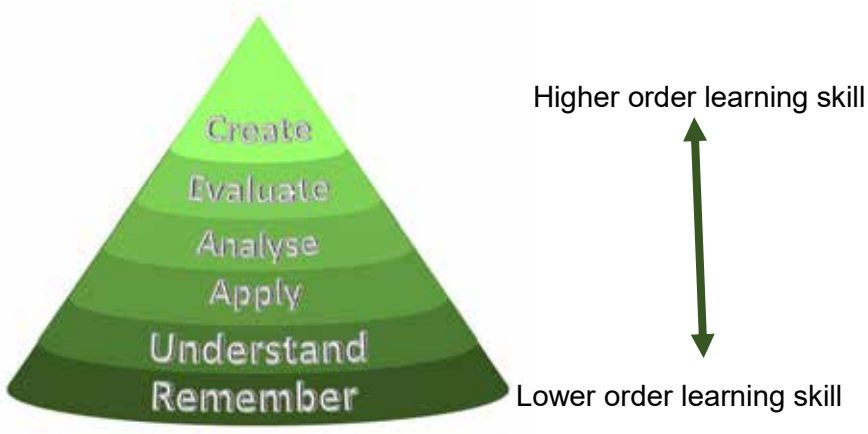

Figure 2. Revised version of Bloom Taxonomy

3. 21st century students

The 21st century students are from generation alpha, Y and Z and are digital natives. They have grown up with the advancement of digital technology and digital communication. Most of them own and carry smart devices with them all the time, digital literate to access information, following the fast changes and upgrading technology tools to learn and live. They are connected all the time via social media. According to Kemp (2020), the chief analyst of DataReportal, there are 3.8 billion social media users in January 2020 with a record of more than 9 percent increase as compared to the year before. Table 3 shows social media demographics as reported by Khoros (2020).

Table 3: 2020 Social media demographics (Khoros, 2020).

Social media platform	Percentage of users according to age group
Facebook	86% of people ages 18-29 years old 77% of people ages 30-49 years old 51% of people ages 50-65 years old 34% of people that are 65+ years old
Instagram	67% of people ages 18-29 years old 47% of people ages 30-49 years old 23% of people ages 50-64 years old 8% of people that are 65+ years old
Pinterest	34% of people ages 18-29 years old 35% of people ages 30-49 years old 27% of people ages 50-65 years old 15% of people that are 65+ years old
Twitter	38% of people ages 18-29 years old 26% of people ages 30-49 years old 17% of people ages 50-64 years old 7% of people that are 65+ years old
YouTube	81% of people ages 15-25 years old 71% of people ages 26-35 years old 67% of people ages 36-45 years old 66% of people ages 46-55 years old 58% of people ages 56+ years old

Among the users, generation alpha, Y and Z were recorded as the main users in social media. As they make the largest number of the students, social media platforms can effectively engage them in learning. Thus, 21st century educators need to adapt themselves to 21st century platforms. A survey carried out on 33 lecturers from a higher learning institution consensually agreed that social media could be the teaching platform for teaching. There were

45.5 percent strongly agreed and 51.4 percent of them agreed that social media provides a useful platform for them in teaching. All of them saw the educational value in using social media for teaching. Another survey study carried out on 223 higher learning institutions' students showed that 100 percent of the students agreed to use social media in learning.

On the average, social media users spend 2 hours and 24 minutes per day on social media platforms (Chaffey, 2020). The average time spent from the study on 223 higher learning institution students is 5 hours 30 minutes per day. Figure 3 shows the percentage of time spent (hours) by the students on social media. A majority of 41.3 percent spent 3 to less than 6 hours followed by 24.7 percent who spent 1 to less than 3 hours per day. There were 22.9 percent of the respondents who spent 6 to less than 12 hours and 9 percent of the respondents who spent 12 hours and above per day. Only 2.1 percent of the respondents spent less than 1 hour on social media per day.

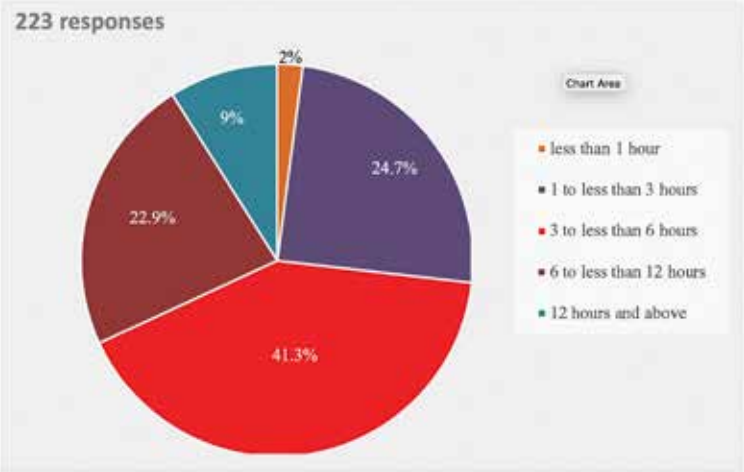

Figure 3. Number of hours spent by 223 higher learning institutions students per day on social media.

Social media platforms versus Learning Management Platform

A Learning Management System (LMS) is a web based or cloud-based software program which assists in teaching and learning process and helps in effective delivery of instruction, training and development programs (Chaubey and Bhattachara, 2015, p.158). The traditional learning management platform has been used by many higher learning institutions since the launch of LMS by University of Illinois in 1960. However, as educators need to catch up with digital advancement, the use of preferred learning platforms by students to teach are challenging. They have no other options but to ride the wave together with their students. Results of the survey conducted on the 223 higher learning institution students showed preference for social media teaching and learning platforms as compared to LMS (Figure 4).

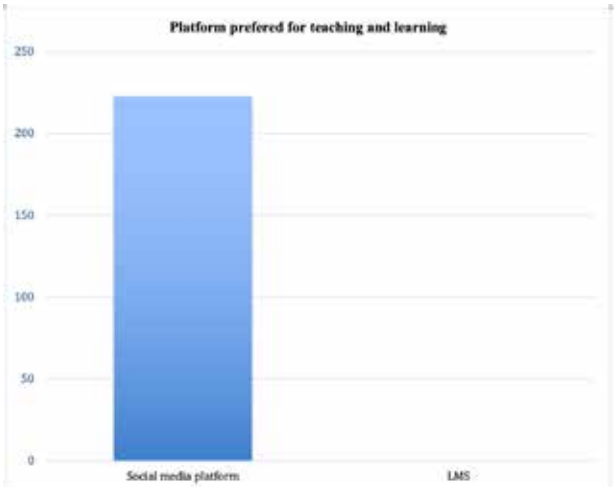

Figure 4: Preference of social media platform for teaching and learning by higher learning institution students

4. Matching social media activities to the 21st Century Skills and Bloom Taxonomy level

the challenge of considering the change in attitude towards 21st century education involves a rethinking of teaching strategies. Many educators have started to use social media in teaching different subjects (Paulsen and Taekke, 2013, p.2). How to use social media tools to help students acquire 21st century skills? Table 4 shows the activities in social media which promote students learning 21st century skills.

Table 4. Social media activities to build 21st century skills aligning to Bloom Taxonomy

Activity	21st century skills	Level of Bloom Taxonomy	Description
1. Create a Facebook/ Instagram/Pinterest /Twitter account and home page	✓ Creativity and innovation	✓ Create	To create a social media homepage, students need to be creative and innovative. If the students can successfully create a social media homepage, he/she has mastered the creative and innovative skills and achieve the Create level of Bloom taxonomy.
	✓ Media literacy ✓ Information literacy ✓ Information and communication technologies (ICT) literacy	✓ Analyse ✓ Evaluate	Students may want to see how others create the homepage or interface. Students need to compare and differentiate some of the existing homepages and make a conclusion on what is an interesting and attractive homepage. To carry out the task, they need to be media literacy, information literacy and ICT literacy.
	✓ Communications ✓ Social and cross-cultural interaction ✓ Collaboration	✓ Analyse	A social media account will encourage students to communicate with others. When they communicate, they need social and cross-cultural interaction skills to keep the communication going. In this situation, the collaboration between the learning community is kicked off and students always need to draw connections among ideas from different social backgrounds. This step requires analyzing the level of Bloom Taxonomy.

Activity	21st century skills	Level of Bloom Taxonomy	Description
2. Work in group to solve a given problem and present the works live via social media platform	✓ Critical thinking and problem solving ✓ Creativity and innovation ✓ Flexibility and adaptability	✓ Create	Solving problems needs critical thinking, problem solving, creativity and innovation skills. Working in a group needs flexibility and adaptability.
	✓ Communications ✓ Collaboration ✓ Initiative and self-direction ✓ Flexibility and adaptability ✓ Social and cross-cultural interaction	✓ Create ✓ Evaluate ✓ Analyse ✓	Working with group members promotes communications and collaboration skills. Each member needs to take initiative and self-direction to find innovative solutions to the problem and share with their group members. All members need to be flexible and receptive to solutions suggested by group members. The communication between group members also promotes social and cross-cultural interaction skills
	✓ Leadership and responsibility	✓ Create ✓	The leader of the group needs leadership and responsibility skills. A leader also needs critical thinking skills to lead the group.
	✓ Information literacy ✓ Media literacy ✓ Information and communication technologies (ICT) literacy	✓ Create ✓	Group members need the information literacy, media and ICT literacy skills to access more information for creative and innovative solutions to the problem.

Activity	21st century skills	Level of Bloom Taxonomy	Description
3. Create digital story and content	✓ Communications ✓ Collaboration ✓ Creativity and innovation	✓ Create	This activity allows students to create innovative story or course content. By doing this, students need creativity and innovation skills and the story they created shows that they have achieved the Create level in Bloom Taxonomy.
	✓ Creativity and innovation ✓ Critical thinking and problem solving ✓ Communications ✓ Collaboration ✓ Information literacy ✓ Media literacy ✓ Information and communication technologies (ICT) literacy ✓	✓ Create ✓ Evaluate ✓ Analyse	The process of writing the story and content helps students to collaborate with one another, sharing and constructing knowledge, organising their ideas, research and planning to find inspiration and information for the content of their story. It includes blog posts, videos, infographics and more. The process needs creativity and innovation, critical thinking and problem solving, communications, collaboration skills to complete the task. This promotes active involvement of students and challenges students to create their own lesson materials. At this level, students have achieved the highest level of Bloom Taxonomy. In the process of achieving this, they need all the skills of the digital literacy skills.
	✓ Flexibility and adaptability ✓ Initiative and self-direction ✓ Social and cross-cultural interaction ✓ Productivity and accountability ✓ Leadership and responsibility	✓ Create ✓ Evaluate ✓ Analyse	The activity gives students a chance to learn career and life skills through the process of producing the story or content. They need to have initiative and self-direction on the task, flexible and receptive to the new ideas put forward by friends, social and cross-cultural interaction skills to tackle peers from different backgrounds, accountable and responsible for their writing. The completion of this task indicates the achievement of students in the Create level of Bloom taxonomy

Activity	21st century skills	Level of Bloom Taxonomy	Description
4. Digital portfolio	✓ Initiative and self-direction ✓ Critical thinking and problem solving	✓ Create ✓ Evaluate Analyse	The digital portfolios can be used to display students' best work and their digital resume. The good work of other students may inspire, encourage, and build enthusiasm in learning among students. They need to be self-initiative and self-directed to produce good work. Beside this, students learn the creativity and innovation skills of others. This will promote competitions among students to deliver good work and hence improve their critical thinking and problem-solving skills which are at the highest level of Bloom Taxonomy.
	✓ Information and communication technologies (ICT) literacy ✓ Productivity and accountability ✓	✓ Create ✓	To create a digital portfolio, students need ICT skills, productivity, and accountability skills to produce a good work.
5. Conduct test / quiz	✓ Initiative and self-direction ✓ Critical thinking and problem solving ✓	✓ Create ✓ Evaluate ✓ Analyse ✓ Apply ✓ Understand ✓ Remember	Preparing for tests or quiz trains students to have their own initiative and self-direction skills to access their own learning. The test and quiz questions are set according to different levels of the Bloom taxonomy. Students need to have higher order thinking skills to score high in the test / quiz.
6. Conduct polls	✓ Creativity and innovation ✓ ICT literacy	✓ Create	Educators and students can obtain views from each other by posting surveys, questions, or polls. The application is available in most of the social media platforms. Students need creative and innovative skills together with their ICT skills to design the polls. By doing this, they will be at the created level of Bloom taxonomy.

Activity	21st century skills	Level of Bloom Taxonomy	Description
7. Share learning resources	✓ Critical thinking and problem solving ✓ Communications ✓ Collaboration ✓ Creativity and innovation ✓ Information and communication technologies (ICT) literacy ✓ Productivity and accountability	✓ Create ✓ Evaluate ✓ Analyse ✓	Social media platforms prepare an exceptional opportunity for diverse groups' students to share learning resources. Educators may encourage students to do research, evaluate and publish learning resources on a topic. This may promote students' critical thinking and problem-solving skills
8. Participate in social connection	✓ Critical thinking and problem solving ✓ Communications ✓ Collaboration ✓ Information literacy ✓ Media literacy ✓ Information and communication technologies (ICT) literacy ✓ Social and cross-cultural interaction	✓ Create ✓ Evaluate ✓ Analyse ✓	Social media platforms connect students at anytime and anywhere. The instant connection allows students to share opinions, experiences, and knowledge with their friends and families. The connectivity can be extended all over the world within a second. This means 21st century students learn through wide connectivity which provides them with more opportunities for collaboration. They need critical thinking and problem-solving skills to analyse, evaluate their network and decide which network will enhance their learning.
9. Invite experts /speakers	✓ Critical thinking and problem solving ✓ Communications ✓ Collaboration ✓ Creativity and innovation ✓ Information and communication technologies (ICT) literacy	✓ Create	Live presentation tools which can be found in most social media platforms allow invited experts or speakers to offer endless opportunities to expand young minds. Students get opportunities to connect and collaborate with experts. In this way, students gain their 21st century skills faster. They have more opportunities to learn and master their higher order thinking skills through the guidance of experts.

5. Four exemplars of using social media for teaching and learning

The course on Social media in teaching is offered to educators in http://moodle.blteae.eu/ from the ERASMUS+ KA2 – Cooperation for innovation and the exchange of good practices – Capacity Building in the field of Higher Education, European Union. The module includes four chapters: Teaching with Facebook, Teaching with Instagram, Teaching with Pinterest and Teaching with Twitter.

5.1 Facebook (FB)

Facebook (FB) has many features which are suitable for teaching and learning. Educators may develop and deliver content in real time, share educational resources with students and peers, as a platform for students' collaboration

work, communication and network among students or between students and educators. Besides these, FB also can be used for self-managed learning where students can submit their assignments. Subjects which are abstract are also suitable to be conducted on FB.

The 21st century skills are embedded when teacher and learning is carried out via FB platform. For example, in completing the group assignment given in the FB platform, students need to discuss, communicate and come to an agreement of their innovative ideas for their assignment. The process promotes learning and innovation skills, and career and life skills. When they look for the online resources for their assignment, digital literacy skills will be promoted. Beside this, the process of joining the group's members' ideas in a piece of good work needs students' critical thinking, which is the higher order thinking skill in Bloom's taxonomy.

Figure 5 shows the FB interface for teaching mathematics and statistics courses in core subject knowledge. First, a closed group is created to ensure privacy issues of the course content and discussions. To carry out the task, a selected group member or a volunteer can be assigned the task. This process promotes leadership and responsibility skills. The skill needed to create the close group is information and communication technologies (ICT) literacy.

Figure 5. Interface of Statistics and Mathematics learning groups

The most important part of teaching and learning is the course content. The course content can be shared in the feed in the FB. Educators may use live video (Live Video) to conduct a live lecture or live discussion. This feature allows educators to carry out a few hours of the online teaching or online discussion. On the other hand, pre-recorded video on the teaching can be prepared and uploaded at any time. The feature is useful for educators who are unable to carry out their task according to the timetable scheduled due to other commitments. Thus, the students do not have to miss the lecture. This feature also allows students who have initiative and self-direction skills learn at their own pace. To do this, in the new feed (Figure 6), the educator can write the message or instruction to students. Before posting the message, the educators may add the file by clicking on the button that matches the type of file that is going to be uploaded on the right of the "Add to your post" located at the bottom of the feed.

Figure 6: New Feed in FB

Figure 7 shows the add on feature on FB. The feed is also a platform for discussion and sharing of resources. The group members may express their emotion on the post through emoji in "Like button" or give comment via "Comment button". This feature promotes communication, collaboration and all digital literacy skills. The group discussions among students therefore can result in an innovative product where they learn to be accountable. To achieve such a level, students need higher order thinking skills such as critical thinking, problem solving, creativity and innovative solutions. Working in a group needs flexibility and adaptability. From the group work activities, social and cross-cultural interactions skills will be developed since students are from different backgrounds and cultures.

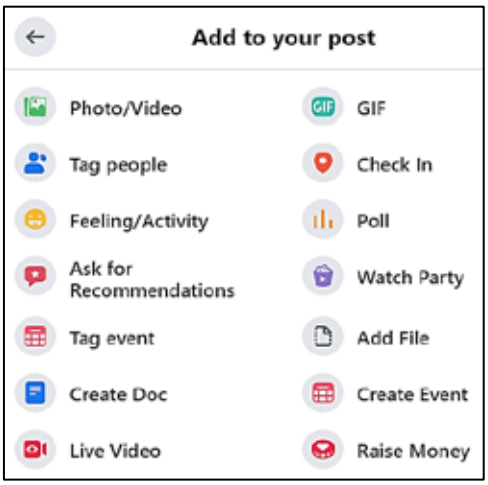

Figure 7. Add on feature on Facebook

Thus, FB is a platform which can be used to obtain the core knowledge and the 21st century skills for teaching and learning for the 21st century students. The use of the teaching and learning features in FB promotes all 21st learning skills and instils students' higher order thinking skills which is in the highest level of Bloom taxonomy.

5.2 Instagram

Instagram is a social media venue that allows users to capture and share stories, images, slideshows and live or copied videos with followers including their description on their profile either privately or publicly. Chan et al. (2019) reviewed that it can provide contextualized visual information, which can be used in educational settings like: virtual participative learning among communities; autonomous learning; establishing content generation; constructive learning; collaborating and sharing of learning; providing authentic interactive learning environment. Several groups formed in a virtual class community are created in the Instagram account (Figure 8). This requires the media and ICT skills to be developed which are essential components of the 21st century environment. Leadership skills are already reflected at this stage as each group commitment is the responsibility of the leader who will lead in the planning, brainstorming and organizing the story content of assignments. They are to showcase and share through the Instagram platform.

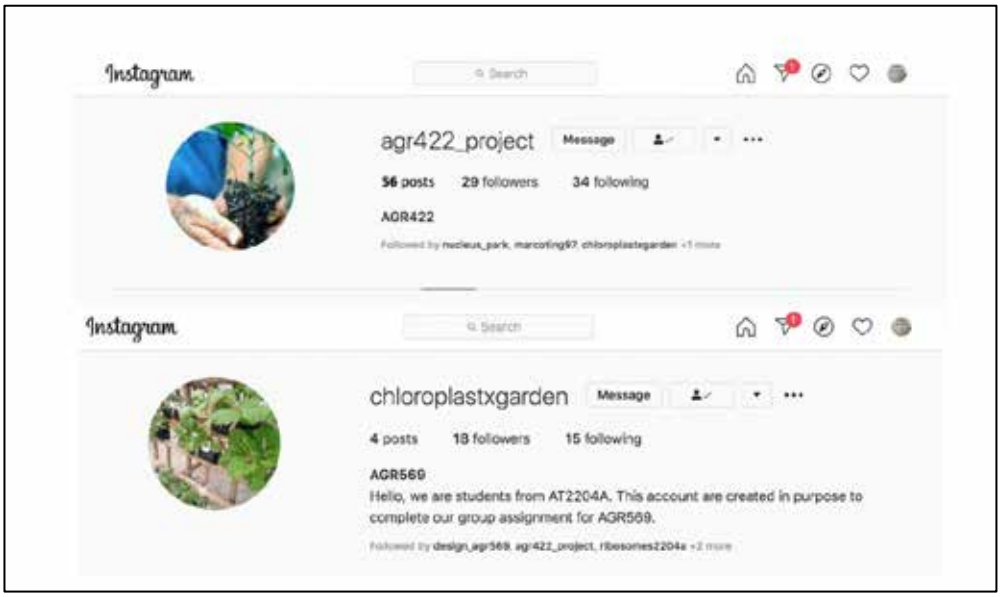

Figure 8: Screenshots of two student group accounts with profile created as agr422_project and chloroplastxgarden.

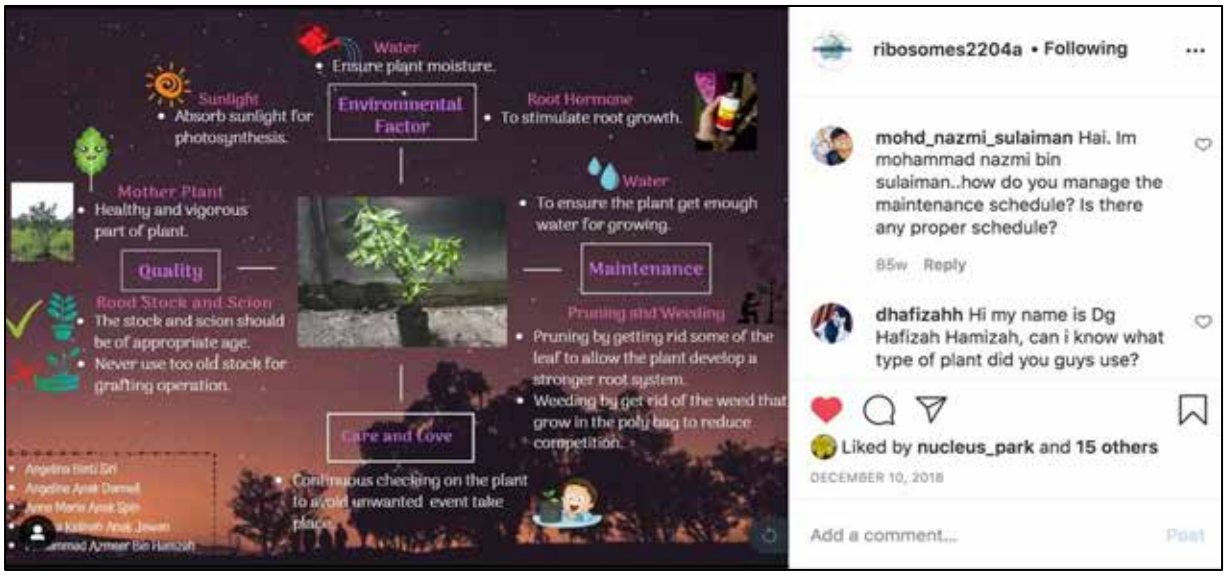

Figure 9: Sharing of graphic mind-mapping presentation in a virtual classroom community in Instagram

An example of an activity on creating a story on a topic on "Methods of grafting and special techniques", documenting the students' learning journey is shown in Figure 9. This prompted each group of students within the class to conduct research and design the process of implementing their projects. Each group used a graphic mind-mapping presentation with captions reflecting collaborative and constructive learning. Students used a useful feature of "hashtag (#) word(s)" for content discovery. The groups were able to obtain the views of their peers and the educator, made possible with the "comment" feature of Instagram.

After interaction with the peers, each group proceeded to create a series of Instagram videos with a timeline capturing their hands-on activities until the completion of the project (Figure 10). They continued to interact, drawing comments and advice from their peers and educators, thus they could achieve the objectives of their assignment and be successful. These are reflections of learning and innovative skills requiring critical thinking and problem solving.

Likewise, different groups of students within the class applied the same process using different plants with a variety of results. Thus, students can socialize academically with each other ubiquitously with response through features like "caption", "follow", "search" or "like" thus creating a virtual classroom community. At the same time, the educator was able to monitor the contributions from all students within the class as a form of attendance by referring to the statistics provided in the "Followers" indicating the number of people that follows an Instagram user with the account e.g. agr422 with their comments and "Followings", the people that follow an Instagram user. The educators used hashtag (#) to organize and categorize content thus enabling students to discuss and interact based on each group account. The students' assignment was assessed aligning to bloom taxonomy.

Thus, the way Instagram becomes integrated into course content will not remain limited only by teaching within the educator's imagination. It broadens learning by providing a platform for students to connect and engage with course concepts with their own thinking skills and creativity. From the students' perspective, using Instagram as a teaching and learning tool revolutionizes the way students communicate, interact and socialize which has become an integral part of their social and cultural fabric. The four domains of the 21st Century Knowledge-and-Skills rainbow with the traditional core subjects and 21st Century themes are clearly reflected in this example. All levels of the revised Bloom taxonomy (Figure 2) are traceable in the students' learning journey.

Figure 10. Screenshots of video uploaded in Instagram through virtual participative learning among student communities

5.3 Pinterest

Pinterest, launched in 2010, is one of the myriad social media in the 21st century where the users can search, collect, share and curate materials that are featured in *virtual pinboards* or bookmarks by pinning and re-pinning. Pinterest functions as a bookmarking tool like pin-board-style which can be kept public or be viewed by other followers or members of the site where they are stored and is available at no cost to users globally. It can be organized by users applying “tags" or using keywords to content. Users are also able to provide a 500-character description under each pin.

With the near ubiquity of social media in contemporary life, educators have explored Pinterest for developing pedagogical ideas and resources and how it can be used to connect with and inspire students. Pinterest could enhance the performance of the teaching core subject knowledge and the 21st century skills as it can sanitize and stoke educator’s creativity by sharing and commenting on visual material like a virtual scrapbook with photographs, sketches, videos or web link. It establishes collaborative learning communities providing the platform for students supervised by the educators to gather, assemble, brainstorm and discuss shared resource collections through research.

Figure 11 demonstrates the use of Pinterest integrating technology-based learning to traditional classrooms in Mathematics. When students sign up for an account to create a board, they are enhancing their media and ICT skills. In addition, when they pin mathematical assignments to the boards, they are sharing and interacting within their group. To keep the group’s privacy, Pinterest has a feature, the secret board that can be created with icon  feature. This allows only members of the group access to the board.

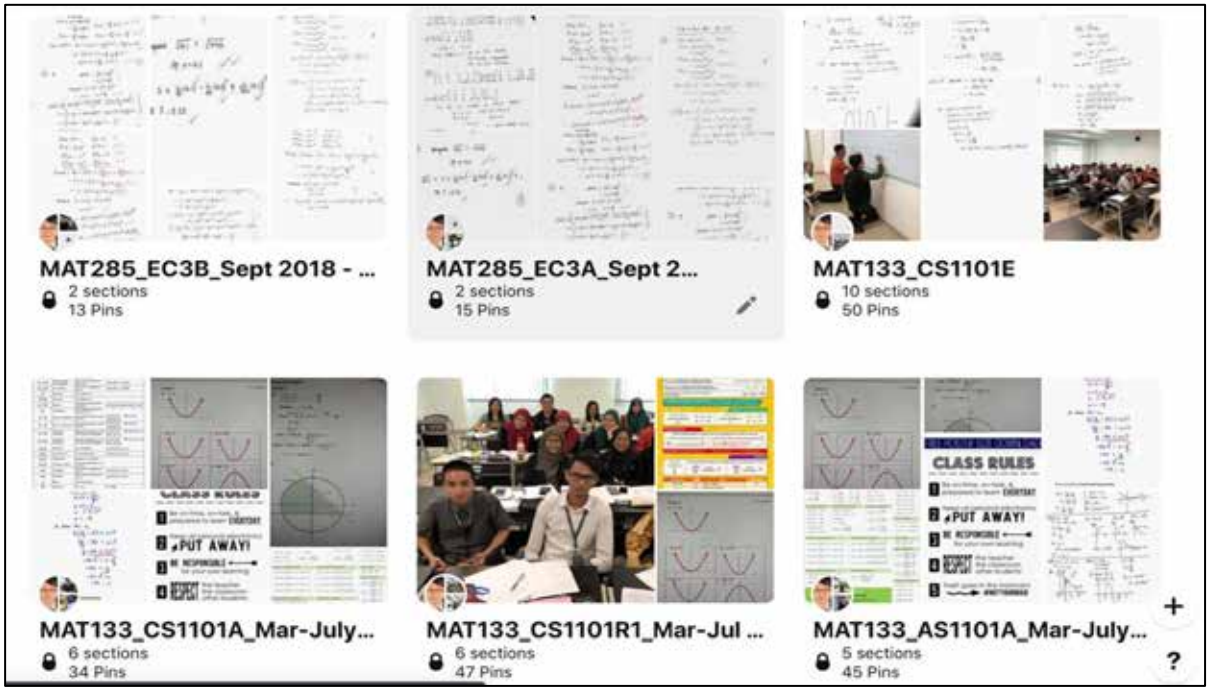

Figure 11. Mathematics Pinterest boards created with secret group

Group members may provide ideas and together organise the board by creating more sub-folders called ‘section’ as shown in Figure 12. To carry on this task, students need to have creativity and innovation skills, social and cross-cultural interaction, productivity and accountability skills. Each topic of the code course is organised under each section. All information on the topic will be either uploaded, linked or pinned. All students known as users or pinners may choose to follow to collect and pin the information of the topic under the section for sharing, comment, and brainstorming in groups. This approach not only provides students with useful information, it connects them to other learning groups in a convenient learning environment at the same time fostering independent learning. Students express enjoyment learning and positive learning outcomes using

Pinterest which has created a perception that it is easier to understand mathematics topics. Being able to bookmark important notes for discussion about specific topics in groups and re-pin new information can draw students to focus and increase their level of involvement and attention due to less distraction in the private group discussion connected in the virtual communities. At the same time, it stimulates students to a higher level of learning skills as in Bloom Taxonomy (Figure 2). This is also observed by Ben-Av and Gurevich (2018) who reported significant improvement in students' attitude towards integrating technology in mathematical courses.

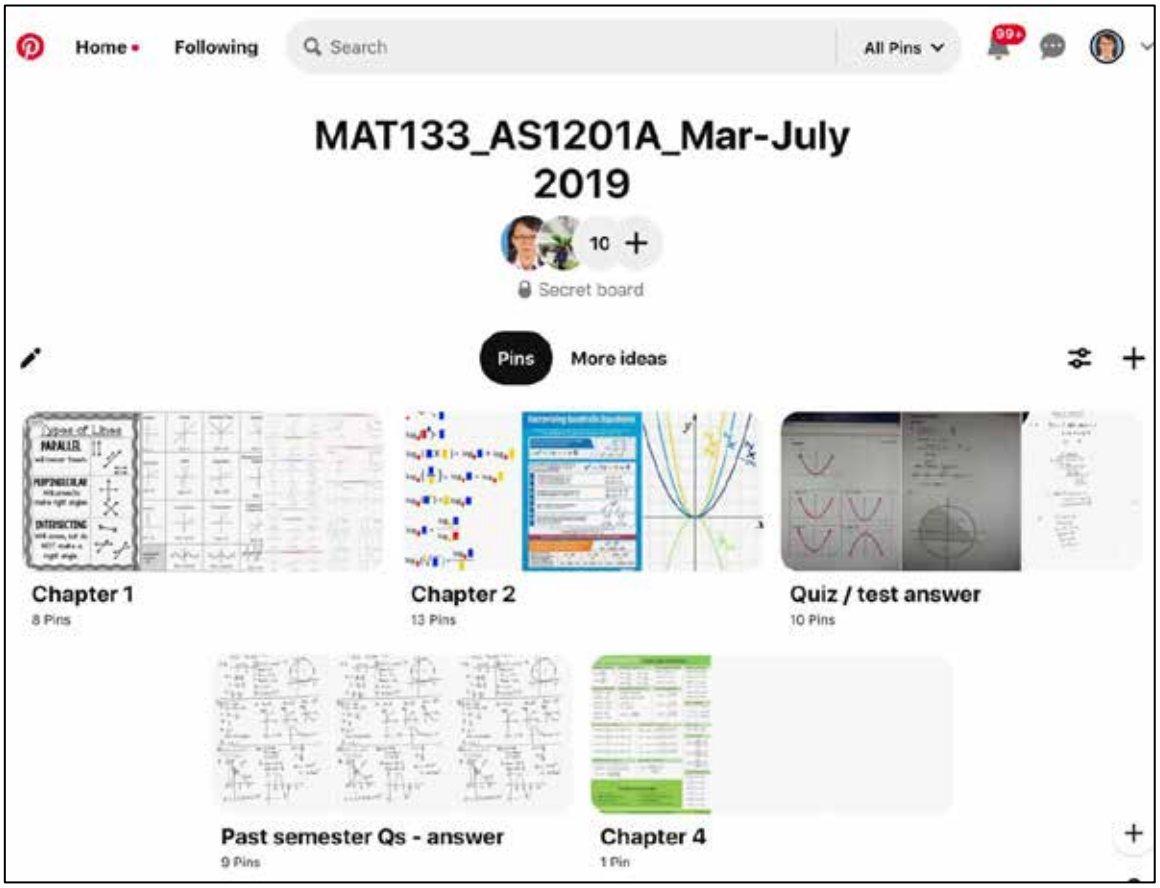

Figure 12. Mathematics topics pinning in sections in the board by secret group

Using Pinterest has shown there is effective teaching and learning which is essential to help students to develop the critical thinking, problem solving skills, self-questioning, self-independent learning, stimulating creative, innovation, and explanation skills needed to master mathematics concepts. To encourage cross-cultural interaction via Pinterest, educators have to be capable of facilitating the positive and constructive interaction that involves multiculturalism. When students engage in using Pinterest in learning Mathematics to carry out their tasks, they exhibit all three categories of 21st century skills: creativity and innovation, communications and collaboration skills.

5.4 Twitter

Twitter is another social media platform which can be used as 21st century education. It has been recognized as a platform that can be used in teaching and learning in many ways such as creating digital classrooms, which enables educators to teach media literacy, information literacy and digital skills as well as to promote students' interaction and engagement inside and outside classrooms. Twitter is also able to connect educators all over the world, in order to share information and knowledge in education, thus indirectly aid them in professional development and continuous learning. Progressively over the years, Twitter has enabled educators to innovate their teaching and learning methods in many different subject areas at various levels of education. Educators can share videos and

demonstrations and raise problems for the students to solve them and tweet back the solutions with a link to the source using a special hashtag. Educators can encourage the students' reading habit from books that have been tweeted, improve writing skill, besides grammar and vocabulary learning applied in all subjects.
To start using Twitter in the virtual classrooms, an educator creates a special Twitter account, whereby it can be a personal account or a subject account for the students to follow. From their own accounts, they can search for the educator's user account using the symbol @, to call out the user's name in the Search section. Through this process, students learn three skills to increase their ICT literacy.

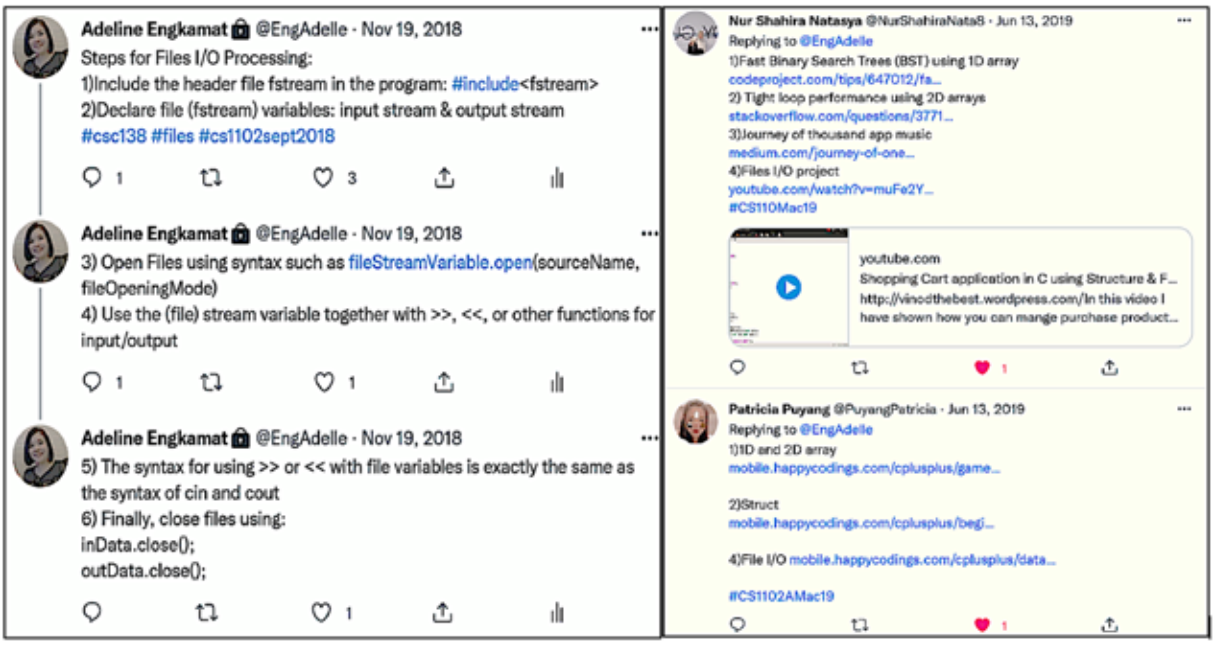

Figure 13: Tweeting notes and resources of educators and students

An example of Twitter implementation in teaching Computer Science relating to C++ programming subject is shown in Figure 13. The educator shares notes of important topics by creating a thread of tweets or sharing the related links. Students are instructed to find their own notes and share extra resources. The regular news updates through the following relevant hashtags will provide an interesting topic for discussion in class. This trains students creativity and innovation, critical thinking, initiative and self-direction skills besides acquiring the content knowledge.

To engage students in group collaborations and discussions, the educator posts discussion questions through tweet and create a hashtag (#) to identify messages on a specific topic, and students use the same hashtag, to follow the conversation. Discussion will carry on and the educator needs to post regularly to encourage discussion. Therefore, students will acquire 21st century skills such as critical thinking and problem solving, creativity and innovation skills for discussion on problems to come to a solution. This also needs flexibility and adaptability, social and cross-cultural interaction skills when working in a group. Students may rotate leading the discussion to learn leadership and responsibility skills. If the solution to the discussion is an innovative product, the productivity and accountability skills are embedded in the learning process. This indirectly promotes active learning among the students.

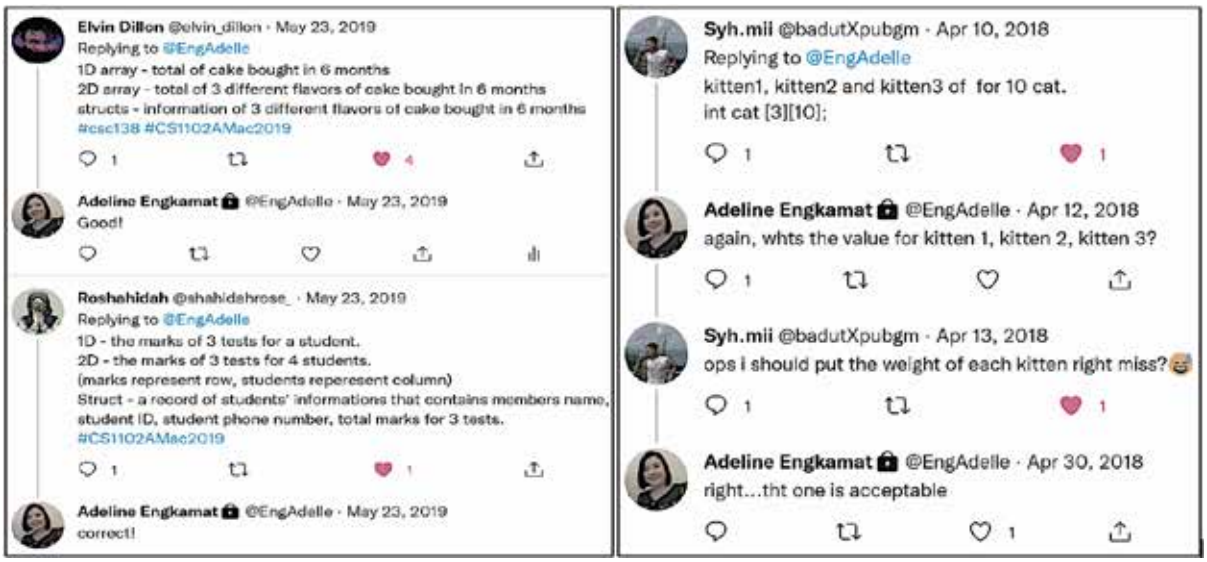

Figure 14. Interaction of educator with students over assignment questions and answers

The educator also can easily and quickly tweet details of homework and assignments questions as shown in Figure 14. Students replied to assignment questions posted in the educator's tweet, by stating the question number and included the hashtag (#) of the topic. Twitter enables real time intervention at any point of students' progress by giving feedback on their answers, comments and good advice to students. Students can use Twitter to ask each other questions. Thus, this will encourage cooperation among students and thus, improving their interrelation and social skills.

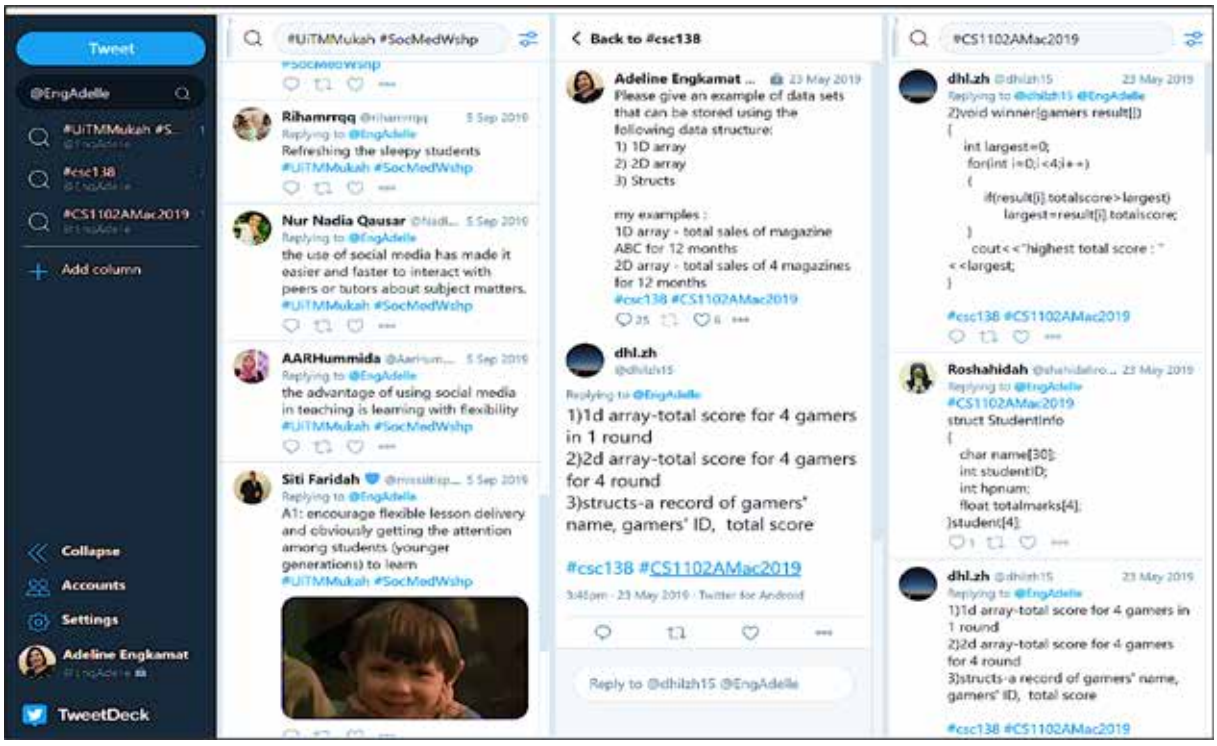

Figure 15. TweetDeck usage in monitoring discussions using the discussions' hashtag

The educator can also use TweetDeck to track their classes' discussions by creating a search column in TweetDeck using the discussions' hashtag. This provides convenience to the educator to closely monitor the participation of the students in the discussion and build Tweet collections for a particular topic in one easy interface as shown in Figure 15. This will enable the educator to assess each group assignment and make comparisons based on Bloom taxonomy.

6. Conclusion

The advancement of technologies in the 21st century has changed the traditional methods of teaching. The 21st century learning is no longer confined within the four walls of classroom learning. With the rapid improvement in social media platforms, they have become the latest trend of teaching platforms which complement the weaknesses of traditional face to face learning to accommodate the trend of the 21st century students. The expansion of classroom learning to virtual classrooms via social media platforms, is not a challenge to 21st century students as they are internet savvies or digital natives. They are connected all the time via their smart devices. The examples of the four social media platforms have demonstrated that organizing teaching resources and activities on one's own website and integrating technology can bring students' learning experience to a different level. It has been demonstrated that the 21st Century Knowledge-and-Skills Rainbow can be acquired in line with the Bloom Taxonomy. It is the changes in the demand for the skills that have profound implications on competencies which educators themselves need to acquire to effectively teach 21st century skills to their students. The shift from looking upwards to seniority must now be towards looking outwards to young educators. Younger educators, who are from the generations Y and Z can easily adapt to 21st Century Education and will not feel stifled with the traditional classroom teaching approach.

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Digital Learning Technology Blend in Assessment Activities of Higher Education: A Systematic Review

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Online teaching and assessment in higher educational institutions have become the new normal due to the COVID-19 pandemic. This chapter presents a systematic literature review on various digital assessment activities as the diversity of student assessment and feedback technologies cannot be identified from existing literature. Applying Creswell's five steps and PRISMA guidelines, 40 peer-reviewed articles are reviewed. The synthesis of the digital learning technologies for student assessment and feedback are classified into three categories: regular online examinations, alternative online assessment strategies, and ethical assessment. The authors focus on the recent digital technologies for student assessment as well as feedback and recommend empirical investigation on the functionalities and pedagogical designs.

Keywords: Digital Learning Technology, Blended Learning, Assessment, Higher Education, Online Examination, Feedback, E-learning.

1. Introduction

The digital systems categorized as digital learning technologies or e-learning applications for teaching-learning activities and assessment or exam-related activities in education are receiving greater attention during the COVID-19 social distancing. Amidst the new normal, educational institutions are trying to remain operational and uphold the quality, with particular emphasis on teaching-learning and assessment activities. Existing literature lacks an overview of the digital technologies integrated for conducting the formative and summative evaluation. Thus, this systematic review includes peer-reviewed articles and applications on digital assessment. Due to the didactic differences in different age groups and teaching-learning activities in the pre-school, elementary school and tertiary educational institutions, this chapter primarily focuses on the assessment practices in higher education. Despite technological advancement, the policies, procedures, and norms in the national and educational contexts play a significant role in the adoption and integration of educational technologies. While the techniques and technologies for assessment and exams are being developed and integrated with the technologically and economically advantaged contexts, the disadvantaged contexts are putting up greater effort as well. This systematic literature review addresses the following questions:

1. *What digital learning technologies are blended in the examination and feedback activities of the courses in higher education?*
2. *How are the digital systems blended in higher education for examination and feedback?*

The different sections of this chapter unfold the research questions. First, a brief presentation of the background shows the preliminary knowledge and expectations with which the authors began to write the chapter. Second, the methods section elaborates the systematic approach to the literature review. Third, the analysis and synthesis summarize and discusses the main themes identified in the articles on assessment and feedback of students' learning in digital platforms.

2. Background

COVID-19 pandemic has forced higher educational institutions to conduct examinations and feedback online, which involve various kinds of systems, functionalities, and perceptions. The scope, functionalities, and perceived affordances of the digital learning technologies depend on the differences among *P*eople (i.e., individual

differences of mental model, size, etc.), *A*ctivities (i.e., formative or summative, multimodal digital, oral), *C*ontext (i.e. local culture, indoor/outdoor/lab etc.), and *T*echnologies (i.e., systems, media, and functionalities) (Benyon, 2019). Studies have shown that the use of digital technologies either do not affect the students' scores (Khalid et al., 2011; Stack, 2015) or have a positive effect due to strategic use of formative assessment and feedback (Johnson & Kiviniemi, 2009).

In the entirely digital technology-mediated courses, interpersonal communications are mediated by computer interfaces rather than face-to-face instructor-student interactions. The lack of visual cues, absence of synchronous conversations, and incorporation of technical issues suggest that assessment in an online learning context varies from the traditional face-to-face classroom (Reeves, 2000).

The structured activity students are engaged with after their instructor has graded and returned an exam, is defined as an *exam wrapper*, which "is designed to promote self-reflection and improve study practices (Stephenson *et al.*, 2017). A study conducted in two Canadian universities shows that exam wrappers do not have a significant effect on final exam scores or on course drop rates. However, the use of wrappers are "associated with improved rates of test pickup and increased scores on a course evaluation question regarding the fairness of evaluation methods" (Stephenson *et al.*, 2017).

To facilitate the increased number of computer science students, an introductory computer programming course's traditional pen-and-paper exam was replaced with multiple take-home exams (Hellas *et al.*, 2017). Belli *et al.* (2020) used Turnitin and Urkund on 2,390 students' written works to promote honesty and trust in students, grow self-confidence, learn not to plagiarize, and save time for the teachers. Migut *et al.* (2018) present preliminary results of automated video proctoring as part of bring-your-own-device (BYOD) assessment at the University of Amsterdam. The study investigates how to partially automate the proctoring process by using the recordings of the screen and automatic video analysis.

Bloomfield and Groves (2008) present the design and implementation of a system that allows a standard paper-based exam to be graded via tablet computer. As part of a course, with a special footer to automatically recognize the examination page, a high-speed scanner scans the pages, graded by one or more people using tablet computers, and returned electronically to the students. Khalid *et al.* (2011) generated multiple sets of quiz questions using a plugin of Moodle learning management system, which was answered by sending an SMS string and returned an SMS containing score with right answer string and by attending the quizzed on Moodle in a computer lab. Balta and Tzafilkou (2019) used Socrative software in a physics course for instant formative feedback on quizzes and noted the improvement of student engagement and attitudes towards the subject matter.

Technology-mediated text-based corrective feedback for second-language learning to writing skills, in general, are supported by the software KungFu writing, LangCorr, Grademark, Markin, and EasyCorrect (Kjaergaard, 2017). For instance, the company EasyCorrect developed Edword.com with plugins to Google Docs and Microsoft Word for giving feedback to students using comments, voice, references, and other features along with reusing comments to save time and providing insights through analytics on both teacher's activities and students' actions.

The authors were exposed to the above-mentioned digital learning technologies designed for or integrated into the assessment and feedback activities of higher education and identified the scope of a broad categorization. Thus, the scope of this book chapter is 'what' digital technologies and 'how' the functionalities are integrated for assessment and feedback part of online teaching-learning activities.

3. Methods

This study applies Creswell's five major steps for systematic literature review. These are identifying key terms, locating literature in the databases, critically evaluating and selecting the literature, organizing the selection of literature by abstracting or taking notes and writing a literature review reporting summaries of the literature for inclusion (Creswell, 2012). Accordingly, two databases were selected: ACM Digital Library and ERIC. Search criteria were restricted to peer-reviewed full-text of the last 5 years and written in English. Using different combinations of the keywords shown in Table 1, experimental searches and an iterative approach to searching were conducted.

Table 1: Keywords for Systematic Literature Review.

Assessment	Technology	Higher	Strategy
Evaluation	Digital	Tertiary	Activity
Feedback	Blended	University	Technique
Examination	E-Learning	Graduate	Process

First, ERIC returned 48 papers and ACM digital library returned 120 papers. Furthermore, additional relevant and related 31 resources including online materials, journals and conference proceedings, written in English and dated back to the year 2000, were considered for this review. During the eligibility phase, papers on the theoretical framework, models, techniques and efficacy of online learning were excluded. The review process included identification, screening, eligibility, and included stages as proposed by the PRISMA guidelines (Moher *et al.*, 2009). Figure 1 shows an overview of the review methodology by illustrating the PRISMA steps and procedures.

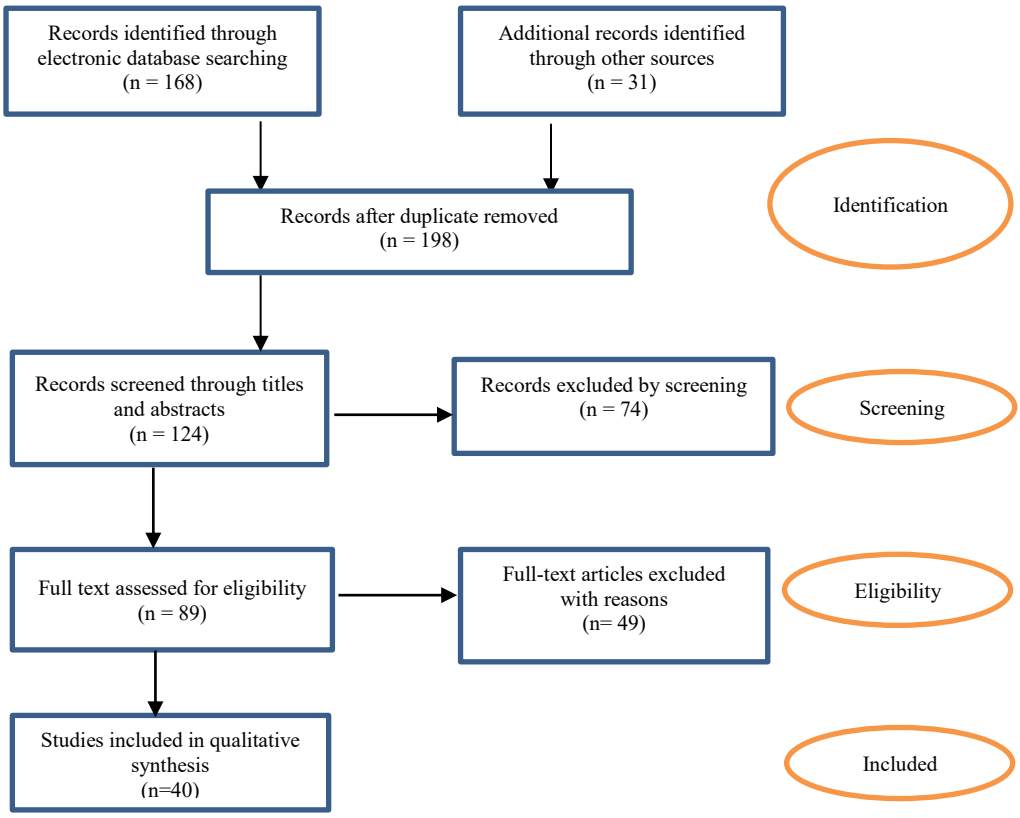

Figure 1: PRISMA Flow Diagram of the study.

Finally, 40 papers were included for qualitative synthesis. The constant comparative method (Hewitt-Taylor, 2001) was applied to qualitatively analyze and synthesize these articles.

4. Synthesis: Technology Blended Assessment Activities in Higher Education

The summary of 40 research materials is shown in Table 2, which shows the six categories emerging from the literature. They are regular online assessments or examinations, adaptive assessment, automated assessments, digital badges, Recognition of Prior Learning (RPL), and ethical assessments.

Table 2: Overview of the Digital Technology blended Assessment

Sl.	Article Authors	Categories					
		Online Assessment/ Examinations	Adaptive Assessment	Automated Assessments	Digital Badges	Recognition of Prior Learning	Ethical Assessments
1	Ahadi *et al.*, 2015			x			
2	Alston, 2017	x					
3	Armellini & Aiyegbayo, 2010	x	x	x	x	x	
4	Baird, 2013				x		
5	Balfour, 2013			x			
6	Baylari & Montazer, 2009		x				
7	Beebe *et al.*, 2010	x					
8	Boboc *et al.*, 2006	x					
9	Boud & Soler, 2016			x			
10	Bradley, 2016						x
11	Butcher, 2015					x	
12	Cao and Porter, 2017	x					
13	Challis, 2005		x				
14	Chauhan, 2014		x	x			
15	Chen *et al.*, 2005		x				
16	Chen, 2018	x					
17	Conrad *et al.*, 2013					x	
18	CPR, 2020			x			
19	DiCarlo and Cooper, 2014	x					
20	Heintz, 2017						x
21	Hellas *et al.*, 2017						x
22	Hickey & Kelley, 2013				x		
23	Khan *et al.* , 2017	x					
24	Kolowich, 2013			x			
25	Meyer & Zhu, 2013		x				
26	Murphy, 2017	x					
27	Mwiya *et al.*, 2017	x					
28	Nguyen *et al.*, 2017	x	x	x	x	x	
29	Pereira *et al.*, 2009	x	x				
30	Qing and Akins, 2005	x					
31	Quansah, 2018	x					
32	Reeves, 2000,	x	x				
33	Shermis *et al.*, 2010			x			
34	Speck, 2002	x					
35	Tally, 2012				x		
36	Van Gog *et al.* 2010			x			
37	Vonderwell *et al.*, 2007	x					

Sl.	Article Authors	Categories					
		Online Assessment/ Examinations	Adaptive Assessment	Automated Assessments	Digital Badges	Recognition of Prior Learning	Ethical Assessments
38	Vonderwell and Boboc, 2013	x					
39	Weleschuk *et al.*, 2019	x					
40	Yudelson *et al.*, 2014			x			

The six categories are grouped under three broad concepts: regular online examinations, alternative online assessment strategies, and ethical assessments. The following subsections discuss these concepts or themes.

4.1 Regular Online Examinations

In differentiating online pedagogy and traditional pedagogy, Qing & Akins (2005) reported, "face-to-face pedagogy can and should be used to inform online pedagogy. But face-to-face pedagogy in itself cannot be the driving force to designing online courses; one must consider e-pedagogy to create a successful and meaningful course". Speck (2002) suggested that trainers should design assignments that finds a good balance between summative and formative assessment. Regarding online pedagogical assessment strategies, Vonderwell *et al.* (2007) opined that online learning assessment should encompass personal and peer group assessment, learner autonomy as well as regulatory mechanisms. The literature thus suggests that traditional assessment strategies need to be revisited for a balanced online learning assessment. Besides, exploring various effective assessment strategies and activities can help to identify and develop improved formative and summative evaluative tools for online environments.

Online examinations are regularly carried out in many higher educational institutes globally that provide online education. Online examinations are also practised as independent assessment tools in traditional education assessment practices in order to avoid subjective bias (DiCarlo & Cooper, 2014). In online examinations, initially, a question repository is built by teachers and test sheets are automatically formulated based on examination system's predefined strategy. Students receive invitations or links for the examination from the concerned teacher, sign up and complete the examinations remotely. Once the examination is over, answers are automatically checked by the examination system and students can have the feedback immediately or after a prescheduled time interval. Thus, online examinations can help complete the assessment without human monitoring, without subjective bias and minimal man-hour involvement (Chen, 2018). A typical online examination system block diagram is shown in Figure 2.

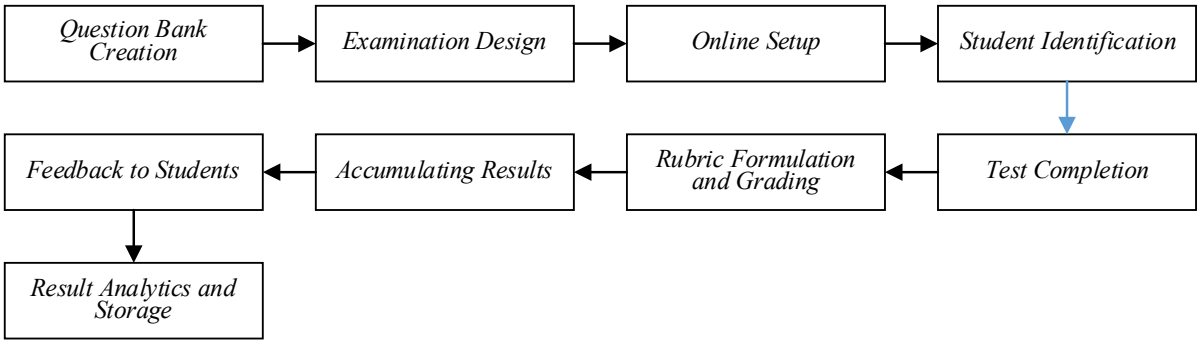

Figure 2: A typical online examination system block diagram

Initially, a question bank is created and the examination for an individual is designed. After that, online setup is prepared for test paper uploading and dispatching to an individual student. Students identify through authenticating themselves via predefined security protocols and complete the test. Then grading rubrics is designed by the examiners and the test papers are graded. Afterwards, the results of all the tests are accumulated and students are notified to view their scripts and results. Last but not the least, different analytics on the final results are deployed for reporting to the concerned stakeholders and the results along with all the reports are stored in a database or cloud (Cao & Porter, 2017).

The question repository or bank for conducting online examinations usually contain questions of various modes, like true/false questions, single answer questions, multiple-choice questions etc. that try to evaluate the grasps of students on the fundamental concepts of a subject and the capacity of students to apply the knowledge in problem-solving. Questions are put up in the repository and arranged according to difficulty levels, starting from easy to highly difficult. Different examination papers are prepared for individual students with questions from all the difficulty levels maintaining a similar difficulty level for every individual test (Murphy, 2017).

The online examination system has superiority over the traditional examination system. The online examination system automatically summarizes, analyzes the test results and ready to interpret with a click depending on the requirements of the user. Analysis regarding question-answer patterns, individual and overall performance can be readily available for monitoring and future development.

I. Formative Assessment

Vonderwell, Liang, and Alderman (2007) summarized methods for "promoting formative assessment in online teaching and learning" (p. 22). The methods are reflection paper, the minute paper, role play, hook questions, things to keep in mind, questions wall, and checking in with students. Nguyen *et al.* (2017) examined the design of computer-based assessment in 74 undergraduate modules and its impact on 72,377 students' engagement, satisfaction, and pass rates. Their analysis using fixed effect models suggests that educators implement very different learning designs, which is the adaptivity dimension of content and activities. The formative assessment activities strongly influence students' time spent on the virtual learning environment and arguably will be similar in the case of time of time spent on the adaptive learning platforms. The definition of learning design included the following activities: assessment, assimilation (attending to information), finding and handling information, communication (discussing module realted content with another person), productivity (constructing an artefact), experiential (applying learning in real-world settings), and interactive/adaptive (applying learning in a similated setting). The learning design variables were able to explain 69% of the variability in time spent on the VLE per visit. Only one of the models implied that the increase of an average one hour assessment time is associated with only 0.48 min average increase in time spent on site. With different assessment strategies across modules, the students adapt their learning strategies.

II. Summative Evaluation

Challis (2005) reviewed that the design of online summative examinations is likely to require more time and effort compared to the traditional exams, bring complex scenarios of possible ways of setting questions (image, sound, simulation), and integrating adaptivity will require considerably enhanced skills. Furthermore, while computer-based testing are considered inappropriate in some disciplines, it was envisioned that consortia will be employing experts to prepare banks of tests for national and international use, contributing to reliability of assessments and comparability of standards. Nguyen *et al.* (2017) reflected that "Whether students were actually learning and to what extent good pass rates and high satisfaction scores are actually an accurate reflection of appropriate learning designs and [computer-based assessment] CBA can be debated." (p. 712) The reflection raises the need for defining teaching and learning quality dimensions and the desired impact and interpretation of summative assessment.

4.2 Alternative Online Assessment Strategies

I. Adaptive Assessment

Automated assessments are almost mandatory for providing the learner grading and feedback anywhere and anytime enrolled in Massive Open Online Courses (MOOCs) as learner-trainer interaction is nearly impossible (Reeves, 2000, Chauhan, 2014). Researches have shown that assessments based on Item Response Theory (IRT) can be an effective online assessment strategy (Chen *et al.*, 2005, Baylari & Montazer, 2009). According to IRT, tests are designed to automatically adapt according to learner's progress, learner performance and learner's achievement of learning outcomes. The tests include different difficulty levels and automatically adjusts the difficulty levels based on the response of the learner to each test item (Meyer & Zhu, 2013). The final score is based on the correct answers with weighted difficulty levels with each answer (Challis, 2005). Thus, adaptive assessment is advantageous in tailoring the course content to accommodate individual learner needs and a meaningful strategy to assess and help diverse participants enrolled in a MOOC (Baylari & Montazer, 2009).

II. Automated Assessments

Automated assessment is in effect since the inception of MOOCs and helps to provide prompt feedback to participants. Researches have demonstrated positive results, reliability and satisfaction in MOOC faculties regarding the usage of automated assessment techniques (Chauhan, 2014, Kolowich, 2013).

Automated Essay Scoring (AES) and UCLA's Calibrated Peer Review (CPR) have been the two most favourite choices of MOOC automated assessment techniques (Shermis *et al.*, 2010). AES evaluates student writing assignments for multiple factors like grammar, style, complexity, vocabulary usage and content alignment with the overall theme of the essay. Whereas, CPR is a web-based tool that evaluates peer-reviewed discipline-based writing in classes of any size (CPR, 2020). CPR is more suitable than AES for large sections and able to provide personalized feedback to students. However, the preference of the two depends on a number of factors like learning outcomes, course structure, pedagogy, and student expectations etc. An initial start with AES followed by CPR in the later stages of a MOOC is preferred by some researchers (Chauhan, 2014, Balfour, 2013). Even though controversies regarding the accuracy and effectiveness of AES and CPR remains, MOOC platforms like EdX and Coursera have successfully incorporated automated assessment strategies for writing skills assessment (Balfour, 2013).

Ahadi *et al.* (2015) applied machine learning on programming process data of introductory programming course for early detection of students in need of assistance. The benefits are: providing early feedback to struggling students and increase the difficulty level for the students, early detection of students who do not ask for feedback, and matching high-performing and low-performing students for peer-group learning.

III. Digital Badges

A digital badge is a process of assessing one's accomplishments that can be integrated with online platforms. A trainer can measure the required skillset and knowledge base of a trainee and can issue a badge once he or she has completed certain landmarks. The badge showcases the trainee or learner's achievements. Thus digital badges can be a measure of student learning and achievement in digital classrooms. The badge earning landmarks or learning outcomes may incorporate accumulation of knowledge and skills, completion of teaching-learning activities like assignments and presentations, and the extent of learner's engagement with the course content. Many professional and educational institutes utilize the digital badge strategy to recognize learning and achievement. LinkedIn users' additions of MOOC completion certificates over Coursera and similar platforms are widely recognized in professional communities globally (Baird, 2013). In a similar manner, universities like Indiana University and Purdue University use four different types of badges for the Big Open Online Course (BOOC) participants and a local badge system called "Passport" on the successful accomplishment of course objectives respectively (Hickey & Kelley, 2013, Tally, 2012).

IV. Recognition of Prior Learning (RPL)

RPL is one of the most popular choices for assessment techniques in Open Education Resources (OER). Participants in OER programs submit portfolios and a summative assessment of their learning in succession for achieving certification in RPL (Butcher, 2015, Conrad *et al.*, 2013). Students participating in MOOCs, offered by various well-reputed institutions, for a credit or certification may find this assessment strategy rewarding in pursuing their learning goals. Institutes can enjoy leverage by utilizing RPL for both formative and summative assessments as well as assess students' prior learning and skills to provide them with a better opportunity in their upcoming endeavour.

4.3 Ethical Assessments

Plagiarism is a wel-recognized problem in all education programs and the central concerns are the unnoticed or unidentified plagiarism that make the assessment unreliable. Where there lies an opportunity for students to take unethical means, the assessment becomes questionable. Bradley (2016) randomized the programming assignments that are set for students so that it becomes unlikely that any two students will be working on the same problem set. The study analyzed the "natural similarity i.e. the level of similarity that could reasonably occur without plagiarism (p. 21).

Assessment of writing exercises, articles and other write-ups are in practice for a long time in academia and are checked for plagiarism through paid and free software like Turnitin, iThenticate, Urkund, Grammarly, etc. However, digital ethical assessments demand modifications due to the nature of examination platforms and the

environment. The matter gets worse regarding examinations on a computer as computers provide the opportunity of cheating in digital examinations and examinations performed at home (Heintz, 2017).

Hellas *et al.* (2017) reported that potential cheaters tend to show behaviour patterns, like help-seeking, systemic cheating and collaboration with peers and/ or outsiders etc. Linear solution processes that can detect copy-paste plagiarisms, detection of alignments of processes in programming exercises, use of plagiarism checkers in written assignments etc. can be deployed to countermeasure the cheatings in digital examinations (Hellas *et al.*, 2017). However, detecting plagiarism and ensuring ethical standards of examinations constitute a big area of concern for instructors and researchers that is out of the scope of this chapter.

5. Discussion

The findings of this study are far from an exhaustive or sufficiently comprehensive overview of digital assessment methods and tools in the contexts of higher education. This chapter may help educators identify ways to improve their assessment practices in an online environment. Factors that influence the design and implementation of online assessment strategies should be analyzed in such a way that they can enlighten subsequent progress of formative and summative assessment activities as well as tools. One particularly difficult issue to address in online education is an invisible distance setting. Rather than developing a diversified, responsive and participation-oriented assessment process, the majority of assessment practices follow informal feedback strategies suggesting digital product as an outcome than the improvement of the learning experience. For example, implementing online asynchronous discussions, typically participants are measured quantitatively (i.e., as the assessment *of* learning) rather than qualitatively (i.e., as assessment *for* learning). Hence, assessment procedures, especially in the online settings, need to be balanced between formative (process) and summative (product) outcomes that demand increased online interaction among instructors and students. Online formative assessment is appreciated by the researchers as it helps participants to review their scores along with the evaluation of gained knowledge, thus, assists in improving performance (Van Gog *et al.* 2010; Boud & Soler, 2016). Formative classroom assessment methods should follow straightforward design methods to ensure significant positive differences in learning outcomes; though there exists diversity among competencies being assessed in online courses (Pereira *et al.*, 2009; Mwiya *et al.*, 2017). Although instructors' course design as well as feedback between students and teachers is more individualized in the online environment, online learning and technologies have the potential to be collaborative and constructive. Hence, it is vital to design and implement assessment practices to encourage and enhance interdependent learning activities in the online environment.

Moreover, features that influence effective assessment practices in the online environment are not exclusively technological, but also supervisory and pedagogical. Since online learning is facilitated through a computer interface, there may be a distinction made between the delivery of online learning and mediation and the expedition of online learning. Developing a responsive and responsible online pedagogy generates sets of interrelated characteristics that persuade effective assessment strategies and tools (Boboc *et al.*, 2006, Alston, 2017). Hence, online pedagogy needs to consider those factors which facilitate a more constructivist interaction across the computer interface of the virtual classroom (Quansah, 2018). Subsequently, reforming the organizational educational system as well as a better understanding of learning experiences for online students, web 2.0 tools can be employed as a new design for involving students and exploiting the benefits of formative assessments in the online classroom (Armellini & Aiyegbayo, 2010; Nguyen *et al.*, 2017).

Furthermore, generating an assessment plan for the period of the thorough online class evidently help instructors to map out their pedagogical strategies considering students' technological tools as well as connectivity to avoid the digital divide (Vonderwell & Boboc, 2013; Khan *et al.*, 2017). Five major themes including time management, student responsibility and initiative, the structure of the online medium, complexity of content, and informal assessment are mimicked in the online setting directed towards the contributory better outcome (Beebe *et al.*, 2010; Weleschuk *et al.*, 2019). As recent technological advances are outpouring, it is projected that more learning technologies will have emerged and the more varied applications of the online settings will be needed for better understanding. As such, it is vital to identify the factors that maximize student participation and performance, as well as teacher effectiveness and overall instructional satisfaction through online platform. Last but not the least, integration of plagiarism related rubrics in assessment models (Yudelson *et al*., 2014) can be beneficial regarding the standardized assessment practices (Ahadi *et al.*, 2015).

6. Future Research Directions

There is a need to evaluate an appropriate pedagogy for assessment within the environment of the online settings, especially for teaching at scale or large classrooms. Future research should provide educators with tools and

approaches in developing online-specific, pedagogically sound learning opportunities to concentrate on both summative and formative assessment systems. Hence, stakeholders need to emphasize on creating and maintaining a sustainable online learning community to support assessment for learning as well as to promote high-level thinking skills. The diversity of assessment practices including written essays, multiple-choice tests, take-home exams, oral exams individually and in groups, and the individual differences in the application of assessment rubrics encompass a sufficiently large domain that need further study from the perspective of digitalization and authomation. The explanability of numerical and computation methods along with the ability of individuals to understand the methods applied for digitalized assessment also pose some dillemas.

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Technological, Pedagogical and Subject Content Knowledge (TPACK) Profile of Final Year Pre-Service Teachers at Paro College of Education, Royal University of Bhutan

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Paro College of Education is one of the two teacher training colleges in Bhutan specialising in primary education, Dzongkha education, and physical education. The recent COVID-19 pandemic forced teachers nationwide to implement online teaching irrespective of their readiness. This census survey was conducted to explore and understand the personal and professional needs related to technological, pedagogical, and subject content knowledge (TPACK) of the final year pre-service teachers (N= 223) who had just completed their four-year bachelor programme and two-year diploma programme. The findings showed that all the respondents (100%) use the Internet every day (87% more than once a day and quite a significant number using more than three hours a day 72.6%). Social networking, searching information for an assignment, instant messaging topped the list of reasons for using the Internet. However, integrating Information and Communication Technology (ICT) into the curriculum, lack of pedagogical knowledge on how to use ICT in teaching and learning, and Internet connectivity being too slow and expensive were identified as major problems. Findings also indicated an overwhelming need for professional development on blended learning and other ICT related skills. This paper also presents insights into the seven-factor TPACK model and its implications. Given its transformative potential, teacher education institutions must provide more focus on improving the overall ICT skills and facilities and incorporating blended learning to facilitate higher learning experience. Further research needs to be carried out to understand both pre-service and in-service teachers' TPACK framework and how the issue of the income gap could impact online teaching and learning.

Keywords: Bhutan, Technological, Pedagogical and Content Knowledge (TPACK), Pre-service Teachers, Online Teaching and Learning

1. Introduction

Educators across the world have been facing unprecedented challenges especially in the field of technology. Teaching with technology has become an inevitable reality. The Internet and Information and Communication Technology (ICT) have influenced and transformed the education system (Antony, 2019; Garrison & Kanuka, 2004; Kose, 2010; Joo, et al., 2018). As a result, education across the world has embraced the Internet and ICT as an important educational tool (Chang, et al., 2015; Chukwuemeka, et al. 2019; Finger, et al., 2004; Graham, et al., 2009; MoE, 2014, 2019; Sahin, 2011). In early 2000, Mishra and Koehler (2006) proposed a conceptual framework for educational technology by building on Lee Shulman's formulation of "pedagogical content knowledge" (Shulman, 1986) and extended it to the phenomenon of teachers integrating technology into their pedagogy. The development of the TPACK framework by teachers is critical to effective teaching with technology. Today, one cannot imagine the teaching and learning process without effective integration of these three core components- content, pedagogy, and technology (Joo, 2018; Koenler, et.al., 2011; 2013; Lloyd, 2016; Oner, 2020). Further, Niess (2011) argues that teachers must rely on their ability to integrate digital technologies into the process of designing and implementing curriculum and instruction. Hence, the TPACK framework has been effectively implemented across various school subjects such as Mathematics (Polly, et al., 2010), Science (Graham, 2009), and Physics (Chang, 2015).

The growth of technology has been so rapid and immense that the education system has not been able to make effective use of educational technology (Tondeur, et al., 2017) especially in developing and underdeveloped nations (Castéra et al., 2020; Chukwuemeka, et al. 2019). As a result, technology has impacted educators both personally and professionally (Joo, et al., 2018; King, 2012; Palloff & Pratt, 1999) and more so currently due to the COVID-19 pandemic as both school and university education have to be provided online (Ahmed, 2020). Teaching and Learning have changed dramatically, with the distinctive rise of e-learning, whereby teaching is

undertaken remotely and on digital platforms. The notion of the classroom within four walls has changed and home has become a learning space. Teaching has become remote and communication online. Sometimes teaching-learning happens while you are on the move - in a car, bus, plane, and even in a coffee shop.

Teaching has always been a complex profession that required one to be knowledgeable and multi-skilled (Koehler, et al., 2013; Mishra & Koehler, 2006; Oner, 2020) and this has become even tougher now. The COVID-19 pandemic has caught many educators, students, and educational institutions unprepared for a complete online education (Ching & Roberts, 2020). This new education scenario has been challenging in many ways, forcing both teachers and students to cope with technologies within a very short time and to meaningfully engage, interact, and learn through online platforms. Consequently, this has negatively impacted student learning. Such developments have implications on the overall education system, more specifically on teacher education programmes. Recently there has been a lot of emphases to adequately prepare pre-service teachers to integrate technology along with their pedagogy and curriculum (Hofer & Grandgenett, 2012; Joo, et al., 2018; Tondeur, et al., 2017).

In the context of Bhutan, relatively few studies have been done on whether teachers are well prepared to integrate technology along with their pedagogy and curriculum. However, a recent TPACK study has also shown that higher education institutions in Bhutan (including teacher education colleges) are ill-prepared to integrate educational technology into their teaching (Choden & Sherab, 2019). Additionally, anecdotal evidence from the current COVID-19 pandemic has shown that teachers are not ready for online education.

This has direct implications on the teacher preparation programmes. Perhaps the teacher education colleges are not adequately preparing their pre-service teachers to integrate technology into their teaching despite the developments that are taking place all around them. Research from international contexts has shown that pre-service teachers were confident and intended to use technology in their instruction if they had high levels of TPACK competency (Joo, et al., 2018; Maeng, et al., 2013). Lack of empirical evidence in Bhutan makes it difficult to assess whether pre-service teachers are adequately trained to apply educational technology in their teaching including the TPACK framework. This lack of evidence provided the impetus for this study focussing mainly on finding out the final year pre-service students' (at the verge of their graduation) perceptions of confidence and competence to integrate technology into their teaching.

2. Background

2.1 TPACK Framework

The TPACK framework was introduced by Punya Mishra and Matthew J. Koehler of Michigan State University in 2006. Since then TPACK has become an essential part of the education system today as it incorporates the growing demand for the use of technology in the classroom as well as continuing the focus on the content and how to teach it (Mishra & Koehler, 2013). The framework involves technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK) (Koenler, et al. 2009, 2011, 2013). It defines the use of technology to support particular pedagogies within a specific content area (Mishra & Koehler, 2006). This knowledge and these skills have now increasingly become a necessity for the twenty-first-century teacher (Castéra et al., 2020; Joo, et al., 2018; Özgün-Koca, et al., 2010; Lambert & Mäkitalo-Siegl, 2017). The three dimensions of the knowledge base (TK, PK, and CK) and the interactions among them which include TCK (technological content knowledge), TPK (technological pedagogical knowledge), PCK (pedagogical content knowledge), and TPCK (technological pedagogical content knowledge) has led to the design of a seven-factor TPACK model which is widely used to prepare teachers for the 21st century (Koenler, et al., 2013; Lin, 2013). According to Niess (2011, p. 301], "TPACK is viewed as a dynamic framework describing the knowledge that teachers must rely on to design and implement curriculum and instruction while guiding their students' thinking and learning with digital technologies in various subjects." Hence, the TPACK framework has been implemented in various school subjects such as Mathematics (Polly, et al., 2010), Science (Graham, 2009), and Physics (Chang, 2015) to make the teaching-learning process meaningful to students. Literature also indicates that a TPACK framework has been used to design, modify, and evaluate the impact of both pre-service teacher education as well as in-service teacher professional development programmes (Roussinos & Jimoyiannis, 2019). Due to the lack of research in the Bhutanese context, the state of TPACK amongst the pre-service teachers is unknown.

2.2 Education During the COVID-19 Pandemic

The COVID-19 pandemic has placed teachers and educators around the globe in a challenging situation (Ching & Roberts, 2020). The notion of the classroom within the four walls has changed and the home has become a learning space. Teaching has become remote with communication done online. The world has accelerated fast in

terms of technology. Educators now should know how to navigate themselves on the screen and with technology. The teaching-learning culture is on the move (Kukulska-Hulme, 2010; Liu & Milrad, 2010; El-Bishouty et al., 2010). With 1.5 billion students out of school and hundreds of millions attempting to learn solely online, education is remaking itself. The pandemic has given technology significant influence and provided numerous insights as to what human development and learning looks like. It has allowed for the shifting of education from more rigid and inflexible content dissemination to a dynamic and flexible system, empowering students to learn at their own pace. It is a reminder to educators to be more fluid with their education system and be more aware of the high-tech world. The new world that teachers are seeing now leaves no other option than to embrace the technological platforms if they want to reach out to their students. If teachers do not teach remotely, they lose out on some years and months of curriculum. Education experts comment that students might eventually return to the classroom, but virtual education or blended learning will likely become the norm (Anderson, 2020; Kim Hart, 2020). Thus, the necessity for technology-driven content and ICT tools that suits the present need and situation has become a new normal in educational settings. Teaching with technology has become an inevitable reality.

Twenty-first-century teachers have generation Y (born between 1981 and 1996) and Generation Z (born between 1996 and 2015) as their learners (Kasasa, 2019). These generations are born in the world of the internet and technologies. They grow up playing with tablets and watching online movies. So, when these children come to class, they expect similar adventure and learning that caters to their internet addiction and skills. We are in the one-one learning in mobile and computing age (Lui & Milrad, 2010). The 1:1 ratio of students to mobile in Bhutan has become a reality. Teacher education must thus fast-track teacher development to meet the demand of the twenty-first-century learners. The study conducted by Choden and Sherab (2019) confirms that although most of the higher education educators used smartphones and social media, they still lacked the TPACK knowledge. The study also indicated that teacher educators themselves need professional development on blended learning and other ICT related skills (Choden & Sherab, 2019), consequently lacking competency in the use of TPACK. Using social media for leisure and acquiring technological knowledge for educational purposes are two different skills.

2.3 Demographic factors influencing individual TPACK

Earlier research has shown that teacher's age and teaching experience have an impact on the use of TPACK (Yanti, et al., 2019). The younger generation seems to use technology with greater ease than the older generation. The research further states that being technology savvy does not guarantee the success of the teacher in the classroom. The content and use of pedagogy go together. Qualification and experience have an impact on the use of TPACK. For instance, a study in Indonesia revealed that senior teachers have PK, CK, and PCK better than junior teachers and that junior teachers have TK, TCK, TPK, and TPACK better than senior teachers (Antony, et al. 2019). Perhaps, this is one of the indications that freshly graduated teachers have better technological knowledge. However, this cannot be ascertained due to lack of research in the Bhutanese context. Although, Koh et al. (2010) indicated that gender impacts use of TPACK, a recent study by Castéra et al. (2020) in which Bhutan is a part, suggests that gender plays no vital role in the use of TPACK. To further confirm this, this study also explored if there were any differences between male and female pre-service teachers. There is a lack of literature to show if the type of course students take have any difference in the use of TPACK. This is something that this study explored.

2.4 Teacher Education Curriculum

The quality of school education is highly dependent on the quality of teachers produced by teacher education colleges (MoE, 2014). The Paro College of Education envisages to "prepare and create a group of people with higher qualification to provide the much needed academic and professional leadership at the primary level" (PCE Programme Document, 2010). Based on this vision, the College identifies preparing pre-service teachers' proficiency and competence in content and pedagogical knowledge appropriate for primary classes (Pre-Primary to Class VI) to fulfill the above. While there are two Information and Communication Technologies (ICT) related modules (out of 35 taught modules) offered, no specific mention has been made to the enhancement of proficiency and competence in educational technology in the overall aims and objectives of the programme. One module is for functional purposes which cover topics like – introduction to computers, managing files and folders, use of word processing and spreadsheets, use of presentation software and, the internet. The other module is on 'ICT in teaching and learning' which covers topics such as – Information tools, communication tools, constructive tools, co-constructive tools, and situating tools. This indicates that educational technology has not received the required attention in the teacher education curriculum. Existing literature from other countries implies that the emerging educational technologies have placed a demand on the need for enhancement of teachers' technological knowledge (Chukwuemeka, et al. 2019). In the Bhutanese context, there is no empirical evidence on the school teachers' technological knowledge. Even so at the university level, a recent study of faculty in the Royal

University of Bhutan has shown that there is a need for professional development on equipping higher education lecturers with educational technology which includes a demand for an introductory course on Internet use and general applications (Choden & Sherab, 2019). Their study showed that less than 50% of the respondents used technology in teaching. This suggests a lack of TPACK framework both at higher education institutions and the Ministry of Education (MoE). For instance, the new Bhutan Professional Standards for Teachers (BPST) also lacks mention of the TPACK framework (Choden & Sherab, 2019). The authors suggest that the TPACK framework should be embedded in the BPST like in Australia, where ICT Competency Standards are seamlessly embedded into the Australia Professional Standards for Teachers (APST) (Finger, et al. 2004; Finger, et al. 2010). Existing literature recommends building teacher capacity as fundamental in successfully integrating technologies into teaching and learning (Chukwuemeka, et al. 2019; Park & Bodrogini 2016). The authors further stated that teaching is an extremely demanding profession and if the society wants any policy to be successful, continuous professional development for teachers is a must. Thus, there is a significant need to align pre-service teacher preparation programmes with that of integrating educational technology into pedagogy and curriculum (Angeli & Valanides, 2009). It is not only an added advantage in the technology-driven world, it also makes educators/teachers better prepared/equipped with TPACK skills and knowledge to teach effectively during educational disruptions such as COVID pandemics. More so the TPACK framework is proven to be a multiplicative framework that can continue to guide course design and evaluation for pre-service teacher preparation to integrate ICT into classroom teaching and learning (Chai, et al., 2011; Chukwuemeka, et al. 2019). Teachers' knowledge and use of TPACK can influence the way they teach and bring activities into the class (Yanti, et al., 2019). Using TPACK in teaching can help teachers engage their students in observational, correlational, and experimental inquiry investigations. It also places the learners in the centre (Maeng, et al., 2013). Due to the lack of research in the Bhutanese context, it is uncertain whether the pre-service teachers are adequately equipped to integrate educational technology into their teaching and learning. Therefore, this study was designed to explore preservice teachers' TPACK framework through the following research questions.

Research Question

What is the final year pre-service students' perceptions of personal and professional needs related to technological, pedagogical, and subject content knowledge (TPACK)?

Sub-questions

1. What Internet activities are most applicable to final year pre-service teachers' everyday training programme?
2. Is there a need for professional development related to educational technology for the pre-service teachers who have just graduated? What are the main areas they want to develop?
3. How confident are the final year pre-service teachers to apply different pedagogical methods (not related to technology) in their teaching?
4. What are the limiting factors influencing final year pre-service teachers' use of educational technology?
5. What is the level of final year pre-service teachers' perceptions of the seven-factor TPACK model?
6. Are there any significant differences in the seven-factor TPACK model in terms of gender and course the final year pre-service teachers?

3. Research methods and materials

This study was designed to explore the pre-service teachers' perceptions about TPACK through a census survey of all the final year students who had just completed their four-year training programme in July 2020 (except for the Diploma which is only for two years). So, a paper-based survey questionnaire was administered to all the final year students (N= 223) while they were on campus after seeking ethics approval from the Centre for Educational Research and Development.

3.1 Survey Instrument

A validated survey instrument was employed to explore the relationship between final year students' personal and professional needs related to technological, pedagogical, and content knowledge (TPACK). The questionnaire contained demographic items in section A and the use of ICT, pedagogical, and content knowledge in section B. The use of ICT was measured using various questions related to hours spent using the Internet, reasons for Internet usage, problems faced, whether students require professional development on the use of Internet and ICT or not. The application of various pedagogical activities was measured using a Likert type scale beginning with often (2), sometimes (1), never (0), and don't know (9). The seven-factor TPACK model consisting of 26 items was adapted from Lin et. al. (2013) which was earlier used to measure the TPACK of the Royal University of Bhutan faculty.

The items related to the TPACK abilities of the pre-service students were rephrased to make it future-oriented as they were not yet full-fledged teachers. For instance, the item 'I have sufficient knowledge of the subject matter I teach' was rephrased to 'I have sufficient knowledge of the subject matter I am going to teach' and 'I am able to guide my students to adopt appropriate learning strategies' was rephrased to 'I will be able to guide my students to adopt appropriate learning strategies.' The TPACK model was measured using a four-point Likert-type scale beginning with strongly disagree (1), disagree (2), agree (3), and strongly agree (4). The questionnaire also had a provision for any other comments for the respondents to share anything not covered by the survey items. The additional comments shared by the respondents are referred to by their respondent number and their course in the results section.

4. Results and Findings

Solutions are presented in terms of answers to each of the sub-questions posed above but first the demographic presentation of the survey participants.

4.1 Demographic Characteristics

A total of 223 final year pre-service students of Paro College of Education, Royal University of Bhutan responded to the survey (see Table 1 for details).

Table 1: Demographic (N=223)

Characteristic	Category	n*	%
Gender	Male	106	47.5
	Female	117	52.5
Course	Bachelor of Education Primary	124	55.6
	Bachelor of Education Secondary	23	10.3
	Bachelor of Education Dzongkha	55	24.7
	Diploma in Physical Education and Sports Coaching	19	8.5

*Totals do not add up to 223 due to missing values

4.2 Internet and ICT Usage

Four different aspects of Internet and ICT usage were asked in this category- how often the Internet is used, the number of hours used per day, purpose and frequency used, and popular place the Internet is used. The findings from this survey showed that all the student respondents (100%) use the Internet every day with 87% more than once a day and quite a significant number using more than three hours a day (72.6%). Hostel/residence being number one followed by home, classroom, library, and café/other public places (in order) are the popular places where students use the Internet. The majority of the students appear to use the Internet for social networking (81%), instant messaging (78%), searching information (75%), reading the news (49%), and gaming (26%) more than once a day. Slightly less than half of the respondents (41%) use the Internet for emailing once a day. However, quite a large proportion of students have never used Skype (68%), creating blogs (65%), and shopping (37%). Some students tend to use PowerPoint presentation (39%), file sharing (32%), using text editors (26%) only once a week. It has been encouraging to note that some respondents acknowledge the importance of ICT in the 21st-century educational environment (Respondents 11 & 96 B.Ed Primary; 181 B.Ed Dzongkha).

4.3 Major problems in using the Internet and ICT

Internet connectivity being too slow and expensive, sites that ask for payment to access information, integrating ICT into the curriculum, and lack of pedagogical knowledge on how to use ICT in teaching and learning were identified as major problems (see Figure 1). Poor Internet connectivity, lack of pedagogical knowledge to integrate ICT into teaching and learning, lack of ICT resources, and the high cost of Internet connectivity were also highlighted by some of the respondents is their open-ended comments (Respondents 37, 64, & 96 B.Ed Primary; 150, 182, & 201 B.Ed Dzongkha; 215 Diploma).

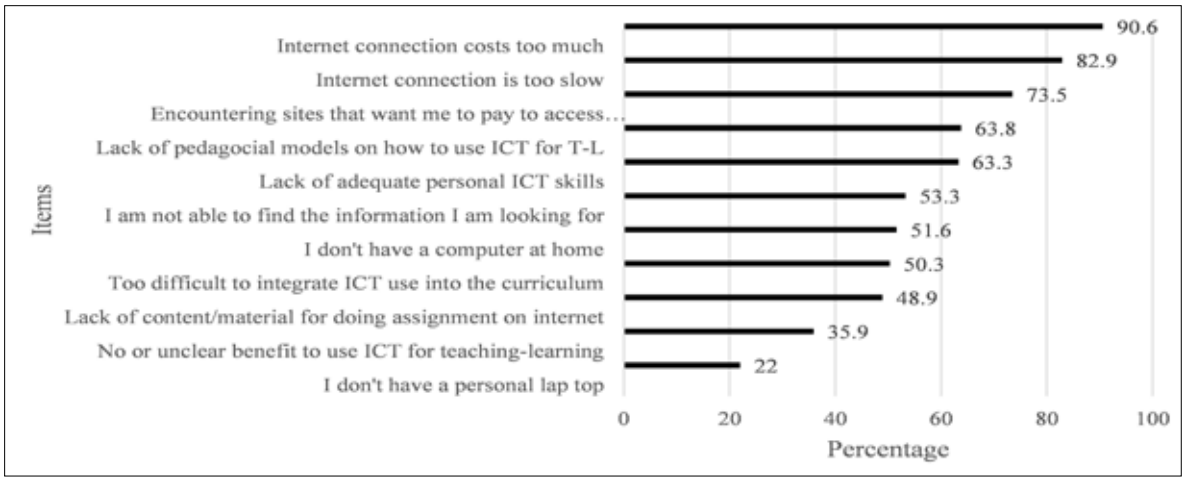

Figure 1: Major problems in using the Internet and ICT

4.4 Professional Development

Findings indicate that a vast majority of the students (more than 80%) have the perception that they require professional development on both the basics and advanced Internet and ICT related skills (Fig 2). This was further supported by Respondent 37 (B.Ed Primary) "I would like to learn more [about] technologies and their essential features so that I can use it in teaching and learning"

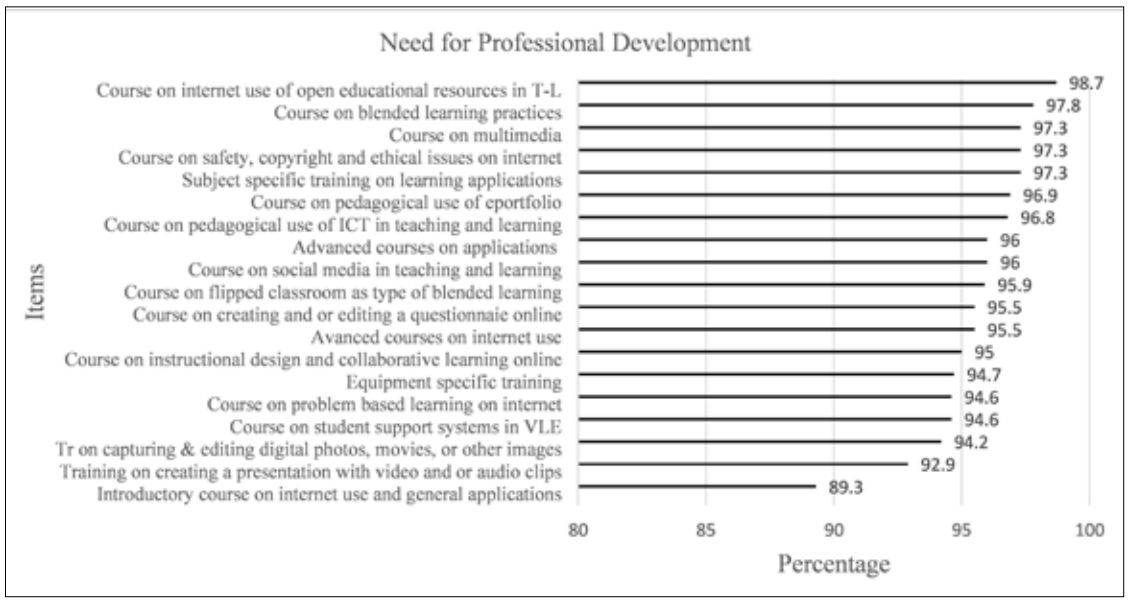

Figure 2: Need for professional development

4.5 Use of Internet Activities for Academic Tasks

The data for the use of Internet activities for various academic tasks are provided in Figure 3. It has been encouraging to note that more than 62% of the respondents use the Internet often and very often for various academic tasks such as searching information for their assignments, class presentations, and online communication with lecturers and colleagues during their training period.

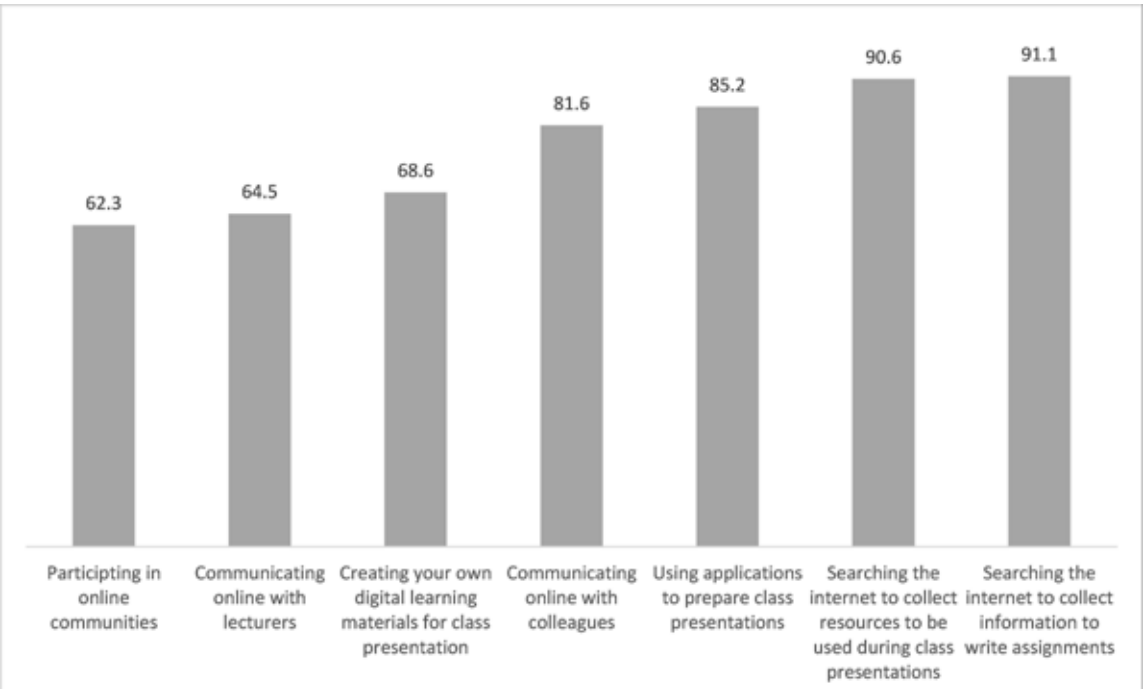

Figure 3: % of respondents using the Internet for academic tasks (very) often

4.6 Use of Pedagogical Methods

Student perceptions about whether they will be able to apply the different pedagogical methods in teaching when they become a full-fledged teacher have not been encouraging. As shown in Figure 4, slightly more than half of the respondents seem to be not confident in applying the different pedagogical methods in their teaching. This is a concern that requires immediate attention.

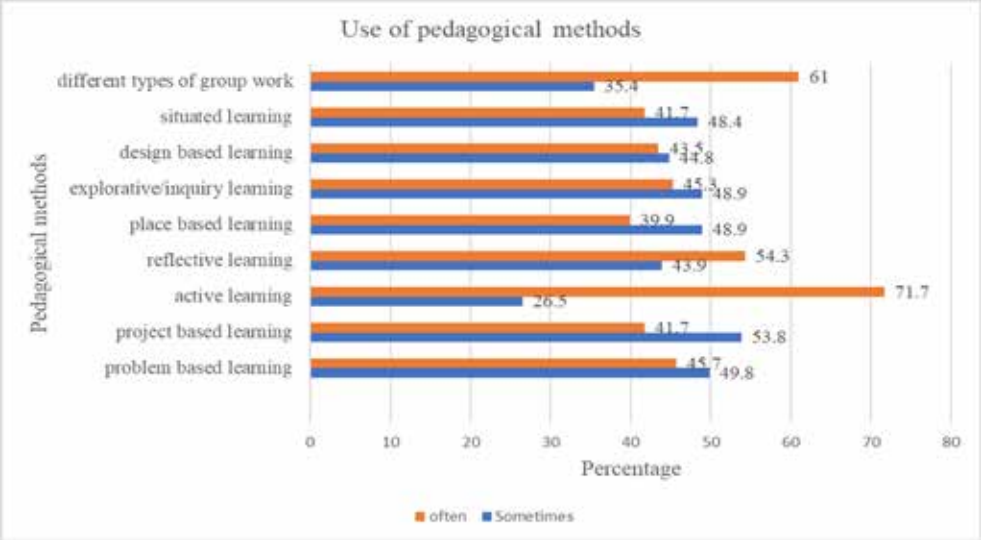

Figure 4: % of respondents not confident to use different pedagogical methods

4.7 Seven-Factor TPACK model

The validated seven-factor TPACK model was included in the survey to measure the final year pre-service students' perceptions of TPACK (see Table 2). All factors showed an internal consistency reliability alpha value between .72 and .91 which is acceptable to good reliability (Cooksey & MacDonald, 2011).

Table 2: Seven-factor TPACK model with Cronbach Alpha

Item	TPACK scale	Cronbach Alpha
1) I have sufficient knowledge of the subject matter I am going to teach	CK	.72
2) I can think about the content of what I am going to teach like a subject matter expert	CK	
3) I will be able to develop a deeper understanding of the content of the subject matter I am going to teach	CK	
4) I will be able to stretch my students' thinking by creating challenging tasks for them	PK	.91
5) I will be able to guide my students to adopt appropriate learning strategies	PK	
6) I will be able to help my students to monitor their learning	PK	
7) I will be able to help my students to reflect on their learning strategies	PK	
8) I will be able to plan group activities for my students	PK	
9) I will be able to guide my students to discuss effectively during group work	PK	
10) Without using technology, I can address the common misconceptions my students have about taught subject matter	PCK	.72
11) Without using technology, I can help my students to understand the content knowledge in various ways	PCK	
12) I have the technical skills to use computers effectively	TK	.81
13) I can learn technology easily	TK	
14) I know how to solve my own technical problems when using technology	TK	
15) I keep up with important new technologies	TK	
16) I will be able to use technology to introduce my students to real-world scenarios	TPK	.88
17) I will be able to facilitate my students to use technology to find more information on their own	TPK	
18) I will be able to facilitate my students to use technology to plan and monitor their own learning	TPK	
19) I will be able to facilitate my students to use technology to construct different forms of knowledge representation	TPK	
20) I will be able to facilitate my students to use technology to collaborate with each other	TPK	
21) I know about the technologies that I have to use for research of the content of the subject matter I am going to teach	TCK	.77
22) I can use appropriate technologies (e.g. multimedia resources, simulation) to represent the content of the subject matter I am going to teach	TCK	
23) I can teach lessons that appropriately combine knowledge of the subject matter, technologies, and teaching approaches	TPCK	.81
24) I can select technologies to use in my classroom that enhance what I am going to teach, how I am going to teach, and what students are going to learn	TPCK	
25) I can use google classroom to teach my students without much problem	TPCK	
26) I can use social media apps such as Facebook, WeChat, WhatsApp, etc. to teach my students	TPCK	

4.8 Pre-service Students' perceptions of Seven-Factor TPACK Model

The mean for each of the seven factors related to student perceptions about their technological, pedagogical, and content knowledge appears to be on a higher side based on a four-point Likert type rating scale (see Table 3). Findings show that of the seven factors, final year students exhibit much higher perceptions of PK (pedagogical knowledge) CK (content knowledge), and TPCK (technological pedagogical content knowledge) of the school subjects they are going to teach soon as full-fledged teachers. The two areas that students have some reservations about are the TK (technological knowledge) and PCK (pedagogical content knowledge) as shown by a lower mean (see Table 3).

Table *3: Seven-factor TPACK model with mean and SD (n=223)*

	No. of items	Mean	SD
CK	3	3.19	0.48
PK	6	3.39	0.53
PCK	2	2.80	0.54
TK	4	2.89	0.55
TPK	5	3.07	0.54
TCK	2	3.06	0.58
TPCK	4	3.20	0.54

Some of the respondents rightly comment that "I would like to learn more about technologies and their essential features so that I can use it in teaching and learning" (Respondent 37, B.Ed Primary).

4.9 Comparison of Seven-Factor TPACK Model in terms of Two Demographic Variables

A total of two one-way MANOVAs were conducted between the seven-factor TPACK model: i) CK (Content Knowledge); ii) PK (Pedagogical Knowledge); iii) PCK (Pedagogical Content Knowledge); iv) TK (Technological Knowledge); v) TPK (Technological Pedagogical Knowledge); vi) TCK (Technological Content Knowledge); and vii) TPCK (Technological Pedagogical Content Knowledge) as dependent variables and two categorical variables (gender and course) as independent variables to explore if there were any statistically significant differences in pre-service teachers' perceptions about TPACK knowledge.

Inspection of multivariate Box's M Test showed significance for only course, indicating that homogeneity of covariance matrices of all the dependent variables were equal across groups except for the course. However, an examination of standard deviations for the course showed that differences were minimal. Levene's tests for each of the dependent variables were produced to check the homogeneity of variances. The results were not significant ($p > .001$) for each MANOVA indicating that homogeneity of variances was similar.

Results of multivariate F-tests

The overall multivariate F-tests showed a significant difference only for *course* (Wilk's Lambda = .761, MV $F(21, 606) = 2.886$, $p < .05$, partial $\eta^2 = .117$). Following the significant multivariate F-tests for *course*, univariate F-tests were examined to identify which of the seven dependent variables contributed to the significance.

Results of univariate F-tests

For the univariate F-tests, *course* showed statistically significant difference on CK and PK, and marginal significance on TK (see Table 4).

Table 4: Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Course	CK	4.227	3	1.409	6.658	=.001	.084
	PK	5.979	3	1.993	7.793	=.001	.097
	TK	4.118	3	1.373	4.793	=.003	.062

Examination of Tukey HSD multiple comparisons showed the following:

B.Ed Dzongkha showed significant and marginally significant results with B.Ed Secondary and B.Ed Primary respectively on CK. Further examination of the descriptive statistics showed that B.Ed Dzongkha (M = 3.41; SD = 0.46) had significantly and marginally significantly higher CK compared to B.Ed Secondary (M= 2.96; SD= .43) and B.Ed Primary (M= 3.14; SD= .49).

B.Ed Dzongkha showed significant results with B.Ed Primary and B.Ed Secondary on PK. Further examination of the descriptive statistics showed that B.Ed Dzongkha (M= 3.66; SD= .38) had significantly higher PK compared to B.Ed Secondary (M= 3.15; SD= .67) and B.Ed Primary (M=3.31; SD= .54).

B.Ed Dzongkha showed marginally significant results with Diploma on TK. The examination of descriptive statistics showed that B.Ed Dzongkha (M= 3.08; SD=.53) had marginally significantly higher TK compared to Diploma (M= 2.57; SD= .42).

However, the examination of effect size, as measured by Partial Eta Squared for CK (.084), PK (.097), and TK (.062) explained a small proportion of variance of scores between B.Ed Dzongkha and B.Ed Secondary, and B.Ed Primary (8.4%), between B.Ed Dzongkha and B.Ed Secondary, and B.Ed Primary (9.7%), and B.Ed Dzongkha and Diploma (6.2%).

Findings suggest that B.Ed Dzongkha students have higher CK and PK compared to their B.Ed Secondary and B.Ed Primary counterparts. Likewise, B.Ed Dzongkha students also seem to have higher TK compared to Diploma students. While it is beyond the scope of this study to determine the plausible reasons for these findings, it is worth further exploration using multiple research methods. Perhaps, one of the reasons could be due to a lesser number of B.Ed Secondary (10.3%) and Diploma (8.5%) students compared to B.Ed Primary and B.Ed Dzongkha. Findings from this study tentatively suggest that B.Ed Secondary and Primary students need to work on their CK and PK while Diploma students need to work on their TK.

5. Discussion and Recommendations

The purpose of this study was to examine the final year pre-service students' perceptions of personal and professional needs related to TPACK. Findings confirm that the 21st Century is the age of digitalisation. All final year pre-service students who have just graduated use Internet and technologies daily with the majority using three hours a day. It is interesting to note that these pre-service teachers use ICT for mainly networking and socialisation, instant messaging, searching for information, and also for gaming. Findings also suggest that these students use ICT for academic purposes such as searching information for their assignments, class presentations, and online communication with lecturers and colleagues during their training period. This is an encouraging trend that must be further reinforced. However, only a few seem to use the Internet and technologies for making PowerPoint presentations, file sharing, using text editors, and creating blogs.

It is encouraging to learn that the Internet and technologies have become a part of the lives of the pre-service teachers which was beyond their reach only a few years back. However, some issues and challenges need the attention of relevant stakeholders. This study confirms the earlier findings of Choden and Sherab (2019) who reported the TPACK of university teachers that the Internet connectivity is too slow and expensive, that it is difficult to integrate ICT into the curriculum due to lack of ICT skills and knowledge, and that university teachers lack pedagogical knowledge on how to use ICT in teaching and learning. Sadly, the current findings showed that more than 50 percent of the pre-service teachers do not have a computer at home. Findings from this study suggest that majority (more than 80%) of these pre-service students who have just completed their four-year training programme desire to attend professional development on both the basics and advanced Internet and ICT related skills. This demonstrates that pre-service students do not receive adequate training on Internet and ICT during their training programme at the College. Hence, these teacher graduates are unlikely to make use of emerging educational technologies in their teaching and learning processes.

The review of the teacher education programme has shown that pre-service teachers study two ICT modules- one on functional IT and the other on ICT in teaching and learning (see PCE, 2010 for content details). If these students do not feel confident to integrate ICT into their teaching, it only indicates that they are not adequately prepared for this task. The finding from the current study confirms the earlier findings that pre-service teachers have the perceptions that they are not adequately prepared to make effective use of technology in their teaching (Polly et al., 2010; Tondeur et al., 2013). The finding suggests that PCE strategise how to support pre-service teachers to integrate technology. It is crucial to prepare them to integrate technology into different subject areas rather than just focusing on the two stand-alone ICT modules. As suggested by Mishra and Koehler (2006), PCE needs to focus on understanding the interrelationships between and among content, pedagogy, and technology.

The COVID-19 pandemic has shown to the world how crucial it is for teachers as well as students to learn about educational technologies. It is recommended that the College strengthen these modules to equip future pre-service teachers with knowledge and skills to integrate educational technologies into their teaching. In addition to the existing ICT related modules, pre-service teachers could be provided with opportunities to learn about educational

technologies in each of their teachable subjects. This means that teacher educators should be well equipped with educational technologies. All technologies may not apply to all teaching subjects. Therefore, teacher educators should be able to customize the available technologies to be used in making their subject interesting and relevant.

It has been concerning to note that even after four years of the training programme, slightly more than 50 percent of the participants perceive that they will not be able to implement various pedagogical methods such as place-based learning, project-based learning, problem-based learning, reflective learning, situated learning, design-based learning, and explorative learning into their teaching. Such a low level of confidence in the graduating students has a direct implication for the College. It infers to the quality of the teacher education programme. Existing literature highlights the important influence of teachers' beliefs and views on instructional decision-making and classroom practice (Roussinos & Jimoyiannis, 2019, Yero, 2010). The low level of confidence to implement different aspects of pedagogy is likely to negatively impact the teaching-learning process. The College needs to address this issue as quickly as possible. Otherwise, this has the potential to further deteriorate the quality of education. If teachers are not able to vary the pedagogical approach to deliver content knowledge, learning can be monotonous and uninteresting. Such a teaching-learning process will not be able to address the needs of an individual student.

Furthermore, findings from this study also suggest that pre-service teachers need to particularly enhance their TK and PCK so that they can competently implement educational technologies into their teaching. Given the power of educational technologies in the 21st Century education landscape, the College must provide strategic leadership in improving the overall ICT skills and facilities and incorporating TPACK framework into teaching to facilitate the higher learning experience. The College needs to develop a better understanding and implement TPACK into their programmes for better preparation of pre-service teachers (Hofer & Grandgenett, 2012) but first, teacher educators need to build their own TPACK confidence and competence as recommended earlier (Choden & Sherab, 2019). It is noteworthy that the recent experience of compulsory online teaching due to the COVID-19 pandemic has exposed teacher educators to the use of educational technologies. Such experiential learning is good, but it would be better if there is a well-planned introduction of TPACK framework into the pre-service teacher education programme. Otherwise, it will be a challenge for the College to produce teachers for the 21st Century educational setting. It is crucial to understand that teachers cannot make their teaching and learning meaningful without mastering these three knowledge bases; content, pedagogy, and technology. In this 21st Century, these three knowledge bases are interdependent where one cannot function to its full potential without a combination of the other two (Castéra et al., 2020; Joo, et al., 2018; Özgün-Koca, et al., 2010; Lambert & Mäkitalo-Siegl, 2017).

Given the current developments in the education system, it is significant that educational leaders envision technological knowledge as an equally important component of a teacher's professional standards compared to content and pedagogical knowledge. Due to a lack of empirical evidence, it is uncertain if school teachers have the required technological knowledge and skills. Unfortunately, the professional standards for teachers in Bhutan do not provide a much-deserved focus on the technological knowledge compared to the content and pedagogical knowledge of the teachers (MoE, 2019). This suggests that Bhutanese education system is still grappling with the age-old content and pedagogical issues. Today, teacher's technological needs should be treated at par with the content and pedagogical needs (Koenler, et al., 2013; Lin, 2013). ICT competency standards for teachers should be much more rigorous not just for functional purposes. In the Bhutanese education system, technology appears to be only for functional purposes, not as a means for enhancing teaching and learning. If such practices continue, the issue of declining quality of education (MoE, 2014) is likely to remain for many years to come. As argued earlier, "all relevant stakeholders need to understand that in today's technology-based world, it will be unfair to leave behind any school student's potential untapped due to lack of a teacher's technology related knowledge" (Choden & Sherab, 2019, p. 282).

6.0 Future Research Directions

Due to a lack of research, it is uncertain how in-service teachers are faring in terms of educational technologies. Irrespective of their technological skills and knowledge, all teachers have been required to go to online teaching during the pandemic. It would be interesting to examine teachers' online teaching experiences with more focus on TPACK framework.

While there is not enough data, the findings from this study also suggest that education stakeholders in Bhutan need to understand how the issue of income gap could impact the learning. There has been some indication in this study that internet connectivity and high cost technologies are a burden for many poor families. However, this

issue needs to be further explored and accordingly addressed. Otherwise, universal quality education would remain a distant dream for many aspiring youths in Bhutan.

7.0 Conclusion

This chapter provided an overview of the Bhutanese pre-service teachers' perceptions of personal and professional needs related to technological, pedagogical, and subject content knowledge (TPACK). This is the first of its kind. While the use of TPACK framework has become a must for the teachers to make their teaching-learning more engaging and interactive, the situation of pre-service teachers appears to be not as promising as it should be as they lack the required knowledge and skills to implement TPACK. Relevant stakeholders need to urgently address the issue identified.

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