ICT INTEGRATION IN THE CLASSROOM OF SECONDARY SCHOOL IN BANGLADESH

Thesis

Submitted for the award of the Degree of
Doctor of Philosophy in Education

By
Biplob Mallick

Under the guidance of
Professor Dr. Selina Banu
&
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[This thesis is submitted to the University of Dhaka for fulfillment of the requirement for the degree of Doctor of Philosophy (Ph.D) in Education]

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DECLARATION

I, Biplob Mallick candidate for the degree of Doctor of Philosophy in Education under Institute of Education and Research, University of Dhaka certify that:

i) The thesis paper is personally written by me under the supervision and guidance of Professor Dr. Selina Banu and Professor Dr. Md. Abdus Salam, Institute of Education and Research, University of Dhaka, Bangladesh.

ii) The data used in this study are original, personally collected with help of some research assistants and analyzed by me and

iii) I shall at all times be governed by the conditions, policies and regulations of the University of Dhaka on thesis writing, including the copyright and Patent laws of Bangladesh.

In the event that my thesis, be found to violate the conditions mentioned above, I voluntarily waive the right of conferment of my degree and be subjected to the disciplinary rules and regulations under University of Dhaka, Bangladesh.

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ABSTRACT

In recent years, the emergence of educational technology has been considered as means of achieving the educational goals in teaching-learning environment where teachers play the key role. Integration process of information and communication technology (ICT) in education is highly related to teachers' attitudes, motivation and access, ease of use and usefulness of ICT. The study intended to explore teachers' attitudes towards ICT-pedagogy integration in BGS classrooms, their classroom practice, and the challenges they face while practicing. In doing so, the study followed a quantitative research design whereby survey instruments and observation checklist were used to collect data from 391 teachers of Bangladesh and Global Studies (BGS) subject of secondary schools of Bangladesh. After cleaning, the collected data have been analyzed using SPSS V25 for statistical analysis. Results showed that the teachers possessed positive attitudes towards ICT-pedagogy integration in classroom practice which contradicted with the findings from classroom observation to some extent. Further, data claimed that there were correlations among teachers' attitudes, practice, challenges and school location, school types, teachers' skills, ICT training and their age. The results also indicated that the perceived usefulness, ease of use and some affective components have influenced on the acceptance of ICT-pedagogy integration in teaching-learning practice. The study found the level of ICT-pedagogy integration was at ordinary stage while teachers demonstrated assertive mindset which shed light on potential impact of ICT-pedagogy integration in BGS classrooms. Concurrently, the teachers faced numerous challenges during integration process, which were the other major findings of the study. To overcome the challenges and bring positive impact, the study proposed an ICT-Pedagogy Framework that would be helpful to foster ICT-pedagogy integration in BGS classrooms as well as secondary school education for creating teaching-learning effective and ensuring quality education in classrooms. Nevertheless, the study focused on secondary school teachers only, but it had huge potential in all stages of education in Bangladesh from the technological-pedagogical point of view, which could be examined by further study in future.

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DEDICATION

This work is also dedicated to my father Jatindra Nath Mallick and my mother Champa Rani Mallick. I am indebted a great deal to my parents as they taught me right from wrong and the value of hard work.

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LIST OF ACRONYMS

A2I	: Access to Information
ADB	: Asian Development Bank
ANOVA	: Analysis of Variance
BA	: Bachelor of Art
BANBEIS	: Bangladesh Bureau of Educational Information & Statistics
B Ed	: Bachelor of Education
BGS	: Bangladesh and Global Studies
BIAM	: Bangladesh Institute of Administration Management
BMTTI	: Bangladesh Madrasah Teachers Training Institute
BPEd	: Bachelor of Physical Education
BRAC	: Bangladesh Rural Advancement Committee
BSS	: Bachelor of Social Science
CAL	: Computer Aided Learning
CD	: Compact Disk
CIDA	: Canadian International Development Agency
CPD	: Continuous Professional Development
D-Net	: Development Research Network
DPE	: Directorate of Primary Education
DSHE	: Directorate of Secondary and Higher Education
DU	: University of Dhaka
ECDP	: Early Childhood Development Program
EFL	: English as a Foreign Language
ELT	: English Language Teaching
PMO	: Prime Minister Office
EFA	: Education for All
GoB	: Government of Bangladesh
GPS	: Global Positioning System
HSC	: Higher Secondary School Certificate
HSTTI	: Higher Secondary Teachers Training Institute

ICT	: Information and Communication Technology
IER	: Institute of Education and Research
KOICA	: Korea International Cooperation Agency
MA	: Master of Art
MEd	: Master of Education
MMC	: Multimedia Classroom Monitoring
MoE	: Ministry of Education
MoPME	: Ministry of Primary and Mass Education
MPO	: Monthly Pay Order
MSS	: Master of Social Science
NCTB	: National Curriculum and Text Book Board
NEP	: National Education Policy
NGO	: Non-Governmental Organization
NIP	: National ICT Policy
PIL	: Microsoft-based Partners in Learning
SHED	: Secondary and Higher Education Division
SPSS	: Statistical Package for the Social Science
SSC	: Secondary School Certificate
STEM	: Science Technology Engineering and Math
STEAM	: Science Technology Engineering Art and Mathematics
TAM	: Technology Acceptance Model
TPACK	: Technological Pedagogical Content Knowledge
TQI-SEP	: Teaching Quality Improvement in Secondary Education Project
TQI-II	: Teaching Quality Improvement-2
TTC	: Teachers' Training College
TVET	: Technical Vocational Education and Training
UITRCE	: Upazila ICT Training and Resource Center for Education
UNESCO	: United Nations Educational, Scientific and Cultural Organization
USB	: Universal Serial Bus

CHAPTER I

INTRODUCTION

1.0 Background of the Study

The development in the field of information and communication technology (ICT) and its use in the teaching-learning practice intensely changed the traditional concept of teaching and learning by transforming the classrooms from teacher-centric to student-centric (Basavaiah, Anthony, & Patil, 2021; Yadav, 2019; ADB, 2017; Thakur, 2016; Raman, Mallick, & Sofian, 2015; Ghavifekr & Rosdy, 2015). Regarding the reality, ICT and ICT tools had been considered as influential levers for the diffusion of knowledge in education (Mbodila, Jones, & Muhandji, 2013; Birisci, Metin, & Karakas, 2009) and played a fundamental role during the Covid-19 pandemic (Salas-Rueda et al., 2022; Coman, et al., 2020). Covid-19 pandemic prompted and forced teachers to explore the use of online technologies and ICT in carrying out the teaching and learning process (Ramadass & Shah, 2022; Pozo et al., 2021; Chandwani, Singh, & Singh, 2021) despite incorporating ICT in secondary schools by recent decades in different countries, including Bangladesh, to change and innovation of education (Musheer, 2018; Tezci, 2009). Whatever it was, teachers' positive attitudes toward technology integration in teaching and learning could significantly transform the classrooms to be student-centric (Mumtaz, 2000) as well as motivate and engaged the students in lessons (Wijnen et al., 2021, Babu & Nath, 2017). Therefore, teachers' attitudes, perceptions, competency, readiness and challenges they faced during the ICT-pedagogy integration process were important indicators of using ICT-pedagogy in the secondary education system of Bangladesh.

The stated indicators were also considered as primary predictors of using new ICT tools in educational settings (Makhlouf & Bensafi, 2021) and could be more relevant regarding ICT-pedagogy integration in developing countries including Bangladesh. The teachers' lack of time, training, and interest, large class size (Mansura, 2016; Ayeni & Olowe, 2016; Chowdhury, Arefin, & Ahmed, 2020), insufficient physical infrastructures, lack of digital skills, and shortage of ICT resources (Talukder & Saba, 2016), and the stakeholders' resistance to change were the main barriers for integrating technology into educational settings (Cha, Park, & Seo, 2020; Hinostroza, 2018; Alkahtani, 2017) in Bangladesh.

On the other hand, the education system in Bangladesh was separated into primary, secondary, and higher education while secondary education worked as a connector between primary and higher education. The level had a significant influence on its learners as it prepared young students for higher education whereas the traditional, less engaging, and teacher-centric approach could not motivate students to be attentive to classes or not prepared well for work (Kaymakamoglu, 2018; Mascolo, 2009). Although the teaching-learning process in Bangladesh was partially practiced participatory approach, the entire system of education was not quite learner-friendly yet (Ebrahim, 2017). Asadullah (2017) discovered that there was a little interaction between teachers and students in classroom practice either by trained or untrained teachers. In contrast, the national curriculum (NCTB, 2012) emphasized the importance of students learning ‘how to learn’ rather than simply ‘what to learn’. The teachers were encouraged to use multimedia digital content in their lessons that might help to learn more interesting, meaningful, stimulating and motivating to the students (Mansura, 2016; Başar & Elyıldırım, 2022) whereby ICT could be used as a stimulus for its potentiality in the teaching-learning process in social studies classroom (Arkorful, Barfi, & Enchill, 2020; Hero, 2019; Zafar, 2019).

Thus, ICT-pedagogy was introduced through multimedia digital contents in different subjects in secondary schools in Bangladesh for ensuring more participation of students in learning process although the integration of ICT could not bring desired changes yet in Bangladesh (Babu & Nath, 2017). Moreover, primarily it was used in Science & Mathematics (Chowdhury, Arefin, & Ahmed, 2020; Mallick & Anam, 2020; Obaydullah & Rahim, 2019), including English language education (Talukder & Saba, 2016; Islam, 2015) and later on other subjects including Bangladesh and Global Studies (BGS). The different policies also focused to introduce ICT, especially on Science, Mathematics, and Language Education (NIP-2009, 2015, 2018; & NEP, 2010) aimed to improve the quality of education.

Among the subjects taught in secondary education, BGS was the integrated study of sociology, history, civics, economics, geography and populations in a combined way rather than in an individual manner (NCTB, 2012; Ekpenyong, Joseph, & Agbor, 2019). The study of BGS specifically allowed knowing the history of the country and the world, legacy, culture, and bravery of the people of Bangladesh (NCTB, 2012). It was believed that the study of BGS changed students' attitudes positively towards the country and its people. Additionally, to know Bangladesh, history, heritage, culture, socio-economic-political conditions and the lives of people living in different parts of the country ICT-pedagogy integration in teaching BGS could stipulate learners to gain complete knowledge of the societal issues of Bangladesh (NCTB, 2012). It was also expected that the students would be turned into citizens with complete civic values (Fuentes-Moreno, et al., 2020; Ekpenyong, Joseph, & Agbor, 2019) by practicing these issues following the cherished tradition of Bangladesh. Additionally, they would be able to enrich their world of knowledge compared to global issues and help learners to understand how to connect globally.

At the same time, the pedagogic use of ICT in BGS teaching-learning activities could improve students' motivation and active participation by making learning effective and enjoyable. Additionally, students could enhance their academic achievement and improve their problem-solving ability using ICT in BGS. It also made teachers more responsible for creating joyful classroom learning opportunities (Hasan & Mirza, 2020; Wang, 2007) while ICT resources could be critically utilized to analyze the BGS contents in a pedagogic way.

Concurrently, the practice of ICT-pedagogy in classroom activities was connected with positive attitudes of teachers toward technology integration. Similarly, Makhlouf and Bensafi (2021); Bingimlas (2009) claimed that teachers' attitude was one of the key enablers in the classroom practice of ICT-pedagogy (Cubukcuoglu, 2013). Moreover, Makhlouf and Bensafi (2021) revealed that it was teachers who agreed on when, where and how to use these tools in the classroom environment. Therefore, the study of ICT-pedagogy integration in BGS classrooms might realize the teachers' attitudes, their interest and motivation of using ICT-pedagogy as well as the challenges towards integrating technology in teaching BGS because of being a new user of technology in teaching BGS. It might contribution to the functional and development of the teaching-learning process through some specific suggestions for successful ICT-pedagogy integration in light of classroom experience. The study might be used as a source of the future field of study. Thus, the study of ICT-pedagogy integration in teaching BGS might be an emerging issue in the field of education.

On the other hand, the Covid-19 pandemic showed the importance of ICT use in education because UNESCO (2021) claimed that two-thirds of learners had no direct contact with teachers during the Covid-19 lockdown. At least 37 million children in

Bangladesh and about 800 million children in Asia, including South Asia, Southeast Asia and East Asia, whose schools were closed due to COVID-19 pandemic, did not get proper access to learning (UNICEF, 2021). Ali (2021) argued that around 39 million learners in Bangladesh were missing out on direct classroom teaching-learning opportunities and interactions with their peers and teachers since 18 March 2020 due to the Covid-19 pandemic. It made teachers speed up to run behind technology and forced them to adopt an online teaching strategy in all subjects to remain connected with students. Additionally, the global monitoring education report (UNESCO, 2020) revealed that the Covid-19 crisis opened a new avenue for teachers to change their way of teaching-learning activities. Therefore, this current study could value added for future education in teaching BGS and also other subjects.

1.1 Statement of the Problem

ICT-pedagogy integration challenged the traditional concept of classroom education (Ma, Anderson, & Streith, 2005), revolutionized the learning of students (Kurt, 2007), and recommended changes in teaching-learning strategies (Özdaml, Hürsen, & Özçinar, 2009) in classroom settings. Regarding the changes in teaching-learning strategies, the education system of Bangladesh started ICT-pedagogy integration in education through multimedia digital content, especially in secondary schools. The aim of ICT-pedagogy integration was to transform the classroom from teacher-centric to student-centric, focusing on the theory of constructivism. The effort was intended to prepare students to compete with the upcoming challenges of 21st-century education by incorporating a constructivist approach, interactive teaching-learning techniques, and educational technologies in classroom activities (Dalia, 2018). The National Education Policy (NEP, 2010) of Bangladesh also expected ICT to be widely used in its education system. Furthermore, the MoE (2013) focused on integrating

ICT into the curriculum as an effective educational tool for the nation's holistic development by ensuring efficiency, transparency, accountability, and dynamism in education.

To explore the efficiency of ICT resources in education in the Bangladesh context, a number of studies were found (Sultana & Haque, 2018; Talukder & Saba, 2016; Parvin, 2013; Khan, Hasan, & Clement, 2012; Rahman et al., 2012) while a very little study was found (Banu, 2006) related to the teaching BGS by using technology. On the contrary, few studies examined secondary school teachers' attitudes towards ICT resources in Science, English Language Teaching (ELT), and classroom management other than Social Science teaching-learning activities. There were some other studies found which focused on the usefulness of ICT in education, challenges and barriers of technology integration in classroom teaching-learning activities (Tarman, Kilinc, & Aydin, 2019; Kilinc, Tarman, & Aydin, 2018). However, most studies were small-scale in nature.

Even though there were many social science studies found from other countries (Çetin & Işçi, 2022; Inyang, 2021; Hero, 2019; Tarman, Kilinc, & Aydin, 2019; Ghanney & Mwinkaar, 2019; Herrera et al., 2018; Hong, 2016; Ekwe, et al., 2016; Gulbahar & Guven, 2008; Malaba, 2005;) to ICT integration, not much had been done on social science teachers' attitudes, their practice of ICT-pedagogy in the Bangladesh context. Thus, there was a need for further studies to explore teachers' attitudes towards ICT-pedagogy integration in teaching BGS. Given this gap, the researcher aimed to study the ICT-pedagogy integration in secondary school BGS classroom teaching-learning activities.

Consequently, the aim of this study was helpful because it illustrated unitedly the necessity of analyzing how teachers thought about the ICT-pedagogy integration process with their level of actual practice in BGS classrooms. Moreover, the study emphasized reviewing the challenges that might hinder the ICT-pedagogy integration process.

Moreover, the history and culture of Bangladesh including its large educational structure, geographic location, economic status, political condition, lives of people and ways of communicating system differed from more developed countries. As a result, further study was needed to understand the teachers' attitudes and current ICT-pedagogy practices in secondary school BGS classroom activities. Simultaneously, it was also required to explore the factors that might influence their attitudes and level of practice. Therefore, this current study was significant because it highlighted the necessity of assessing how BGS teachers observed the use of ICT in their classrooms, the level of practice, and met the challenges of the ICT-pedagogy integration process in teaching-learning activities focusing on BGS. So, it was needed to explore to what extent teachers had positive attitudes towards ICT-pedagogy integration in education as well as their implementation experience and the challenges (Ndawi, Thomas, & Nyaruwata, 2013) encounter, particularly in social science teaching-learning activities.

For this study, secondary school BGS teachers were considered ICT adopters who were the direct users of the ICT-mediated multimedia digital content in the secondary school BGS curriculum. Integration of ICT-pedagogy in classroom instruction, especially in BGS classrooms, had been extensively studied. Thus, the researcher realized the importance of generating knowledge in integrating ICT-pedagogy in teaching BGS. Therefore, "ICT integration in the secondary school classroom in Bangladesh" was a research title.

1.2 Purpose of the Study

Using ICT was a way to strengthen the education systems, prepare a skilled workforce, reduce the existing discrimination in knowledge dissemination, enrich the quality and efficiency of learning, and made available more effective educational services (MoE, 2013). However, the integration of ICT-pedagogy in classroom instruction largely depended on the teachers' attitudes, motivation, implementation skills, and mitigating challenges (Alrasheedi, 2009). Therefore, the study set keen interest in exploring the secondary school BGS teachers' status, their attitudes towards ICT-pedagogy integration, level of practice, and challenges they faced during the integration process of ICT-pedagogy in BGS classrooms.

1.3 Research Questions

The integration process of ICT-pedagogy in classroom instruction required attention to teachers' attitudes, access, availability, and skills on using ICT tools. Therefore, the study intended to explore the BGS teachers' existing status, their attitudes towards ICT-pedagogy integration and the current integration process in BGS teaching-learning activities and the types of challenges teachers faced regarding ICT-pedagogy integration in classrooms. This study expected to find out the answers to the following research questions:

- What was the existing situation of ICT-pedagogy integration in secondary schools for BGS teachers?
- What attitudes did the BGS teachers possess regarding ICT-pedagogy integration in secondary school classrooms?
- How did ICT-pedagogy use in BGS classroom practices?
- What were the challenges to integrating ICT-pedagogy in BGS classrooms?

1.4 Significance of the Study

ICT-pedagogy integration in classroom teaching-learning activities had positively impacted on students' success, made teachers more responsible, and created better learning opportunities for learners (Hero, 2019; Ndawi, Thomas, & Nyaruwata, 2013). Similarly, Hero (2019) claimed that utilizing ICT in teaching performed a significant role in improving the productivity and performance of teachers in classroom teaching-learning activities. Realizing its potentiality, ICT had been incorporated in secondary schools for the last few years in the education system of Bangladesh whereas the covid-19 pandemic situation pushed teachers to use ICT-pedagogy in teaching. Directorate of Secondary and Higher Education (DSHE) also understood the urgency and started an initiative named 'Amar Ghore Amar School' during COVID-19 pandemic to broadcast the lessons for grade VI-X (SHED, 2020). This study might have a positive effect on such initiatives to integrate ICT-pedagogy in secondary school BGS classroom to make a collaborative teaching-learning setting for better knowledge retention (Repiso et al., 2014; Ghavifekr & Sufean, 2011).

At the same time, teachers had a principal role in the initial stage of the ICT-pedagogy integration process (Cavas et al., 2009; Samiei, 2008) for orienting themselves about innovations in the education system. Considering teachers' engagement in the process, the GoB offered several initiatives for the professional development of teachers (NIP, 2018; MoE, 2013) to change their attitudes towards the constructive teaching-learning process. However, the progress of integrating ICT-pedagogy in teaching BGS was not at the expected level because the teachers who were responsible for integrating technology in teaching, faced different types of challenges. In addition to this, many teachers were unfamiliar with modern technologies, and they were usually comfortable with their traditional practices. They did not feel happy about ICT-pedagogy integration in their classrooms (Aloysius, 2018; Githinji, 2016; O'Grady, 2007). Therefore, the study of teachers' attitudes, their level of practice, and challenges in the integration process should be released for smooth integration of ICT-pedagogy in teaching BGS.

On the contrary, the rapid changes and development of ICT revolutionized the teaching-learning activities (Banu, 2011) and teachers are required to actively participate in the ICT-pedagogy integration process in their respective subjects. However, using several types of ICT materials in teaching BGS could assist the students' motivation and ensure active participation by making learning enjoyable. Moreover, teachers could use various kinds of social science teaching aids in lessons to enhance students' engagement in teaching-learning activities. Similarly, teachers could receive support from ICT-pedagogy integration to overcome the problems they faced in regular classroom teaching (Turkmen, 2005). Additionally, Sisco (2008) argued that integrating ICT into the curriculum fosters the students' achievement in learning progress. The process helped to make lessons easily understandable other than promoting rote learning (Kurt, 2007). Detailed challenges related to ICT-pedagogy integration in teaching BGS had not been identified yet clearly, although some studies accomplished in Bangladesh had a significant focus other than BGS. As per researcher knowledge, a very few of studies had been conducted on ICT integration in the context of secondary school BGS classroom activities focusing teachers' attitudes, their ICT-pedagogy use, and possible challenges towards ICT-pedagogy integration. Therefore, this study sought to bridge the research gap in the literatures. However, the effort could inform the teachers, readers, policy- makers, curriculum developers, and other stakeholders about the teachers' attitudes, and their level of integrating ICT-pedagogy in classroom. Moreover, the challenges of integration process and the current status of ICT-pedagogy integration in teaching BGS also were noticed in this study. Therefore, the depth and extent of the problem in the context of Bangladesh and teaching-learning BGS made this topic unique and, therefore, the current research is worthy.

1.5 Definition of the Key Terms

It was wise to clarify the key terms for better insights about the ongoing study. The used key terms were ICT, pedagogy, integration, ICT-pedagogy integration, attitudes, secondary school, teacher, challenge, BGS, model content, and multimedia classroom. The key terms had been presented below in the following sections:

1.5.1 ICT- stood for Information, Communication, and Technologies. Those were available in school and were usually used in teaching-learning activities to promote students' understanding and motivate them towards lessons. ICT referred to computers with multimedia capabilities, internet access, and compatible peripherals (printers, scanners, projectors, and digital videos) that worked together to improve teaching and student participation in the application of school curricula across subjects in schools (Latio, 2009). The concept of ICT was limited to computers or laptops and the blended approach of hardware, software, networks, and media to gather, store, analyze, and present data (voice, data, text, and image) to achieve the goals to encourage active and constructive learning. Consequently, all types of technological tools and resources used in teaching-learning activities were considered ICT. It also included tablet computer, smart phone, multimedia projector, interactive smart board smart board, visualizers, microphone, USB, presentation clickers, and tape recorder that might be used in the learning process. Therefore, this study could conclude that

ICT denoted the technological movement in the school's classroom, having a computer, laptop, multimedia, or devices, in the classroom to manipulate and learn with as a tool (Harris, Al-Bataineh, & Al-Bataineh, 2016).

1.5.2 Pedagogy- referred to the teaching strategies of teachers in which they were connected with students through learning materials during classroom discussion (Santos & Castro, 2021). However, pedagogy could be described as the art of teaching. In a pedagogy integrated classroom, the teachers' role was like a facilitator where students were involved in innovative activities and knowledge acquisition regarding their knowing world. Regarding constructivism, pedagogy was an approach whereby classroom activities were proposed to students that were meaningful for both teacher and student, reflect, search, and use their capacity for taking initiatives and being creative (Dagar & Yadav, 2016). In this study, pedagogy was considered a vehicle of articulating learning goals that stimulated the learning process, focusing on students' perspectives.

1.5.3 Integration- The term 'integration' was often used interchangeably with the word 'use'. However, ICT integration in the classroom teaching-learning process was performed to bring up a positive change in the pedagogical approach in order to make participatory teaching-learning environment in education (Lloyd, 2005).

1.5.3 ICT-pedagogy Integration- was the proper use of educational technology to accomplish the desired learning outcomes revealed by Davies and West (2013). However, ICT-pedagogy integration incorporates ICT as teaching tools, focusing on pedagogy that might promote active learning according to the contents. In other words, the use of ICT in classroom instruction could significantly improve the teaching-learning activities **(**A2I, 2011) and solved pedagogical matters. ICT integration is intended to use ICT tools to promote learning activities, developed new methods of facilitating learning, and evaluated student performance (Jung, 2005). Wang (2007) addressed that ICT integration into the curriculum enhanced teaching-learning activities to promote student achievement. According to Ertmer, Tondeur, and Leftwich (2016), the integration of ICT in education referred to ICT-based practices in the daily routines, work, and management of schools. On the other hand, Bandyopadhyay (2013) revealed that ICT integration could be divided into ICT for instructional, non-instructional, and learning tools. However, in this study, ICT-pedagogy integration was considered a learning tool that facilitated a learner-friendly teaching-learning environment which might help teachers and students to participate effectively in BGS teaching-learning activities.

1.5.4 Attitudes- meant that positive or negative feelings of entities towards any specified topic were an attitude (Alaugab, 2007). Birwal (2017) defined attitudes as the dynamic elements in human behavior that led to or point towards some specific activities of a particular organ of the human body. In this study, the attitudes were the degree of choice to accept or reject the integration of ICT-pedagogy in teaching by teachers. Teachers' responses to specific survey items following a five-point Likert Scale were considered as their level of attitudes. The five-point scales were indicated by Strongly Disagree=1, Disagree=2, Undecided=3, Agree=4, and Strongly Agree=5.

1.5.5 Secondary School- was running in Bangladesh, i.e., junior secondary, secondary, and higher secondary schools (BANBEIS, 2019). In this study, secondary school meant the institutions that incorporated grade VI-X level students and followed the NCTB curriculum to accomplish their study. However, this study followed only Bangla medium schools under the national curriculum although both Bangla medium and English version secondary schools were governed under the control of the Directorate of Secondary and Higher Education (DSHE).

1.5.6 Teacher-referred to those involved as classroom teachers for BGS in respected schools to help students acquiring knowledge and taught from grade VI-X in secondary schools under DSHE. According to the BANBEIS data, as of 2018, there were 43940 BGS teachers, including 13108 female teachers employed at secondary schools (BANBEIS, 2019). However, a total of 189081 teachers in secondary schools were being employed at different subject areas in secondary schools as of 2018.

1.5.7 Challenge- was something new and unknown and problems that required significant effort and determination to integrate ICT-pedagogy in classroom activities. The challenges might originate from concern authority, ICT materials, infrastructural facilities, or teachers' knowledge and skills impeding incorporation ICT-pedagogy in the school curriculum. In this study, the challenges were considered, which might be discontinued the teachers' efforts of ICT-pedagogy integration process in BGS subjects of their daily teaching-learning practices.

1.5.8 BGS- was nominated as a subject that had been taught in VI-X grades in secondary schools. This subject comprised Bangladesh's history, society, culture, civics, economics, geography, and legacy as well as the living style of its people. It was a compulsory subject for students in all grades of secondary schools.

1.5.9 Model Content- was blended with image, graphs, maps, audio, video, sound, or animation according to the lesson plan. Moreover, a single picture or video could be used as content, if it was desired for the lesson. The teachers could create step-by-step content through PowerPoint slides as per his/her plan. The model content had been prepared by subject expert teachers under continuous supervision with teacher educators and finalized through a series of dissemination workshops. However, the teachers could have right to change or modify the content in accordance with text and social context with the help of internet or otherwise obtained resources.

1.5.10 Multimedia Classroom- accommodated a variety of technological tools including laptop, projector, sound system, internet facilities, and connections to support the use of portable devices. The aim of multimedia classrooms was to enhance the teaching-learning process by capturing attention, engaged learners, inspired creativity by visualizing difficult concepts or freeing the students from over-loaded content (Mansura, 2016).

1.6 Limitations of the Study

The research area was confined to some specific geographical locations of Bangladesh due to the given timeframe and capacity of the researcher. At the same time, the researcher felt overwhelmed while selecting the sample for this study. Moreover, the study involved only BGS teachers, while many teachers of other subjects were left out of this study. Therefore, it was challenging to select a representative group of teachers from all over the country. Also, the study could have been considered necessary by the teacher educators, educational administrators, and policymakers to support the study's findings. However, as stated earlier, the given timeframe did not allow exploring further.

On the other hand, the study could follow a mixed-method research design instead of a quantitative approach alone. Also, the quantitative research approach demanded factor analysis, multivariate analysis, or regression analysis for deeper understanding, which had not been done due to the limitations of questionnaires. Moreover, the attitude scale had been focused on measuring only teachers' attitudes, which did not require the factor, multivariate, or regression analysis.

Another major limitation of this study was a comparative analysis done differently between overall attitude with practice and overall challenges with practice other than all specific items. Although the comparative analysis involved comparing and contrasting belongings, there were a few items common in three different sets of questionnaires by their nature.

The teachers were selected using multistage stratified sampling techniques, but a few selected teachers did not give back or partly completed the survey questionnaire. Equally, a multistage stratified sampling technique was used for classroom observations but some of the selected teachers were disinterested in conducting ICT-pedagogy integrated class though it was an informed visit. Therefore, adjustments had been made in the selected sample at the last moment for observing BSG classroom teaching-learning activities.

1.7 Organization of Chapters

The dissertation included five chapters that started with an introduction and concluded with major findings, discussion and recommendations for effective ICT-pedagogy integration in BGS classrooms. Chapter one also introduced the contextual background of ICT-pedagogy integration in Bangladesh with a problem statement. Furthermore, CHAPTER I provided details of the problem of study, study aims, research questions, the significance of the study, and an explanation of terminology and limitations. CHAPTER II presented the literature review in different parts such as secondary education in Bangladesh, the current scenario of ICT integration, and recent research on ICT-pedagogy integration which were ended with analogies of the study. CHAPTER III presented the quantitative research design with the non-experimental study. This chapter also elaborately described the research paradigm, population, sampling procedure, data collection, and analysis process of the results. Later, the data analysis and discussion had been presented in CHAPTER IV with the data presentation, including tables and figures regarding research questions figured in this study. Finally, CHAPTER V summarized the study's findings, discussion, and implications as well as it suggested some noteworthy recommendations for developing ICT-pedagogy integration in school and other research areas.

1.8 Overview

CHAPTER I was an overview that intended to present the background of ICT-pedagogy integration in teaching BGS regarding the context of Bangladesh, statement of the problem, the purpose of the study, and research questions, and concluded with a discussion on the significance of the study. The changing attitudes of teachers towards ICT integration during covid-19 had been pointed out in different sections with relevant information. This chapter also discussed the definition of the terms, and limitations of the study. Furthermore, it offered an overview of the organization of chapters for this study.

In a nutshell, the next CHAPTER II was going to extend the review of the literature focusing on the research questions of this study. It also included the background and current status of ICT-pedagogy integration process in secondary education in Bangladesh.

CHAPTER II

REVIEW OF LITERATURE

2.0 Introduction

This chapter presented the review of related literatures from national and international perspectives, which helped building better understanding and insights into the research problem. The process started prior to initiating the research study and continued till the submission of the dissertation. In the beginning, to make the context clear, some fundamental aspects of study context and different policies of Bangladesh education system had been discussed. Further, the reviews shaded light on research questions those were the present school situation, BGS teachers' attitudes towards ICT-pedagogy integration, and level of integration process in BGS along with the challenges of this initiative. Therefore, this chapter detailed the study context and reviewed the literatures linked with the four research questions as based on themes-

- The Study Context
- Existing Situation for ICT-Pedagogy Integration in Secondary Schools
- Attitudes towards ICT-Pedagogy Integration
- The Practice of ICT-Pedagogy in BGS Classrooms and
- Challenges towards ICT-Pedagogy Integration

Nevertheless, the chapter ended with a brief overview of findings from all the literatures reviewed.

2.1 The Study Context

It was believed that ICT-pedagogy had a fundamental influence on teaching-learning process, and many best practices were emerging in different countries (Zhang, et al.,

2016) to promote independent learning (Chowdhury, Arefin & Rahaman, 2018). It could use successfully in instruction, learning, and assessment in anytime and anywhere as learning tool in education. Thus, ICT was considered a powerful tool for educational change and reform. A number of earlier studies had been found which worked with ICT use in education and found that proper use of ICT in education can raise the quality of classroom activities and might connect learning to real-life situations (Lowther, et al., 2008; Weert & Tatnall 2005). Concurrently, Covid-19 pandemic made its obligatory to use different classroom technologies (Winter et al., 2021; Pozo, 2021) i.e., tablet computers, projectors, smartphones, digital videos, and games which created the learning opportunity better. Therefore, the use of ICT-pedagogy in secondary education especially in teaching BGS could be a time being study which might present combinedly a complete knowledge of the society and environment, history-heritage, culture, socio-economic-political condition and global issues of Bangladesh. The study context required to present the secondary education and taken steps by government towards ICT-pedagogy integration in teaching-learning activities especially for different policies.

2.1.1 The Secondary Education in Bangladesh

The primary, secondary and higher education were the three major stages of formal education in Bangladesh. Primary education started from 6 years of age and it was a 5-year cycle (grades I-V) while secondary education started from 11+ age of students but it continued for 7-years (grades VI-XII). Conversely, the students who completed grade XII, could enroll in the higher education system of Bangladesh.

At the end of primary education, students were referred to admit in secondary education. It covered three sub-cycles those were three years of junior secondary education catered to 11-13-year old (grades VI to VIII), whereas secondary education (grades IX to X) and higher secondary education (grades XI to XII) to 14-15-year olds and 16-17-year olds respectively. The schooling was over with a public examination called Secondary School Certificate (SSC). However, grades XI to XII were known as Higher Secondary Certificate (HSC). There were equivalent levels of education which were offered in madrasahs (Islamic schools) and in technical and vocational education. Dakhil offered the educational equivalent of junior secondary and secondary schools, and Alim compared with higher secondary. The Government officially accepted this equivalency, and graduates from madrasahs were given the equal opportunity to carry on education at higher levels. On the other hand, JSC vocational and SSC vocational were compared to junior secondary and secondary education whereas, higher secondary education were classified in HSC vocational, HSC business management & technology with HSC diploma in commerce. The students could choice one program from general, religious, or technical and vocational education streams at the secondary level. At the end of JSC and JDC, the students of general stream required to follow a curriculum in either the humanities, science or business disciplines. In the madrasah stream, the students could select between general, science, mujaddid and hifjulquaran (both 'mujaddid' and 'hifjulquaran' highlighted Islamic curriculum) whereas there was no sub-division and two years of the certificate program which had been offered in vocational education (Asadullah, 2017).

Based on the management system, there were government, non-government and private schools running in Bangladesh. The government high schools were turned by the government, while non-government high schools guided by their own management committees, which were established in accordance with the norms and regulations of their individual Boards of Intermediate and Secondary Education (Banglapedia, n.d). However, the aim of this level of education was to develop learners' latent intellect and comprehensive inner faculties so that the students could win in a future competitive world. While, secondary education worked as a link between primary and higher education as well as made students acquiring a strong foundation of quality higher education.

The secondary education consisted of three different streams and different subjects. According to NEP-2010:

> There will be three streams at the secondary level, general, madrasa and technical and each stream will have several branches. However, for all streams, uniformity will be maintained through some stipulated compulsory subjects, such as Bangla, English, Bangladesh and Global Studies, General Mathematics and Information Technology (p-13).

The Bangla, English, Mathematics, Science, Social Science, ICT, Religion, Agriculture Education or Home Science were taught in grades VI-VIII under main stream education. The pathways of students changed into three different disciplines e.g science, humanities and business studies in IX-X. The students of science and humanities needed to be taught social studies as compulsory subject including early stated subjects whereas the students of business studies could choose social studies as optional subject (NCTB, 2012). Despite having importance in all subjects, the study of social studies was more important because it was the interconnected study of the different disciplines. Social Studies which was taught as Bangladesh and Global Studies (BGS), comprising social sciences and humanities to encourage civic competence for students and teachers. Instead of isolated presentation of sociology, history, civics, economics, geography and population studies, content of these subjects were integrated in this Bangladesh and Global Studies book. Thus, the students would have a holistic view of a particular time, i.e., they would get a complete idea of Bangladesh and the world context of that period. As a result, the students would get idea about history and heritage, arts and culture, and principles including the values of this country. They would also have scopes to think about very important things such as life of this people, the great achievement of the liberation war, patriotism, humanism, brotherhood, and scientific attitudes. It was also expected to give students the opportunity to know the current global issues and be knowledgeable about environmental and climate issues and could be able global citizen (NCTB, 2012). In this regard, ICT-pedagogy integration might help students and teachers to knowledge formation process in BGS.

Moreover, the national curriculum incorporated life and work oriented education, career education, physical education, health science and sports; and small ethnic group's language and culture also were found room in the new curriculum structure. Business studies stream had been strengthened by incorporating finance and banking at grade IX-X and finance, banking and insurance at grades XI-XII. In addition to new subjects, new content were incorporated in the new curriculum. The new content were accumulated with climate change and people's responsibilities, adolescence and reproductive health, life skills related content, conservation of energy and energy security, use of instruments in medical diagnosis, and water resources including its multidimensional uses (NCTB 2012). Despite having many changes in curriculum structure over time, the study of Bangladesh and Global Studies was still relevant in its own right. Therefore, researcher selected the ICT-pedagogy integration process in BGS as study area at secondary schools which followed the NCTB curriculum.

2.1.2 Policy Perspective

The government of Bangladesh received some initiatives regarding ICT integration which had been reflected in different policies. Moreover, there were some very specific policies that focused ICT-pedagogy integration process in the country and had insights towards the current study. These policies were the key initiatives of positive change in policy and practice to make education sustainable and enjoyable for learners through technology. However, the primarily taken policy was conceptual in nature, later, the education system steps towards digitalization in the country.

The National Education Policy (2010) came up with a blueprint of integrating ICT in education, had been formulated to make a nation with human values who become leaders in societal change of Bangladesh. The policy aimed to work for a sustainable delivery system in education that was reliable, universal, well planned, scientifically sound and of high quality through reforming curriculum, pedagogy, and teacher's capacity building to ensure education for all. Despite having many aims and objectives in NEP-2010, spreading ICT education was one of the important aims whether ICT education itself or use of ICT in education was associated issue for classroom use. Similarly, the government showed efficiency in putting ICT into practice in the field of education whereas the NEP-2010 aimed to increase the use of ICT in educational process at all levels including primary, secondary, vocational and technical education, with higher education.

To achieve the aims and objectives of secondary education suggested in NEP-2010, the government had taken steps to study computer science along with mathematics and science. Moreover, the NEP-2010 suggested the integration of ICT as a tool of the classroom teaching-learning process in every sub-sector of education. The policy emphasized digital literacy and recommends ICT, Math and Science education through the integration of ICT. Thus, there were many steps to address ICT-friendly classroom in teaching Mathematics and Science. However, some challenges had been observed in the integration of ICT in BGS, including other subjects.

However, the **National ICT Policies** (NIP) were committed to ensuring equal opportunity to all citizens of Bangladesh in order to raise the economic status, possessed social equity, created educational opportunities and so on. The national ICT policy was first introduced in 2002, then was revised in 2009 and was again under revision as ICT Policy 2015. The NIP-2009 had been revised based on NIP-2002 but it exactly emphasized specific directions and guidelines requiring Digital Bangladesh. Digital Bangladesh put emphasis on contemporary issues including education, science and technology, infrastructural development, job creation, private sector advancement, agriculture, health and nutrition. All the policies were framed on the basis of Article-19 of the Constitution of the People's Republic of Bangladesh. Whereas, the vision of the NIP-2015 was expected to expand and diversify the use of ICTs to establish a transparent, responsive and accountable government as well as develop skilled human resource and so on.

Along with other objectives of the NIP-2009 and 2015, education and research were stated some issues which were: spread out the reach and quality of education all over the country using ICTs, ensure computer literacy at all levels of education and public service and facilitate innovation, creation of intellectual property and adoption of ICTs through appropriate research and development.

The common strategic themes under education and research of NIP-2009 and 2015 were embedded to encourage research and innovation in education with a short, medium and long-term vision to contribute to the achievement of national development goals. The policies aimed at developing the ICT professionals and meet gaps through training programs and adopt continuing education. It also planned to create an ICT Centre of Excellence with the requisite long-term financing to teach and undertake advanced ICT research. It wanted to increase ICT literacy across the country by including ICT courses in primary and secondary schools, as well as Technical and Vocational Education and Training (TVET) programs. The policies aimed to improve the quality teaching and learning activities, with a particular emphasis on mathematics, science, and English, as well as to increase the use of ICT tools at all levels of education. However, the other subjects including BGS also were required attention for quality and reach of education at all levels. The policies focused on Early Childhood Development Program (ECDP) including mass literacy and lifelong learning. It also emphasized ensuring people with disabilities and special needs who had access to education and research through the use of ICT equipment.

Conversely, the **NIP-2018** was overwhelmingly revised in light of the inauguration of 5G technology and the fourth industrial revolution (BSS, 2018). The policy aimed on different issues especially universal access to education, research and innovation, skill development and creating job opportunity, and increasing domestic ability to deal with impending technology revolutions.

The objectives against education, research and innovation in the NIP-20I8 stated that information and communication technology would be used effectively in education and research, promote innovative activities and offer incentives for their innovation to make a knowledge-based society by 2041. Regarding education, research and innovation, the policy incorporated ICT education courses from primary to all levels and all categories of education and repeatedly updated the courses. It received the initiative to use ICT at all levels for teaching-learning activities in education and updated the ICT syllabus in line with market needs and increased teamwork between educational institutions and ICT industries. It also focused ICT in specialized education and ensured effective use of ICT in educational administration.

Access to Information (A2I) under Prime Minister's Office (PMO) was an umbrella organization that provided the assistance in the development of the digital nation by delivering services at the citizen's doorsteps. Concurrently it worked together to make ICT-embedded education accessible throughout the country with Ministry of Education (MoE), Ministry of Primary and Mass Education (MoPME), Directorate of

Secondary and Higher Education (DSHE), and also with Directorate of Primary Education (DPE). A2I occupied with a three-pronged strategy to renovate the system of education in Bangladesh: i) launching Multimedia Classroom (MMC) in schools, ii) teacher training on teacher-led multimedia content and iii) providing electronic versions of textbooks for both primary and secondary school students including technical, vocational and madrasah institutions (Roy, 2013). Therefore, A2I received a number of ICT initiatives in education through capacity development of the teachers to bring a holistic change in the use of ICT in education. It collaborated with MoE for providing ICT equipment in classroom use. Moreover, A2I organized several training programs on making multimedia content on hard-to-grasp topics as well as establishing Teachers Portal, Muktopaath, e-Book, MMC dashboard for real-time monitoring to enhance the practice of ICT in education. A2I made effort to establish MMC creating the teaching-learning activities more effective, enjoyable, accessible and available for both students and teachers anyone-anywhere-anytime (Islam and Ferdosh, n.d.). However, the training on teacher-led multimedia content development was aspired to make teachers capable of developing and presenting the lesson in their classrooms. Moreover, the teacher-led multimedia content were introduced both in primary and secondary schools in order to involve the students in the learning process because the traditional classroom practice was considered insufficient for the progress of learners' learning.

The innovation of MMC in schools comprised of one laptop, one multimedia projector, sound system, teacher-led multimedia content as well as the Internet connection. Both the teachers and students were required to use the content during teaching-learning activities to participate in discussion to the learn content (Islam and Ferdosh, n.d.). MMC integrated ICT and the traditional teaching-learning process which was gradually changing the education system of Bangladesh, focusing interactive and engaging learning environment for students. However, the use of multimedia digital content in the classrooms undoubtedly improved the participation of students in classroom activities (Salam, 2016).

Teaching Quality Improvement in Secondary Education Project (TQI-SEP) was introduced a big step to enhance quality education through ICT intervention in secondary schools. The TQI-SEP, jointly funded by GoB with the support of the Asian Development Bank (ADB) and Canadian International Development Agency (CIDA) that supported the teachers enabling them to practice ICT in the classroom teaching-learning process. After the successful ending of the first phase, consequently, it was run in 2012 for the second phase named Teaching Quality Improvement-2 (TQI-II) in Secondary Education Project. Both the phases of the project were designed to assure high-quality initial teacher training, in-service teacher training, and training for teachers' ongoing professional development. Moreover, the projects intended to develop the classroom teaching-learning performance of teachers and students. Simultaneously, TQI-II arranged several training programs for different tiers of the educational administrator to monitor and supervise the classroom teaching-learning activities efficiently. Additionally, TQI-II intended to arrange Continuous Professional Development (CPD) for ICT, ICT follow-up, advanced ICT and e-learning material development training programs for teachers. It could be summarized that the ICT-based multimedia digital content training initially introduced by TQI-SEP was provided to almost all the teachers of secondary level (TQI-II, n.d.).

Concurrently, MoE published the ten yearlong **ICT in Education Master Plan (2012-2021)** in 2013. The attention of ICT in education master plan was intended to achieve the target of Education for All (EFA), development of education, skilled manpower, reducing the remaining discrimination of rural and urban schooling system, along with right use of ICT in Education. The plan was prepared on the basis of fundamental principles following the Article-17 whereas it stated that 'State shall adopt effective measures for establishing a uniform, mass-oriented and universal system of education…' (p-15).

The vision of the ICT in Education Master Plan was to prepare their learners to develop the capabilities and meet the challenges of 21st century skills. The skills might be achieved by ensuring efficiency, transparency, accountability and dynamism in education through the use of ICT. However, the ICT in education master plan (MoE, 2013) had seven objectives for the effective use of ICT in education. Those were as follows:

> Developing teaching-learning environment; developing professional ICT skills of teachers; improving standards of teaching-learning material; building up skilled human resource as per the needs of the present time; ensuring of transparency, accountability and efficiency in educational management; creating accessibility of education services at the doorsteps of the common people; and ensuring participation of persons connected in the education sector (p-2).

ICT in Education Master Plan described elaborately the guideline of implementation strategy and action plan about different education stages including pre-primary, primary, secondary and higher education, non-formal education, Madrasah education, technical and vocational education, along with educational administration of Bangladesh.

2.2 Existing Situation for ICT-Pedagogy Integration in Secondary Schools

Digital Bangladesh aspired that ICT integration in education transformed classrooms from traditional teacher-centric to student-centric for accelerating the collaborative learning process (MoE, 2013). Therefore, DSHE initiated multimedia classroom in secondary education as new innovation in education with the collaboration of A2I and MoE. The aim of setting multimedia classroom was to integrate ICT-pedagogy in classroom teaching-learning activities for enhancing students' motivation towards the lessons, making learning accessible, engaging, and joyful. It encouraged students positively to work together, express their opinions, solve problems, increase deeper understanding and construct knowledge for achieving quality education (MoE, 2013). Moreover, multimedia digital content, ICT and language labs, and promoting digital education through e-learning had been taken in accelerating the SDG4 accomplishment. Secondary and Higher Education Division (SHED) firmly believed that SDG4, otherwise known as Education 2030 agenda, would be achieved through the efficient uses of ICT with the spirit of Digital Bangladesh (SHED, 2020).

SHED with the help of DSHE established a total of 33285 multimedia classrooms and 2306 ICT labs while another 46340 multimedia classrooms were projected to establish in 31340 schools (SHED, 2020). In addition, 5200 madrasahs received at least one laptop, one multimedia projector with screen, one modem, and sound system for functioning the multimedia classrooms (MoE, 2019; ICT Division-2018; ADB, 2017). On the other hand, the government organized several training programs for secondary school teachers to ensure the effective use of ICT in classrooms. Till 2020, more than 3,50,000 teachers received training on preparing subject-based multimedia digital content and integrating ICT-pedagogy in classroom activities. The similar training were planned for another 3,50,000 teachers. Moreover, during Covid-19 GoB launched online teachers' training to enable them for taking online classes so that students could participate in classes (SHED, 2020). Overall, there were 2.1 million teachers engaged in the education system while 7.5 million students were benefitted from improved teaching-learning process in the classrooms (Rashid, 2019).

Additionally, there were 20,000 computer labs, 19 Digital Language Laboratories and 17 ICT mobile vans were launched; about 1,500 Computer Labs were established in non-government colleges. Initially (in 2019), the Computer Aided Learning (CAL) program was launched in 50 schools. In addition, the Korea International Cooperation Agency (KOICA) established Computer Labs in 100 institutions of Dhaka City for multipurpose use (Rashid, 2019). Similarly, BANBEIS established 125 Upazila ICT Training and Resource Center for Education (UITRCE) in the first stage (2018) with the help of KOICA for teachers training on ICT and ensured e-service in root level education institutions. In the second phase, 160 UITRCE establishments were in progress, where the rest of the Upazilas would be covered in the third phase. ICT-Learning Centers had been set up in 710 educational institutions, which could be used also acting as repositories of e-learning content. Moreover, 16 digital text books of class VI, e-manuals of 3 subjects (Physics, Chemistry and Bangladesh and Global Studies) and e-learning content of 6 subjects (English, Mathematics, Accounting, Physics, Chemistry and Biology) for Class IX-X had been developed. Simultaneously e-Learning modules had been developed for 6 subjects (Bangla, English, Mathematics, Science and Bangladesh and Global Studies) of class VII and VIII for students' betterment (SHED, 2020). The e-learning modules were underway in six subjects for students and teachers to use. Concurrently, in-service teacher training had been provided to teachers through different government organizations.

On the other hand, A2I organized a teachers' window named 'Teachers Portal' for digital content (blended of content, image, video, sound, or animation in PowerPoint presentation), sharing and vividly squeezing together with co-creation and access for high-quality multimedia teaching-learning material, peer-mentoring, self-paced learning through practice, peer-collaboration and motivation (ICT Division, 2018). Moreover, teachers were trained on using online platforms like Teachers Portal, Muktopaath, and other sites related to subject-based resources. They could make themselves enabled to browse, download, edit, and use the content according to their lessons. In addition, subject-based model content were prepared and distributed among teachers in a CD and flash drive as well as shared through online platforms. Therefore, the teachers were expected to integrate resources effectively in their teaching-learning activities irrespective of subjects. Although the initiatives were open for all subjects, this study intended to determine the level of ICT-pedagogy integration specifically in BGS.

Equally, an Online Dash Board was inaugurated in 2012 to ensure ICT integration in the classroom teaching-learning activities and to monitor the multimedia classroom activities effectively. The Mobile based Multi Media Classroom (MMC) App where teachers could upload their events with instant image, Global Positioning System (GPS) location and time which also could be used for real-time monitoring system to ensure quality class using multimedia. Simultaneously, online Performance Based Management (PBM) ensured accountability, monitoring and quality education (SHED, 2020).

Moreover, there were some organizations worked ICT in education i.e., BRAC, British Council, English in Action Save the Children. However, the BRAC initiatives were focusing more on secondary school classrooms (grade VI-X) teaching-learning process. They developed interactive multimedia educational digital content based on the national curriculum and focusing on the local context. BRAC aimed to improve the teaching quality and improve the learning of the students while making the classes more interesting and exciting for them. The followed key strategies were ensuring interactive and engaging learning environment for students to make concept clear of national curriculum and local context through student-centric classrooms. BRAC provided Computer Aided Learning (CAL) content with lively and attractive animations. The CAL content might enable teachers to use technology as an effective tool to make concepts and ideas visible and audible for learners which otherwise would have been difficult to comprehend (BRAC n.d.).

Similarly, the British Council was reputed for sharing knowledge and capacity building in schools. The British Council helped administer the ICT material in teaching through an online school program for improving the quality of teachers as well as the betterment of student learning. On the other hand, Development Research Network (D-Net) planned to bring the educational openings through Smart Class Room (SCR). D-Net made opportunities for using audio-visual and interactive learning resources through a personal computer, internet and educational CDs. The material worked as powerful teaching tools for teachers and students contributed positive experiences. All the activities were headed towards making efficient learners meet the 21st century challenges and creating an enjoyable classroom teaching-learning environment through ICT for building a better Bangladesh.

Although there were many initiatives taken to ICT integration in education in Bangladesh, there were a few studies to determine the actual classroom activities whereas this study focused the uses of ICT-pedagogy in BGS classroom instruction. Moreover, Covid-19 discoursed that the efforts were not enough to let participate all students in classrooms either online or physically by using technology due to unavailability of electronic devices, limited access to the internet, high cost of internet, low speed of internet (Dutta & Smita, 2020). Rahaman and Akter (2017) discoursed that less than half of the total rural schools were out of ICT and modern technology facilities. They elaborated that maximum teachers, ether primary or secondary schools had very basic knowledge on computer operation and there were lack of training on ICT or computer components. Sultana and Haque (2018) also revealed that the teachers' knowledge on ICT & their successful use in classroom were not satisfactory in higher education. Rahaman and Akter, (2017) found that most of rural teachers had lack of interest on ICT and felt complicated mater to use computer. However, the previous studies especially in Bangladesh focused the challenges either on teachers or institutional perspective while one of the major aims of this current study was to explore the existing ICT situation of school, teachers' ICT knowledge, skills and confidence, including academic and professional qualification. Therefore, this study would provide valuable insights about the present scenario of ICT status in schools, teachers' ICT knowledge, skills and confidence about using ICT-pedagogy in BGS.

2.3 Attitudes towards ICT-Pedagogy Integration

Teachers' attitudes had a significant positive relationship with ICT integration (Arkorful, Barfi, & Aboagye, 2021) and had significant predictor for their intention to use ICT in classrooms (Scherer & Teo, 2019). Yusuf and Balogun (2011) added that the positive attitudes of teachers were important factors to integrate technology in curriculum implementation process. Hence, the teachers' attitudes, their perception, competency and readiness for using ICT-pedagogy in classroom instruction were important factors in the context of Bangladesh. Many types of research had been identified which disclosed a correlation between teachers' attitudes and the practice of technology in classroom activities whereas researcher identified Technology Acceptance Model (Davis, 1989) to explain the attitudes of teachers towards ICT-pedagogy integration process and the challenges of integration process faced by school teachers. The model might helpful for further clarification and explaining the comfort integration process of newly innovated teaching tools in education. TAM dealt with perceived usefulness (PU) and perceived ease of use (PEOU) which aimed at attitudes and behavioral intention towards technology acceptance. Granić and Marangunić (2019) claimed that perceived ease of use and perceived usefulness had been proven to be antecedent factors affecting acceptance of learning with technology. In this study, the TAM model was used to find out the variables that affected teachers' attitudes towards ICT-pedagogy integration through perceived usefulness (PU), perceived ease of use (PEOU) and affective components (behavioral intention), which finally influenced the attitudes of ICT-pedagogy in classroom teaching-learning activities.

Alwahaishi & Snasel (2013) stated that “TAM sought to measure the willingness of people to accept and adopt new information technology innovations of that era, such as the electronic mail systems (Davis, 1989)”. TAM had been widely used by individual to measure the effectiveness of technology acceptance behavior which was one of the most influential theories to predict use and acceptance in contemporary information systems research (Ghavifekr & Rosdy, 2015). TAM focused on Perceived Usefulness and Perceived Ease of Use as two determinants that could explain the adoption process of technology in education. Davis (1989) used TRA as a theoretical basis in his TAM to make link between perceived usefulness and perceived ease of use with users' attitudes, and intentions as well as actual computer usage behavior. Ghavifekr and Rosdy (2015) revealed that perceived usefulness was the degree to which an individual trusts on the benefit from the use of a specific technology that would develop his or her job performance. Whereas, perceived ease of use represents the degree to which an innovation was felt comfort to use by users regarding technology integration in education.

Many researches had been found which revealed a strong relationship between teachers' attitudes and the degree of technology integration in teaching-learning accomplishments (Lal, 2014). The tendency of teachers who possessed positive attitudes, the degree of technology integration was very high in their teaching. Wong and Hanafi (2007) reported that the teachers were positive about using technology as well as incorporating ICT into teaching-learning activities. Kilinç, et al., (2016) & Hong, (2016) exposed that teachers had positive beliefs and attitudes toward technology use in teaching social studies and they would like to be updated about the use of technology.

In contrast, Hue and Jalil (2013) wanted to know whether there were any links between teachers' attitudes towards ICT integration into the curriculum and their ICT use in the classrooms. They demonstrated a little positive relationship between attitudes and lecturers' ICT practice in the classrooms. Although lecturers admitted the benefits of ICT integration in classrooms, it started slowly into teaching. Similarly, Al-zaidiyeen, Mei, and Fook (2010) disclosed that the level of ICT integration was lower in classroom teaching-learning activities despite having positive attitudes of teachers. The researchers concluded that there was a positive relationship between the level of ICT use and attitudes towards technology integration. Most researchers disclosed a positive relationship between teachers' attitudes and their level of integration in classroom instruction. They also claimed that the teachers who possessed encouraging attitudes, their level of ICT integration were high. However, the above discussion was comparable with the situation of Bangladesh secondary school classrooms. Thus, this study was needed to recognize the roadmap of involving teachers and their attitudes towards ICT-pedagogy integration in teaching BGS.

On the other hand, Semerci and Aydin (2018) conducted a study on examining high school teachers' attitudes towards ICT use in education where gender, age, teaching experience, ICT experience, ICT skills and ICT training were considered. The study exposed that the teachers possessed highly positive attitudes towards the uses of ICT in their classrooms and no noticeable difference was found in willingness among teachers. On the other hand, Mustafina (2016) studied the teachers' attitudes towards technology integration in secondary schools and found that self-confidence, knowledge, gender and age had potential influences in diverting teachers' attitudes towards technology. Researcher claimed that the success of the educational reformations were depended both on government efforts to supply ICT equipment and teachers' positive attitudes towards ICT integration. Finally, it was concluded that teachers' positive attitudes towards ICT use in the classrooms influenced students' academic motivation.

On the other hand, the teachers' motivation and perception towards ICT use undoubtedly helped integrating ICT successfully into the school curriculum. The positive perception of teachers permitted not only to use of ICT in teaching-learning procedures but also to stimulate the learner to acquire knowledge independently outside the classroom activities. Similarly, Copriady (2014) studied the teachers' willingness to use ICT in their classroom practice and identified that motivation worked as a significant mediator in ICT use. It helped teachers to be ready to use ICT in science and social science teaching-learning activities. Researchers established that there had a significant correlation between knowledge, skills and the usage of ICT with the attitudes towards ICT.

Mahdum, Hadriana, and Safriyanti (2019) investigated the perceptions and motivations of senior high school teachers towards ICT use in learning activities and found an encouraging relationship between the level of perception and motivation towards ICT adaptation. They concluded that the teachers were found with positive attitudes and feel interested in using ICT in learning activities. Mirzajani et al. (2016) also determined that self-confidence, skills, and knowledge were found as important motivating elements because the teachers who possessed more positive attitudes were motivated themselves to use technology in the classrooms. Therefore, ICT could be a factor in student academic achievement and motivation in the learning process (Harris, Al-Bataineh, & Al-Bataineh, 2016), especially in BGS classrooms (Arkorful, Barfi, & Enchill, 2020). Moreover, positive attitudes towards ICT proclaimed that the ICT knowledge, skills, experience, and confidence were encouraging factors for the successful use of ICT. Furthermore, new innovations required more motivation of its users for the prompt and successful integration process, especially in education.

However, teachers were found irregular in ICT use for classroom teaching-learning activities, despite having awareness about the importance of ICT integration (Gámez & Fernández, 2020). The evidence urged that the teachers required encouraging for improving their attitudes towards the use of ICT. Hermans et al. (2008) explained differently that teachers' beliefs had a key role in explaining why they decided to use computers in the classrooms. Conversely, teachers were habituated to integrate ICT in usual rather than unusual subject matter and it was usually found that ICT integration was lower in BGS than other subjects, i.e., science, English Language Teaching (ELT). Motivation could play a significant role in teaching BGS with ICT material because the nature of this subject was immaterial or abstract. O'Grady (2007) found that the newly qualified primary teachers were motivated to integrate ICT in school into their daily work. In another study done by Young (2016) confirmed that the teachers possessed positive attitudes towards technology and they were enthusiastic concerning the role of ICT in improving students' learning and making the subject matter more interesting and understandable. Therefore, it was required to know how the inspiration helped teachers to use ICT tools in teaching-learning BGS classrooms.

Several types of training programs had been initiated by GoB in order to make teachers habituated to apply the acquired new ICT knowledge and skills in classroom teaching-learning activities. Similarly, teachers made them competent and minimized their anxiety regarding the use of ICT tools because the integration process of ICT in teaching-learning practices depended on teachers' attitudes and their training in the technology (Alrasheedi, 2009). Some other studies revealed that training on ICT had appeared as a significant factor affecting component in teachers' attitudes towards ICT use in classroom practice. Bozdogan and Ozen (2014) claimed that teacher training had been found to be a strong factor for making confidence in ICT self-efficacy in classroom practice.

Moreover, Tasir et al. (2012) studied the relations among teachers' ICT competency, the level of confidence in practicing ICT and the satisfaction of teachers on ICT training programs. Researchers discoursed that the teachers had much ICT capability which was found a moderate correlation between teachers' confidence level in using ICT in terms of satisfaction towards training program. Kilinç et al. (2016) claimed that teachers, who participated in in-service training courses on technology and teaching material courses in social studies, possessed more positive attitudes than others. On the other hand, Semerci and Aydin (2018) had not found any visible difference between teachers' use of ICT and ICT training. Wario (2014) also claimed that there was no significant relation between computer training and level of ICT practice in classroom activities. Therefore, this study intended to explore whether there were any significant differences continued regarding teachers' attitudes by training in Bangladesh. Moreover, it was needed to be recognized the importance of ICT training because of its pedagogic use in classroom activities. Furthermore, the current study aimed to identify the teachers' attitudes, perceived usefulness, perceived ease of use and affective components in the perspective of Bangladesh. On the other hand, the different perspectives and conditions might have different results as well as significant effects on the integration process of new innovation in education.

Additionally, many teachers could use ICT in diverse ways of the teaching-learning process but there was a question outstretched regarding the current practice of secondary school BGS teachers' awareness about the possibilities of ICT use and how they involved with the process. The findings of this study might provide a better understanding of teachers' attitudes towards ICT-pedagogy integration process and could make a firm foundation for advancing ICT-pedagogy integration process in BGS classroom activities.

2.3.1 Attitudes and Perceived Usefulness

Different studies were identified where researchers tried to connect with teachers' perception on pedagogic usage of ICT and their possibilities in classroom practice. However, Ali (2018) intended to stipulate a better understanding of how ICT affected pedagogy as well as practice in teaching. The findings disclosed that the maximum of teachers' perception was positive about the possibility of ICT use in the classrooms. At the same time, Pandey (2017) illustrated that utilization of ICT was very much essential for education that made learning enjoyable. In the same way, Anandan and Gopal (2011) revealed that educators exhibited enormous positive impressions of using ICT in classroom instruction.

Teachers' positive attitudes could help them to plan and prepare lessons as well as conduct the teaching-learning activities more effectively and efficiently by using ICT. Additionally, the efficient use of ICT material in teaching supported teachers to become multi facilitators in their lessons while students acquired an opportunity to flourish their creativity. Furthermore, students with learning disabilities could be strongly benefited from ICT-pedagogy integration which assisted them in enlightening their self-confidence and facilitating their acquisition of useful life skills (Sbai et al., 2018; Tas & Arthur, 2010). In contrast, the use of ICT material in classroom made teachers more curiously, responsible, and informed about the employment of ICT in teaching. However, the success of newly integrated technology in education depended largely upon the support and attitudes of teachers who were involved in the process. In this context, Teo (2008) claimed that the interactive use of ICT in the curriculum depended on teachers' attitudes, perceived usefulness, and ease of use.

2.3.2 Attitudes and Perceived Ease of Use

Positive attitudes, usefulness, ease access, skills, experiences of computer use, and confidence were the critical components for integrating technology in teaching-learning process (Wang, 2007). The listed components made teachers more comfortable with more confidence for using ICT-pedagogy in teaching-learning activities. Moreover, Aslan and Zhu (2016) claimed that the teachers' attitudes towards technology were positive while perceived competency predicted their ICT use in teaching practice. ICT skills and experiences with ICT self-efficacy and confidence were also correlated with positive attitudes in different ways and different levels because the ICT skills help teachers to make self-confidence about using new innovation in education. Wijnen et al. (2021) revealed that increased self-efficacy had a positive impact on teachers' intended or actual use of technology. Çetin & Işçi (2022) and showed that there was a positive, moderately significant relationship between social studies teachers' ICT competencies and their ICT literacy self-efficacy levels. Thus, to comprehend the characteristics of new user and their confidence in ICT skills, the findings of the following studies might provide positive insights about the possible steps towards ICT-pedagogy integration in schools.

Teo (2008) revealed that positive attitudes, length of computer use, and level of computer confidence were certainly correlated and acted as significant factors considering attitudes towards ICT integration. Furthermore, there was a significant relationship between gender, teaching experience, ICT experience, ICT skills, and ICT training and teachers' readiness to use ICT (Copriady, 2014). Additionally, Cavas et al. (2009) claimed that the attitudes of teachers differed regarding computer ownership at home, and their computer experience. In contrast, Wario (2014) claimed that the teaching experience in years had no significant effect on ICT integration in teaching practice.

It could be stated that the attitudes of teachers towards ICT were highly positive if they had prior experience with computer and internet use. Lal (2014) claimed that the teachers showed significantly better positive attitudes compared to ICT non-user teachers, although both of the teachers demonstrated positive attitudes towards ICT. Moreover, Varol (2013) claimed that the teachers' ICT engagement predicted their attitudes towards technology and self-confidence for teaching with ICT tools. Similarly, teachers' computer skills and experiences were precisely essential for the effective usage of ICT whereas Crittenden (2009) claimed that the years of ICT use in classroom instruction were not found significantly related with ICT integration. However, whether the social science teachers and their experiences had any effect in ICT-pedagogy integration in teaching BGS, was considering issue for effective integration process of ICT-pedagogy in BGS classrooms.

Concurrently, Wario (2014) claimed that technology skills were found as the single most important component which affected ICT use in the classrooms. Yusuf and Balogun (2011) examined the competence and attitudes of student-teachers towards information and communication technology while the participants of the study demonstrated positive attitudes towards the use of ICT and they exposed competent themselves in use of few basic ICT tools. They concluded that the student-teachers were far behind from the required competence for the full integration of ICT in the curriculum. Equally, Alemu (2015) reported that both the teachers and learners possessed confident attitudes towards technology and they had sufficient acquaintance and positive understanding of technology and its potentiality in teaching-learning activities.

On the other hand, the anxiety towards new innovation was always a matter of concern though it was related to ICT skills, experience and level of confidence. In contrast, the teachers with more experience comparatively faced lower anxiety to use ICT tools and it was completely correlated with the ICT integration techniques. Semerci and Aydin (2018) also revealed that teachers' ICT experience, ICT skills, and ICT training had significant impacts on their negative attitudes toward ICT use in education. In the same way, Gopal (2012) aimed to measure the influence of teaching attitudes and anxiety about the application of ICT in classroom activities. The researcher found important variations between the level of utilization of ICT, teaching attitudes and anxiety among the teacher educators. Furthermore, there was a significant relationship between the level of utilization of ICT with teaching attitudes, utilization of ICT with anxiety among the teacher educators at a high moderate and low level of teaching attitudes and anxiety. Similarly, Attis (2014) discovered the necessity of accomplishing e-learning acceptance because teachers were required to either acquire or enter the profession with experience and a need for teacher training to minimize computer anxiety. On the other hand, Wario (2014) did not find any notable correlation between computer anxiety and attitudes towards practicing technology and ICT integration.

Therefore, it could be said that different studies identified different views. Somewhere, it found either significant relationship or difference with skills and experience regarding their practice of ICT in teaching. However, most of the researchers exposed that the ICT skills, experience and self-efficacy were positively correlated with the usage of ICT in teaching-learning activities. It also helped to minimize the computer anxiety of teachers, especially in classroom use. In contrast, it was found that the teachers lacked the required competencies in ICT integration. Hence, the above discussion guided the current study to differentiate whether there were any variances continuing between ICT use in terms of teachers' ICT skills, experience and self-efficacy. Moreover, this study analysed the situation of teachers' competencies, their access to ICT material and contributes to analyzing the usefulness including the necessity of ICT-pedagogy integration in teaching-learning BGS.

2.3.3 Attitudes and Affective Components

ICT-pedagogy integration in classroom was connected with attitudes and requirements of teachers towards technology integration, their age, gender, leadership role, institutional support and also curriculum structure. Drossel, Eickelmann, and Gerick (2017) focused on knowing whether the schools' features, teachers' attitudes, their relationship and contextual features determined secondary school teachers' rate of recurrence of technology use in classes. They concluded that teachers' attitudes had the most important effect on the degree of technology use. Moreover, ICT self-efficacy on utilizing it in the classroom had been identified as a strong predictor. Therefore, the usage of new technology for teaching-learning practices was an essential aspect of school and teaching process for teachers. The comparative study of developed countries regarding ICT-pedagogy integration helped to understand the integration process of developing countries and worked as a guiding principle to integrate new ICT tools in education, especially for BGS classrooms.

On the other hand, teachers' age was another factor for ICT-pedagogy integration in classrooms. It had been generalized that the younger teachers were aware more, used ICT confidently and spent comparatively more time with technology in their daily life as well as teaching compared to older. More attachment with technology helped to possess more attitudes towards ICT-pedagogy integration in classrooms. Elsaadani (2013) revealed that there was a moderate but positive correlation between participants' age and their attitudes towards ICT integration in classroom instruction. Mwila (2018) also argued that there were relationships between age and attitudes towards the integration of ICT. Conversely, Mustafina (2016) revealed that there was no influence found in respect of age and gender despite having positive attitudes towards ICT use in classroom activities whereas Tou et al. (2019) revealed that the attitudes towards ICT integration in teaching significantly differed among teachers of different gender, age, and teaching experience.

Conversely, Mwila (2018) exposed that both male and female teachers were positive towards the integration of ICT in the classrooms. Male teachers demonstrated significantly more confidence in practicing ICT as teaching tools than their female counterparts (Proctor et al., 2006). Equally, Alrasheedi (2009) showed that male teachers' attitudes were slightly positive than the female teachers. The researcher argued that training might play an important role in affecting the male teachers' attitudes towards ICT but had even a greater effect on female teachers' ICT use. Concurrently, Alaugab (2007) studied female faculty and found that female faculty and students exposed positive attitudes towards online instruction. At the same time, Wong and Hanafi (2007); Cavas et al. (2009), Yusuf and Balogun (2011); Birwal (2017); Ahmed, Qasem, & Pawar (2020) disclosed that there was no significant disparity found regarding the attitudes of female or male teachers towards information technology.

Then again, Guoyuan et al. (2009) and Lal (2014) highlighted that teachers' subject domain and their gender affected traditional educational beliefs. Chowdhury (2009) observed significant differences across gender, discipline, technology experience and teaching experience with the use of ICT in the classrooms. Additionally, a significant inverse relationship had been found between beliefs about ICT integration and practice in the classrooms. In the societal context of Bangladesh, the female teachers faced different types of family affairs compared to male teachers and then they needed to concentrate on teaching. Although it was a general myth that their acceptability was comparatively more in school teaching, it had importance to identify whether there was any difference in teachers' attitudes differed by gender variations regarding ICT-pedagogy integration. The above discussion made a way to understand the differences between male and female teachers' attitudes in teaching BGS and what steps should be needed for implementing ICT-pedagogy integration in BGS classrooms.

On the other hand, Afshari et al. (2012) analyzed to disclose whether the computer proficiency, level of computer use, and professional development activities of principals influenced their role in ICT deployment in schools. The findings demonstrated the connections among measured variables like transformational leadership, technology experience, technology use and professional development. There were positive relationships found between computer use and computer competency that indirectly influenced the transformational leadership role of principals in the implementation process of ICT in schools. Thus, it was needed to explore the BGS teachers' attitudes towards ICT-pedagogy integration because they had responsibility to demonstrate a clear conception about the history, culture, heritage, and the people of Bangladesh.

There were some studies found which exposed the inverse results regarding computer attitudes. Sultana and Haque (2018) found in their study that the teachers' possessed negative attitudes towards computer use in their classroom activities though the students were found very much interested in ICT integrated classrooms. On the other hand, Oni, Haruna, and Amugo, (2017) confirmed that ICT was not employed as pedagogy for teaching by the majority teachers in the secondary schools while they possessed negative attitudes towards the use of ICT. Additionally, Malcolm-Bell (2009) concluded the level of technology integration in teaching was low in schools. Even the university teachers were not found with frequent use of ICT in their classrooms (Gámez & Fernández, 2020).

Despite having different interventions in ICT-pedagogy integration in schools, the results of researches discovered that ICT-pedagogy integration had not been reached a desired level in secondary schools in Bangladesh (Babu & Nath, 2017; Haque & Kashem, 2014; Rahman, et al. (2012). Additionally, the process of ICT-pedagogy integration had been going more slowly than expectations in Bangladesh due to some challenges i.e lack of teachers' confidence in using the multimedia content, uninterrupted electricity and internet connectivity (Babu & Nath, 2017). Conversely, effective ICT-pedagogy integration required teachers' attitudes, their beliefs, ICT skills and experience with friendly ICT supported classrooms. There were lots of studies found attitudes and technology integration all over world (Wijnen et al., 2021; Çetin & Işçi, 2022; Semerci & Aydin, 2018). Many studies also had been found in Bangladesh but the nature of current study was differed from these (Sultana & Haque, 2018; Nafiu, 2017; Mahmuda, 2016). Most of the studies focused on technology integration in tertiary education but the nature and characteristics were different from secondary schools. Moreover, the earlier researchers had not yet disclosed clearly the question of how secondary school BGS teachers' attitudes toward

ICT in perspective of Bangladesh. This means that further research was needed in order to shed light on the reasons for the stagnation of technology integration process in Bangladesh. Specifically this current study had taken efforts to explore teachers' attitudes from different aspects to identify the international view of teachers towards ICT-pedagogy integration in BGS classrooms. However, the literature disclosed that the teachers' attitudes were differed either subject or location, gender, level of education, developed or developing countries etc. On the other hand, very little literatures were found which reflected BGS classroom teachers' attitudes towards ICT-pedagogy practices in teaching-learning activities. Conversely, the current study intended to provide understandings about teachers' attitudes in different extents and different situations (limited ICT material, insufficient infrastructures, teachers' ICT skills and competency, self-confidence including teachers' teaching subject). Therefore, the above discussion offered a clear avenue to study the attitudes of teachers towards ICT-pedagogy integration process in BGS classrooms.

2.4 The Practice of ICT-Pedagogy in BGS Classrooms

The teachers' positive attitudes towards the integration of new innovation in education and ICT-pedagogy integration in classroom were significantly correlated with each other. The correlations increased interest among teachers on one side as well as emphasized the implementation process as a whole on another side. Similarly, the proper integration of ICT-pedagogy made learning more stimulating and enjoyable that built curiosity among students to their learning. On the other hand, the rapid changes of technology and its opportunities in education required the integration of ICT for creating student-centric learning activities. Additionally, Jha (2017) claimed that the use of ICT-pedagogy in education developed an understanding with more accuracy, made lively interaction for effective learning and made collaboration between students and teachers cognitively and affectively. Moreover, Shulman (1986) added that a flourishing teacher should concern about four extensive knowledge which was general pedagogical knowledge; content knowledge (CK); pedagogical content knowledge (PCK); and curricular knowledge.

2.4.1 Content Knowledge and ICT-pedagogy Integration

Teachers' content knowledge referred to their understanding of the subject matter to be learned or taught (Santos & Castro, 2021; Ball, Thames, & Phelps, 2008) in pedagogical approach. It was needed for successful ICT-pedagogy integration in classroom to present the content knowledge pedagogically sound. According to Ball, Thames, and Phelps (2008) "pedagogical content knowledge referred to a wide range of aspects of subject matter knowledge and aspects of the teaching of subject matter". In relation to the views of Jang, Guna, and Hsieh (2009), teachers could enrich their subject knowledge by means of (a) self-study, using different reference books in academic fields, related research journals, the printed and electronic media; (b) attending conferences and workshops; (c) having discussions with colleagues or resource persons; and (d) through classroom teaching and the like (cited in Zinnah & Osman, 2013). As Shulman (1986) noted, this knowledge would include knowledge of concepts, theories, ideas, organizational frameworks, knowledge of evidence and proof within a particular subject matter. It might cover the field's best exercise and well-known approaches to interact this evidence with learners. Researchers suggested that teachers needed to acquire the subject knowledge they taught, which was a body of information, made up of facts, theories, principles, concepts, and language, as well as the right pedagogy for teaching it (UNESCO, n.d).

Moreover, Putman (2021) claimed that the teachers were required to know the content knowledge for the betterment of teaching-learning activities, although many teachers entered into class without a solid understanding of the topics, they would be required to teach. Similarly, Shulman (1987) revealed that to teach all students according to today's standards, teachers needed to understand subject matter deeply and flexibly so they could help students creating useful cognitive maps, relating one idea to another and addressing misconceptions. Researcher also added that teachers needed to see how ideas connected across fields and to everyday life (Shulman, 1987). This kind of understanding provided a foundation for pedagogical content knowledge that enabled teachers to make ideas accessible to others. However, this study addressed whether the teachers' content knowledge and its relevant analysis, explanation and discussion were gone through ICT-pedagogy integration in teaching BGS for students' understanding.

2.4.2 Pedagogical Use of Technology

Pedagogy referred to the interactions between teachers, students, and the learning environment and the learning tasks (Santos & Castro, 2021). However, the pedagogical use of technology in teaching helped to understand the concepts easily. The use of pedagogical knowledge in teaching made students motivated and change into creative as well as constructive learners. On the other hand, teachers prepared themselves more confidently about the pedagogic use of ICT in classroom teaching where they could deliver the content knowledge properly (Martinovic, Kolikant, & Milner-Bolotin, 2019). Bandyopadhyay (2013) intended to identify the relationship between technology with pedagogy and concluded that technology integration in education was a complex process. However, the integration process depended on the capacity to use ICT effectively by teachers in classroom teaching that could bring out the best solution for students improving their understanding (Santos & Castro, 2021). In contrast, the prevailing policy environment, teachers' personal appearances, the school condition and the offered innovation acted as a catalyst of technology integration. Bandyopadhyay (2013) also disclosed that both male and female teachers exposed very similar pedagogical techniques and there was no significant variations were found in the pedagogical practices of teachers regarding gender. Conversely, Mary (2002) wanted to know the pedagogical practices of ICT in secondary school classrooms and identified a small gap in content knowledge considering the pedagogical content knowledge, subject-specific aspects of general pedagogical knowledge and knowledge of learners and curriculum knowledge.

On the other hand, Ndibalema (2014) identified the teachers' attitudes as well as their practices of ICT as a pedagogical tool in the classrooms. The researcher claimed that teachers did not integrate ICT as a pedagogical tool in their instruction efficiently despite having positive attitudes. Similarly, Oni, Haruna and Amugo, (2017) intended to examine the level of ICT use as pedagogy and whether the possessed attitudes and perceptions by teachers regarding ICT use in teaching-learning. They concluded that ICT tools were not employed as pedagogy for teaching by the majority of the teachers in the secondary schools. Simultaneously, Rafeedali (2009) studied computer-based technology and its pedagogical utility in teaching-learning activities. The researcher highlighted that the teachers from higher secondary schools were unable to utilize the pedagogical benefits from the resources of ICT rather than they followed the traditional teaching methods into classrooms.

In addition, the GoB recently introduced PowerPoint-based multimedia digital content in different subjects, including BGS, for making teaching-learning enjoyable. However, the success of multimedia digital content was contingent on teachers' skill, attitudes and capability of using it in classroom situations. Thus, it was needed to identify how effectively teachers would integrate ICT-pedagogy in teaching BGS for more involvement of learners in lessons. On the other hand, ICT-pedagogy integration required the availability of technological support in the classrooms. In contrast, Young (2016) asserted that the appropriate support made teachers' positive attitudes towards creating new ICT-enhanced pedagogies and relevant ICT skills. Rafeedali (2009) claimed that very few teachers used PowerPoint presentations in classroom instruction. However, the diversified use of technology in classroom activities had significant insights into current studies as it focused on the practice of ICT-pedagogy integration in BGS classroom practices. Moreover, this study planned whether the BGS teachers extended their practice of ICT material in pedagogic line which was a contemporary issue for ICT-pedagogy integration in secondary school classrooms.

Then again, the success of ICT-pedagogy integration in classrooms required the competence to use ICT material following students' curiosity and their participation in classroom activities. There was a correlation between the practice of ICT-pedagogy into classroom teaching-learning process with attitudes, access, experience, skills, confidence and awareness towards ICT that might truly affect students' learning. Harmoniously, Alemu (2015) found a positive relationship between the practitioners' stages of concern and stages of adoption. At the same time, Mallick and Anam (2020) disclosed that teachers positively adopted ICT material and successfully used them to make secondary school science teaching-learning effective in Bangladesh. Gámez and Fernández (2020) intended to study different factors that could predict the attitudes towards ICT integration. Despite having awareness about the importance of using ICT in all areas of university education, still, teachers irregularly used it in their classroom practice. They needed to be motivated and ought to increase their attitudes towards the practice of ICT in teaching-learning procedures. Moreover, the researchers disclosed that the attitudes were associated with age, participation in projects, gender and teaching in face-to-face and/or online universities.

Mirzajani et al. (2016) studied the teachers' acceptance of ICT and its use in the classrooms to identify the factors that affected teachers' motivation to practice ICT in classroom teaching-learning instruction. Researchers disclosed that acceptable support from administrators, advices to teachers of practicing ICT, ICT knowledge and adequate resources had been treated as influential factors to usage ICT in teaching although the teachers had self-confidence, possessed positive attitudes and were motivated themselves to practice technology in the classrooms. Similarly, Aslan and Zhu (2016) found that the teachers' attitudes were significantly depended on perceived competency in technology integration, perceived ICT competence, computer anxiety, and pedagogical knowledge.

The different literatures disclosed diversified practice of ICT-pedagogy in the classrooms in terms of different environments, condition and school location. Khan, Hadi and Ashraf (2013) aimed to recognize the influences of ICT in teaching focusing on the rural primary and secondary schools in Bangladesh. They disclosed that the use of ICT in teaching helped the learning process of students. The rural students were much appreciated in accepting ICT and internet for learning purpose and made them to catch up with the global world. Concurrently, Malcolm-Bell (2009) explored the status of technology integration in rural primary and secondary schools in Jamaica. The researcher also focused on determining whether and how technological innovations were being used in teaching-learning. The results disclosed that the level of technology integration was low in rural primary schools whereas Tou et al., (2019) claimed that there was no significant difference found in attitudes towards ICT integration among teachers of different school levels.

Positive attitudes towards ICT-pedagogy integration was depended not only teachers' attitudes or perception, perceived usefulness, perceived ease of use but also influenced by other societal issues. Despite having huge disparities in culture, educational systems, and even teachers in different schools, Shameem (2016) argued that cultural conceptions of technology and autonomy were important variables influencing teachers' attitudes towards ICT integration. Wario (2014) also claimed a moderate correlation between the cultural perception and ICT integration. The availability of ICT resources in schools or homes (Wario, 2014), geographical locations (Guoyuan et al., 2009), demographic variables (Gopal, 2012) were treated as a mediator towards positive attitudes to using it in the classroom activities.

2.4.3 Integration of ICT-Pedagogy and Content Knowledge

Technological Pedagogy Content Knowledge (TPACK) could explain the set of knowledge that teachers might need to teach their students, to teach effectively, and to use technology (Santos & Castro, 2021). However, the student-centric pedagogical beliefs of teachers and their technology values were significantly correlated with TPACK (Lai & Lin, 2018). Researchers explained the relationship between student-centric pedagogical beliefs of teachers and their technology values with technological pedagogical content knowledge (TPACK). They revealed that the teachers with lower student-centric pedagogical beliefs believed the use of ICT tools could motivate students and helped them understand concepts along with innovative teaching practices. Researchers concluded that teachers' beliefs were complex concerning the ICT-pedagogy integration process. Teachers possessed different levels of pedagogical and value beliefs that could affect their TPACK. Similarly, Sarah (2017) stated that teachers' pedagogical beliefs and practices about the use of technologies were correlated with each other. Concurrently, Andyani et al. (2020) revealed that technological pedagogical content knowledge inspired of using ICT in pedagogy but it had no effect on teachers' self-efficacy.

Teachers' pedagogical beliefs and their positive thinking about technology usage were correlated with the ICT-pedagogy integration process in classroom instruction (Tondeur, et al., 2017; Tondeur, et al., 2020). Guoyuan et al. (2009) stated that the successful integration of ICT in classroom was positively linked to the thinking process like teachers' beliefs, their efficacies and attitudes towards ICT. Additionally, Sarah (2017) provided precious insights in connection between the pedagogical beliefs of teachers and their practices of ICT tools because teachers changed their attitudes apart from previous and used to practice during the implementation process of ICT in the classrooms. Furthermore, Ertmer, Tondeur, and Leftwich (2016) disclosed a positive correlation between teachers' pedagogical beliefs and their usage of digital technology. Researchers argued that the ICT integration was not an isolated goal to be achieved separately from pedagogical goals but simply the means by which students engaged in relevant and meaningful work.

Cubeles and Riu (2018) revealed that the previous academic experience of the teacher was a significant mediator to apply the TPACK model. There was a positive consequence of constructivist beliefs on the classroom use of computers regarding the impact of computer experience, general computer attitudes and gender (Hermans et al., 2008). In contrast, they found that the traditional beliefs had a negative impact on the integrated classroom use of computers. Burke et al. (2018) aimed to explore the relationship between characteristics of the teacher and their use of educational technology. The teachers' characteristics were also studied, addressing pedagogical beliefs, their level of concerns about the use of technology, their access to technology, and the level of schooling at which they taught. Furthermore, they argued that the teachers, who believed in constructivist pedagogical views, were significantly more likely to use ICT than teachers who transmitted pedagogical beliefs. However, the strongest determinant of usage was whether the ICT was quickly accessible or not.

On the other hand, professional development made teachers acquainted with new technology in education because it helped to build teachers as confident users of new innovation (Bailey, 2019). From the professional development courses, teachers came to know about the use of new ICT equipment and received experiences on how to use new innovations in education. Moreover, they could frequently ask, participate in discussions and avail themselves the opportunity of thinking about new innovations. They could prepare themselves and could achieve competencies on the integration process as well as decided their suitable strategies about to pedagogical use of technology in their classrooms. Moreover, they could prolong their subject knowledge through the pedagogical use of ICT which encouraged students to clear the lesson.

Mierzejewski (2009) explored that most teachers were used to integrating technology regularly in teaching-learning activities while researcher declared that higher levels of technology integration required more professional development for teachers. Chowdhury (2012) also investigated whether the teacher educators used ICT as teaching tools on teacher education programs in Bangladesh and exposed that teacher educator used ICT as an instructional instrument, a medium of education and a means of knowledge construction. The researcher explained although the curriculum prescribed some limited understandings and approaches of teaching with ICT, the educators possessed a significant understanding of the pedagogic use of ICT and could donate more than the curriculum allowed the educators.

Moreover, TPACK consisted of Technological Knowledge, Pedagogical Knowledge and Content Knowledge given by Koehler and Mishra (2005) who explored TPACK “as a way of representing what teachers needed to know about technology, and argued for the role of authentic design-based activities in the development of this knowledge". While, content knowledge referred to the subject matter that needed to be learned or taught (Koehler & Mishra, 2009) and pedagogical knowledge made a teacher skilled in the teaching arena with required strategies whether s/he could successfully use in the classrooms for instructional purposes. On the other hand, the ICT skills further helped teachers to manage a classroom collaboratively and interactively. In other words, TPACK was considered as a theory of knowledge in action because it was originated from pedagogical content knowledge (PCK) and the capabilities could be infused into teacher curriculum to support teaching and learning (Tondeur et al., 2017). Koehler and Mishra (2009) also stated three core components of good teaching with technology: content, pedagogy, and technology, and the relationships among and between them. They also explained that the interactions between and among the three components, which played out differently in different circumstances, account for the wide range of educational technology integration extent and quality. In this study, integration of ICT-pedagogy was incredibly relevant with TPACK framework that could explain the map for understanding how to use ICT-pedagogy into the classrooms efficiently. Employment of TPACK in the classrooms still needed to be given focus for successful delivery of lessons (Santos & Castro, 2021). This learning from TPACK could explain exactly the use of ICT-pedagogy in teaching BGS at secondary school classrooms.

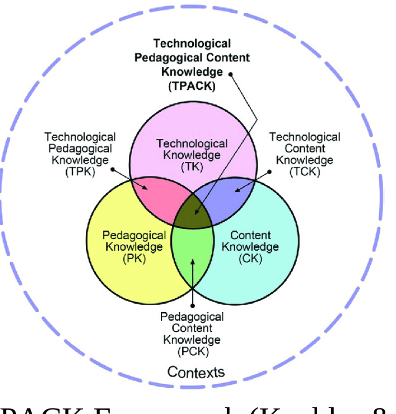


Figure-2.1: The TPACK Framework (Koehler & Mishra, 2009)

Therefore, this was an influential theoretical framework that indicated the incorporation of technology in education to make sensible and creative choice focused on the content and how to use in teaching (Baran, Chuang, & Thompson, 2011). The TPACK framework emphasized the competency of teachers whether they accumulated their understanding of content, pedagogy, and technology with one another to produce effective teaching (Koehler, et al., 2014). TPACK suggested about required knowledge that teachers might be able to use technology into their teaching and how they might improve this knowledge (Baran, Chuang & Thompson, 2011). Mishra and Koehler (2006) added that the TPACK framework offered a productive approach to many of the dilemmas that teachers faced during incorporating ICT in their classrooms.

Cubeles and Riu (2018) explained that TPACK model could use widely to explain the knowledge that teachers needed to integrate technology into teaching. They added that the efficient use of technology in teaching-learning activities was closely influenced by the content that was difficult to differentiate technology from contexts. Therefore, the TPACK framework directed in this study to explain the integration process of ICT-pedagogy in classroom practice that depended on the attitudes of teachers, involved in the teaching-learning activities. It also might help to explore the challenges regarding ICT-pedagogy integration process in BGS classrooms those were met by teachers. The above discussion also helped to understand the degree of using ICT-pedagogy in classroom activities focusing constructivism theory of learning.

2.4.4 ICT-Pedagogy Integration by Discipline

Teachers' attitudes and confidence as well as the practice of ICT in classroom instruction were differed by their diversified disciplines. Although most researchers identified positive attitudes, there were variances found regarding their teaching subjects. Pandey (2017) argued that teachers were required to know the use of ICT in their subject areas to help learning more effectively for learners. Teo (2008) exposed significant differences among different subject areas by computer attitudes. Similarly, teachers' positive attitudes were differed by their disciplines (Crittenden, 2009).

Crittenden (2009) studied the attitudes and perceived levels of self-efficacy towards ICT of career and technical educators of Agriculture, Applied Health and Business Technology. The educators in each of the three disciplines possessed positive attitudes towards ICT, along with a high perceived level of self-efficacy in spite of having significant differences between the studied disciplines. The educators from Business and Technology education showed significantly more positive and higher attitudes and perceived levels of self-efficacy towards ICT than those educators taught Agriculture or Applied Health respectively. Furthermore, the study concluded that the educators who had an advanced degree displayed a more positive attitudes and a greater level of perceived self-efficacy towards ICT.

Although there were many initiatives for improving ICT-pedagogy in classroom teaching, several challenges still needed to be addressed carefully when ICT was employed for BGS teaching-learning purposes. However, Banu (2006) studied the role of information technology in social science classrooms at secondary schools in Bangladesh and expected that the teachers' roles should be facilitators or mentors in classrooms. Simultaneously, teachers were required to carefully plan for selecting and using ICT-pedagogy in classroom corresponding social science curriculum.

Herrera et al. (2018) focused on secondary history teachers' teaching conceptions which were studied as a precursor to how they utilized computer technology in the classrooms. Researchers observed some specific patterns among educational uses of

ICT equipment in relation to teaching conceptions in terms of time allocation and the manner of teacher technology use, and less sharply defined patterns had been noticed in student technology use and teacher-student technology interactions. This argument might help to explore how ICT-pedagogy was used in BGS classrooms by social science teachers in secondary schools.

Equally, Hero (2019) studied the impact of technology integration in teaching performance and claimed that social studies teachers integrated technology in teaching with confidence about their teaching capabilities. They exposed talent on teaching with technology inside the classrooms. Thus, technology integration in teaching had a combined important effect on the teaching performance of social studies teachers. Additionally, efficiency and professional practice were observed as important predictors of technology integration in social studies classrooms.

In the context of Bangladesh, Mannan, Rahman, and Khan (2014) pursued science teachers' perception towards the use of ICT in teaching at the secondary level. Researchers aimed to explore whether the science teachers were ready to accept or reject ICT integration in classroom instruction. The teachers possessed positive attitudes towards teaching with ICT and also felt happy about the usefulness of ICT tools in classroom use. In addition, Obaydullah and Rahim (2019) explored primary school teachers' views about the barriers and challenges stopping them from the integration of ICT-pedagogy in primary science classrooms. The study found that the teachers were not yet prepared to practice ICTs in their classrooms. They faced a number of difficulties, i.e., lack of infrastructures, shortage of ICT tools and internet resources. The researchers found teachers' lack of competencies, inadequate in-service training and technical support during technology integration in teaching-learning activities. Moreover, primary science teachers had a lack of knowledge of integrating technological pedagogical content knowledge into teaching-learning activities of primary science. Researchers suggested that government should form partnerships with the public and private sector to allow internet access, affordability, connectivity and coverage for all schools.

Similarly, Sunday (2010) sought to explore whether students were taught physics with the use of ICT material like computer systems, internet facilities, projectiles, video players. The results disclosed that use of ICT material in teaching physics made the subject more interesting for students by developing their understanding. On the other hand, teachers enjoyed a lot of using ICT material in teaching physics. Moreover, Anandan and Gopal (2011), Cavas et al. (2009) claimed that most science teachers used to ICT material in their classrooms discussions because it made lessons smooth and conducive. Equally, Cavas et al. (2009) studied to distinguish the science teachers' attitudes towards ICT in education. Researchers elaborated that science teachers possessed positive attitudes towards ICT. Additionally, Lal (2014) claimed that the teachers of ICT users and non-users demonstrated positive attitudes towards ICT in relation to their school teaching subjects.

In the case of STEM teaching, Herro, Quigley, and Jacques (2018) revealed that the instructional technology for enacting STEAM had been used in their classrooms i.e., introducing concepts, demonstrating information or to share with experts outside of the school through Google Hangout or Skype. Chan and Mohammad (2019) focused on examining STEM teachers' technology integration practices in the context of ICT. Researchers concluded that teachers' level of ICT skills affected ICT integration in teaching-learning process while the year of teaching experiences had significantly affected the confidence of teachers for classroom practices.

On the other hand, Islam (2015) attempted to determine whether English language teachers were ready to incorporate ICT into English language instruction in the classrooms. The researcher found positive attitudes towards ICT integration (Ahmed, Qasem, & Pawar, 2020). On the contrary, Talukder and Saba (2016) intended to identify the teachers' knowledge on ICT and their use in ELT classes. The study aimed to know the possessed attitudes towards the most useful ICT tools for teaching language. However, the results were not satisfactory either teacher's knowledge of ICT or the successful use of ICT tools in language classrooms. Similarly, lack of knowledge in English was another cause for slighter practice of ICT in language classrooms successfully.

In the same way, Bozdogan and Ozen (2014) made a study to investigate both level and frequency of technology use and factors that influenced the level of pre-service ELT teachers' ICT self-efficacy. English language teachers found themselves self-efficacious for the use of ICT in ELT classrooms. They argued that the perceived use of computers, experience and confidence played a significant role in using technology in language classrooms. On the other hand, Schrey (2008) aimed to investigate how secondary ELA teachers used computer technology into their classrooms and how far they progressed. Researcher found that the teachers started practicing ICT tools in their ELA classrooms. Concurrently, Lari (2014) examined the influence of PowerPoint presentations on secondary school students' learning and motivation. The outcomes indicated that the usage of PowerPoint presentations in teaching had significant positive results on students' learning. Thus, the PowerPoint presentation was considered a powerful pedagogical tool in English classes.

The teachers of secondary schools in Bangladesh started integrating ICT-pedagogy through PowerPoint presentations although it was an unusual use of technology in teaching-learning activities. They practiced pedagogy in classroom through ICT tools in their own way despite having positive attitudes and training on using ICT-pedagogy. Somewhere it was seemed that teachers still faced challenges in using ICT-pedagogy properly and sometimes struggled to operate those materials confidently (Babu & Nath, 2017). However, there were limited evidences found which aimed to way out of practicing ICT-pedagogy in classroom environment especially in BGS classrooms although Ertmer, Tondeur, and Leftwich (2016) underlined that promoting best practices and effective pedagogy was essential for fruitful ICT integration in teaching.

On the other hand, the practice of ICT-pedagogy in the classroom depended on different factors associated with teachers' attitudes, motivation, ICT competency, self-confidence, anxiety, integration of pedagogy in teaching with ICT, the availability of material, infrastructural facilities etc. Moreover, it could be differed by assorted disciplines but all the subjects were getting benefits from using ICT in classroom instruction, the Science and Language education teachers received more attention for integrating ICT-pedagogy in schools, whereas BGS received less priority in schools. Therefore, this study intended to present the status of ICT-pedagogy practices based on very specific classroom experience in BGS. The current study led to knowing how ICT worked currently in teaching BGS in terms of pedagogical aspects in secondary schools. The study also had importance to identify the level of using ICT-pedagogy in BGS classroom and whether the support they needed to conduct effective ICT-pedagogy integration in teaching BGS.

2.5 Challenges towards ICT-Pedagogy Integration

The innovation of technology had significant effect on education system that could meet the learning gap between teacher and students and strengthen the relationships among them. The modern ICT material could be used as teaching aids those were being disrupted the traditional classroom environment towards student-centric classrooms. Nevertheless some positive insights of ICT-pedagogy integration in education, there were some challenges come up with the success. However, the ICT-pedagogy integration was new for most schools and teachers in secondary education in Bangladesh. Teachers increasingly used to practice ICT-pedagogy in their classrooms in spite of facing different challenges (Babu & Nath, 2017). Therefore, it was required to identify whatever challenges teachers faced during ICT-pedagogy integration process in the classrooms. Although the challenges could be classified as either external or internal in different studies (Mou, 2016; Keengwe, Onchwari, & Wachira, 2008), the current study intended to explore the challenges of ICT-pedagogy integration in teaching BGS in major five heads, i.e., technology support in classrooms, ICT-pedagogy integration, pedagogical knowledge, motivation and reward, with other challenges. However, the following sections focused on challenges in different perspectives that might provide the directives to investigate the challenges regarding the ICT-pedagogy integration process at the BGS classrooms in secondary education in Bangladesh.

Mou (2016) studied the possibilities and drawbacks of ICT integration in the Bangladesh Education System and claimed that many teachers could not use ICT efficiently in their classrooms, or if they did, it was not meaningfully incorporated into their curriculum. Bailey (2019) also disclosed that many classroom teachers were not comfortable in the use of ICT tools in classroom teaching-learning activities. At the same time, Talukder and Saba (2016) found a lot of challenges during ICT integration process despite having brought a vigorous positive change in the education system of Bangladesh. They examined the role of ICT in ELT at secondary level institution in Bangladesh, where the computer, internet, e-mailing, word processing software, educational videos and CDs were identified as the commonly used ICT tools in schools. However, the teachers' ICT knowledge or the successful use of ICT tools was not found satisfactory in language classrooms. Moreover, they identified some challenges such as lack of ICT skills, shortage of computers, rarely found interactive multimedia, deficiency of audio devices, insufficient internet opportunity, lack of mobile gadgets, and a limited number of interactive whiteboards. Similarly, lack of knowledge of English language skills was another cause for the smaller practice of ICT in classroom instruction.

Sultana and Haque (2018) intended to explore the ICT status on higher education in Bangladesh. The teachers' knowledge about ICT and its successful use in classroom had not been satisfactory because researchers recognized some challenges regarding ICT integration. The major challenges were: the lack of vision and plan from both for government and college, insufficient fund, shortage of ICT infrastructure, lack of knowledge and skills on ICT, scarcity of time together with social and cultural factors. However, the shortage of resources, low electricity supply, and limited internet connectivity became visible as the main barriers to the ICT integration process. They came to the conclusion that teachers' confidence and comfortable use of computers were the important factors to effective use of ICT in the classrooms.

Additionally, Khan, Hasan, and Clement (2012) studied the barriers of the ICT integration process in education considering developing countries but focused on Bangladesh. They stated that ICT had been turned out to be an effective educational technology that promoted some dramatic changes in teaching and learning processes within a short time. Although the researchers argued that ICT had a significant positive impact on education, developing countries were still far-away from reaping these benefits due to specific limitations. Moreover, researchers recognized some specific barriers to effective ICT integration in the classrooms of Bangladesh education system. Those were: ICT supported infrastructure and lack of resources; insufficient fund; lack of government vision and plan along with school vision and plan; political factors; social and cultural factors; corruption; teachers' attitudes and beliefs about ICT; lack of knowledge and skills on ICT, and lack of time.

On the other hand, Parvin (2013) addressed the challenges in two different heads, i.e., strategic challenges and other challenges. The strategic challenges were considered as lack of ICT-supported infrastructure, funding problems, lack of proper vision and planning, and problems on social, cultural, and political perception. The other challenges were: teachers' attitudes and beliefs about ICT, lack of ICT knowledge and skills, scarcity of time, lack of convergence of technology and education. Concurrently, Rahman, Paul, and Hasan (2012) reviewed the silent features of ICT material and aimed to investigate the overall situation of utilizing ICTs in the field of education. Researchers stated that ICT materials were used for many purposes but in a scattered and limited way for e-learning as well as distance learning. However, researchers disclosed some problems with using ICT in the education sector. The identified challenges were: inadequate infrastructure, lack of computers, insufficient lab facilities, lack of fund, slow implementation of policy, the gap among the policymakers and experts, limitation on English skill, limited budget allocation for maintenance and shortage of ICT skilled teachers.

Concurrently, the BGS teachers' attitudes and their perception towards ICT-pedagogy integration were also important to be known how they accepted it within the limited opportunity of using ICT tools in schools. Therefore, this research studied the different kinds of literatures related to ICT integration especially on social studies subjects. Ghanney and Mwinkaar (2019) investigated social studies teachers' knowledge and usage of ICT in teaching social studies. A number of social studies teachers were found with ICT knowledge. They were positive about using ICT-pedagogy in teaching social studies, whereas a few of them practiced ICTs in teaching the subject. Researchers claimed that insufficient laptops or computers and other ICT equipment, lack of uninterrupted power supply in schools were the reason behind the lower practice of ICT in classroom activities. They also argued that the wrong perception of ICT integration in teaching social studies was another challenge of ICT-pedagogy integration. Anyway, the researcher recommended that the teachers should be given in-service training, supply computers and other ICT equipment by the government for encouraging, motivating and monitoring social studies teachers to integrate ICT-pedagogy in teaching social studies. Similarly, Gulbahar and Guven (2008) studied social studies teachers' perceptions who usually taught social studies in the fourth and fifth grades of students at primary schools in Turkey. They disclosed a strong positive correlation between teachers' attitudes towards ICT in education and their perception of the advantages of using computers in teaching-learning activities.

Hong (2016) reported social studies teachers' views, experiences, desires and attitudes towards ICT integration to support a better environment for practicing ICT in social studies classrooms. The researcher found that most teachers possessed positive attitudes towards ICT as an instructional tool and desired to pick up ICT skills and experience for effective use in their classrooms. Researchers also recognized the shortage of ICT tools as a major challenge that narrowed down their ICT practice in social studies classrooms. Arkorful, Barfi, and Enchill (2020) studied the availability of ICT resources and its effect on utilizing ICT tools in teaching social studies. The study found that inadequate ICT resources were used in teaching social studies classrooms due to a shortage of ICT tools. Conversely, researchers found a correlation between the availability of ICT resources and their use in social studies classrooms.

Similarly, Ekwe, et al. (2016) studied the integration process of ICT in social studies classrooms and explored the necessity of readiness for either teachers or modern ICT classrooms. They identified interrupted power supply, lack of ICT support stuff and proper software to students and educators as significant challenges for using ICT in teaching-learning social studies classrooms in secondary school. Moreover, Tarman, Kilinc, and Aydin (2019) investigated the views of social studies teachers about the barriers to using ICT in their classrooms. The researcher revealed that most challenges for using ICT pedagogy in teaching social studies subjects were inadequate ICT tools, limited internet facilities, and a lack of organizational and technical support. Moreover, there was no statistical variance between male and female teachers' perceived challenges. In contrast, they reported a statistically significant variance between teachers who participated in ICT-related professional training and those who did not.

On the other hand, Malaba (2005) aimed to explore how teachers used ICT as a teaching tool in social studies classrooms in terms of developing countries. The study revealed that the teacher used ICT as teaching aids for supporting students to visualize the abstract concepts. However, the use of ICT in teaching BGS could accelerate, enhance, motivate and engage students to develop their inquiry and analytical abilities as well as increased experiences with visual technologies (Inyang, 2021). It had also been proved that the use of ICT in teaching social studies made learning easy, fasters, accurate and real (Inyang, 2021), which helped students to clear the abstract concepts of Bangladesh history, custom, culture, geographical diversity, and its historical perspective. Therefore, this study helped to explore the challenges of ICT integration in the BGS classrooms.

The challenges regarding ICT-pedagogy integration had not only in Bangladesh but also kept continue all over the world. Although the features differed from country to country, the literatures might guide to comprehend the type of challenges in BGS classrooms of Bangladesh. In the case of Saudi Arabia, Alkahtani (2017) conducted a study about the challenges of ICT integration during a teaching in secondary schools. Both students and teachers were found with a shortage of basic understanding about the functions of technology in education. The researcher revealed several types of barriers: lack of mastery of ICT teaching techniques and a lack of teacher training to bridge the gap, a lack of mastery of electronic equipment, and problems with repairs or timeliness. The researcher specified two significant shortcomings, such as lack of training and shortage of working equipment which were the main barriers of ICT integration.

Albugami and Ahmed (2015) also conducted a study to explore the factors affecting the successful implementation of ICT in Saudi secondary schools. Despite ICT reflecting as an essential tool in improving performance, collaboration, learning experience, and learning outcomes, some challenges might affect the application of ICT in Saudi schools. The challenges were: the lack of space, resources, maintenance, lack of ICT skill among schools, lack of ICT training, and a lack of clear ICT policies. In addition, Al Mofarreh (2016) studied the implementation process of ICT policy in secondary schools in Saudi Arabia and examined the perceptions of the stakeholders involved in the integration process. The researcher found that Saudi culture was to be a facilitating factor in the implementation of ICT policies in secondary schools despite having several factors were found as barriers in the implementation process, i.e., bureaucracy, lack of ICT policy planning and development processes, insufficient infrastructure and resources, poor training and support, time limits, limited financial support, absence of leadership, the role of the individual, subjective norms, and change the process. However, these factors had been classified into four major areas such as organizational, practical or material factors, the individual, and the change process.

Similarly, many African studies were acknowledged regarding the challenges of the ICT integration process in primary and secondary schools. Nsolly and Charlotte (2016) explored the integration process of ICTs in primary and secondary schools of Cameroon then identified some barriers. The barriers were: an inadequate number of qualified teachers with technology-based pedagogy, permanent technical support staff, the ignorance of school administrators and parents on the uses of ICTs in education, and lack of finance which made ICT integration into curriculum ineffective.

Andoh (2012) investigated the factors influencing teachers' adoption and integration of information and communication technology into teaching-based secondary data. The researcher focused on personal, institutional and technological factors which encouraged teachers to use computer technology in teaching-learning activities. In contrast, the researcher identified some barriers: lack of teachers' ICT skills, lack of confidence, lack of pedagogical training, lack of suitable educational software, limited access to ICT, the rigid structure of traditional education systems, and restrictive curricula. Moreover, Oni, Haruna and Amugo (2017) elaborated some factors in their study which might stop teachers' readiness and effective use of ICT in secondary schools. The major factors were identified as lack of ICT facilities in secondary schools, lack of commitment from government and school management, shortage of motivation and training, lack of ICT policies in secondary schools, shortage of technical support (Mannan, Rahman, & Khan, 2014) from government and private sector, absence of qualified teachers to teach ICT, and teachers' anxiety.

Additionally, Onwuagboke, Singh, and Onwuagboke (2014) examined the availability and the challenges of integrating ICT in teacher education programs in Nigeria. Researchers demonstrated that teachers faced numerous challenges in the ICT integration process due to insufficient ICT material. Moreover, the lack of adequate training of teacher educators, epileptic power supply and high cost of ICT resources were the other challenges of integrating ICT. The ongoing teaching-learning activities and their nature, especially for the ICT-pedagogy integration process in Bangladesh, were comparable with the above studies. Additionally, the challenges might be similar from the perspective of Bangladesh, which had significant learning for ongoing work. Furthermore, the situations of BGS classrooms required further study to identify the challenges of ICT-pedagogy integration.

The challenges towards ICT-pedagogy integration had not only in developing countries but also been in developed countries, although the types of challenges might be differed in level or categories and in nature. Cavucci (2009), and Zuniga (2009) identified some challenges for the ICT integration process in the United States of America (USA) which were almost similar to developing countries. In addition, Cavucci (2009) examined the barriers to integrating computer technology and found five barriers against the successful application of computer technology in classroom practices in the middle school curriculum in the USA. The identified barriers were the lack of technological tools, lack of training, lack of time, lack of computer experience or lack of computer for students at home, and lack of cost associated with computer technology classes which were very much alike with developing countries. The above discussion also works as guiding principles to go ahead, although the meaning and level of integration differed from developed countries to developing countries.

On the other hand, Zuniga (2009) intended to identify the public school teachers' perspectives in relation to the level of computer technology integration in classroom activities of the USA. The researcher demonstrated that the level of computer technology integration into the public school classroom had not been entirely integrated. However, the most significant factors were recognized as lack of high-quality training, lack of time, and fear of computer technology, which hindered the integration process in school education. Concurrently, Schrey (2008) found several challenges in meeting the teachers' technology needs due to inadequate access to computer labs, faulty or backdated computer accessories and the high cost of ICT equipment.

Guoyuan et al. (2009) conducted a study on teachers' educational beliefs in Chinese primary schools focusing on socioeconomic and geographical perspectives. Researchers explored the nature of teachers' educational beliefs and examined to what extent the beliefs were affected by teacher-related variables in the Chinese educational settings. Researchers concluded that the traditional educational beliefs were affected by gender and subject domain while economic and geographical context were considered as significant factors affecting variables. In the case of Bangladesh, Karim (2014) investigated the ICT plan for higher education in Bangladesh and exposed that ICT could be used to build new types of interactive learning media to improve quality, equity, and access in higher education. However, the educational setups had not been designed with ICT facilities.

In the case of Malaysia, Mirzajani et al. (2016) intended a study on teachers' acceptance of ICT and its integration in the classrooms to identify the factors that affected teachers' motivation to use ICT in Malaysian classrooms. Researchers identified that insufficient technical support, lack of knowledge, fear of using new technology, insufficient time, and number of students in the class were considered as barriers that might discourage teachers from effective use of ICT in teaching while increasing sufficient material and technical support in schools encouraged teachers in this respect. However, this study anticipated to explore the possible challenges respecting teachers' content knowledge; pedagogical knowledge and involvement in ICT-pedagogy integration process along with motivation and reward and steps towards ICT-pedagogy integration process.

Moreover, there were some different types of challenges in the ICT integration process investigated by many researchers, but the characteristics were similar in different situations. Chen (2012) investigated the elementary EFL teachers' computer phobia and computer self-efficacy in Taiwan. The researcher addressed high computer phobia and low computer self-efficacy as two major obstacles in classroom practice. However, the study unfolded the levels of computer phobia against computer self-efficacy and their relationships to classroom teaching of elementary EFL teachers in Taiwan. Teachers were found to have a moderate to high level of computer phobia as well as a low level of computer self-efficacy. It was claimed that computer phobia was negatively connected with computer self-efficacy because the teachers who frequently used computers demonstrated lower computer phobia. Male teachers possessed more computer self-efficacy, whereas younger teachers were supposed to have lower computer phobia and higher computer self-efficacy. Moreover, the researcher summarized that the availability of computers at school for teachers' usage has meaningfully lesser computer anxiety and raised computer self-efficacy.

Additionally, the level of ICT competency and the level of teachers' accessibility of ICT resources had been studied by Augustine, Daud, and Kamaruddin (2018). They disclosed that the teachers' perceived usefulness, perceived ease of use, attitudes towards ICT, and behavioral intention were high, but teachers' ICT competency was moderate. Researchers also found a link between a low level of ICT accessibility and a level of ICT acceptance and engagement in classroom practice. Thus, the teachers needed access to ICT material for successful integration in education suggested by researchers. In contrast, ICT integration was limited to basic level as well as demonstrative purposes and the teachers underuse simulated tasks for experience, discovery and experiment. Conversely, the pre-service teachers suffered more extrinsic challenges to ICT integration than new teachers addressing ICT amalgamation, while pre-service teachers used technology more frequently than the starting teachers in their teaching practice. It was also identified that gender was a significant predictor for pre-service teachers, but it differed from starting teachers regarding ICT integration into education.

The above literatures addressed the challenges towards ICT integration in a diverse way in different conditions either in the country or abroad which mostly focused the infrastructure development, ICT skills, ICT material, ICT policies, ease access to ICT, internet connectivity, power supply, fund crisis, time limitations, language skills, ICT and pedagogical training, anxiety, confidence, technical support, etc. On the other hand, the challenges towards ICT-pedagogy integration focusing on either Science or and Language curriculum in world views (Çetin & Işçi, 2022; Arkorful, Barfi, & Enchill, 2020; Hero, 2019; Ghanney & Mwinkaar, 2019; Kilinç, et al., 2016; Hong, 2016; Copriady, 2014; Gulbahar and Guven, 2008). Even there were some studies were found in Bangladesh mostly related to science education (Mallick & Anam, 2020; Obaydullah & Rahim, 2019; Mannan, Rahman, & Khan, 2014) and language education (Talukder & Saba 2016; Islam, 2015), but there was very little literature (Banu, 2006) found regarding Bangladesh and Global Studies curriculum which had been pondered in the current study. Therefore, there was shortage of literatures to explore the ICT-pedagogy integration process in teaching BGS in schools. Although the challenges were similar irrespective of discipline and fields of education in Bangladesh, the above discussion would help to shape the possible challenges clearly for ICT-pedagogy integration in teaching BGS for smooth integration of ICT-pedagogy in future. Moreover, this study particularly focused on the challenges of ICT-pedagogy practices in BGS classroom teaching-learning activities which was rarely found but had been identified in the current study. It aimed to recognize the challenges regarding technology support in classrooms, integration of ICT-pedagogy, motivation and reward, including some other challenges which were very much relevant with ICT-pedagogy integration in BGS classroom teaching-learning activities. Thus, this was time being demanded to explore how ICT-pedagogy could smoothly work in secondary school BGS classrooms and what kinds of attention to be paid for further improvement.

2.6 Overview

There were many kinds of literature discussed in this chapter but it was reportedly uttered that there were few of study remaining related to the ICT-pedagogy integration process in classroom activities. Furthermore, very few studies were found directly or to some extent linked with the ICT-pedagogy integration process in the context of Bangladesh, especially for BGS classrooms. However, the overview of the above discussion helped to make the study's foundation in light of prior research. It also helped to get an idea about the concurrent analysis regarding ICT-pedagogy integration in the classrooms teaching-learning environment. Many of the studies explained and verified common myths and beliefs (Gopal, 2012) towards attitudes and challenges teachers face regarding ICT-pedagogy integration in the instructional process.

This literature analysis paved the way to identify research gaps, avoid conflict from past studies, and proceed successfully without any redundancy. The researcher also became helpful in deciding research design and instrumental techniques from the reviewed literatures because it offered insights about apposite pathways for doing current work following appropriate research methodology.

However, the next CHAPTER III elaborately explained the research methodology, research paradigm, research design, population of the study, sampling techniques, research instruments, analysis strategies which were followed in this study.

CHAPTER III

RESEARCH METHODOLOGY

3.0 Introduction

This chapter presented the methodological framework and research paradigm which included positivism, post-positivism, pragmatism, and constructivism. The chapter also explained research design, population, sampling strategies, data collection tools with development procedures, and data analysis. The instruments' validity, reliability, and piloting process were discussed in this chapter. Furthermore, the chapter introduced the classroom observation checklist, the procedure of classroom observation and the semi-structured reflective survey. The last part of the chapter drew the ethical considerations of the study.

3.1 Research Paradigm

The methodology of this study was led by the research paradigm which research questions had directed. A research paradigm reflected the researcher's views on the world in which s/he existed and wished to live (Lather, 1986). The researcher also explained that it was made up of abstract beliefs and concepts that influenced how a researcher perceived the world and how they interpreted and act in it. Simply, it could be defined that the research paradigm worked like a theoretical or philosophical foundation for a study. It guided finding out the authenticity of the study scientifically to explore the ICT-pedagogy integration process in the classrooms because a paradigm was a "worldview" and had a basic set of beliefs that helped to conduct research (Guba & Lincoln, 2005). It explained the philosophical underpinnings of different paradigms like positivism, post-positivism, pragmatism, and theory of social constructivism. Paradigm also opened the door of thoughts for appropriate research methods and approaches for specific studies. Additionally, it helped to describe the role of a researcher in a study and directed the course of research. Philosophical ideas were presented as below in brief.

3.1.1 Positivism

Auguste Comte (1798-1857), a well-known French philosopher, revealed that the positivist paradigm had been specified as a worldview of research. Positivism held that reality existed self-reliantly of humans as well as it was governed by unchangeable laws and was not mediated by our senses (Rehman & Alharthi, 2016). It was based on a specific scientific process of inquiry in research methodologies. As a philosophy, positivism thought only factual knowledge that was come from observation and led to statistical analysis. Moreover, positivists thought that laws existed that control social occurrences and that these laws might be formulated and presented through factual statements using scientific procedures (Rehman and Alharthi, 2016).

Yin (2003) claimed that predictions could be made of the earlier observed and explained certainties and their interrelations and also, analytical data and statements were permissible as accurate through reason alone. In contrast, the function of the researcher had restricted only data collection, explanations and making predictions based on measurable outcomes. Furthermore, positivism concentrated on facts, while phenomenology focused on the meaning and allowed for human interest.

3.1.2 Post Positivism

Methodological pluralism was another name for post-positivism (Morris et al., 2009). It had emerged from the positivist paradigm. It could be clarified that post-positivism was a metatheoretical position that criticized and revised positivism, influencing theories and practices in philosophy, social science, and many models of scientific investigation. However, the research approach was determined by the paradigm that the researcher choose (Krauss, 2005). On the other hand, post positivists assumed that any kind of research was influenced by a variety of well-developed theories in addition to and apart from the variables being examined and that hypotheses must be tested using empirical methods.

3.1.3 Pragmatism

Pragmatism was a rational and logical approach to doing things or thinking about problems based on dealing with concrete events rather than on theories and ideas. Pragmatist researchers concentrated on the research outcomes that consisted of actions, situations and consequences of the investigation rather than antecedent conditions and methods in a real-world context (Salam, 2016). It also focused on social science research as a commitment to an abstract set of philosophical views. The first step of a pragmatic study was to identify the issue and considered it in its broadest sense. This led to a research inquiry that aimed to understand the problem better and, ultimately, fix it.

3.1.4 Constructivism

The theory of constructivism, based on observation and scientific study, enlightened how people learn, transfer, and create information, as well as how they interpreted the environment they lived in (Chowdhury, 2009). Constructivist learning theory promoted collaborative learning, authentic learning, and real-world problem solving, where learners could create new knowledge based on their prior learning (Driscoll, 2000). Dagar and Yadav (2016) stated that constructivism fostered a learner-centered, learner-directed, and collaborative learning approach, including instructor scaffolding and authentic tasks to support learning. They illustrated that the constructivism was an epistemological approach of knowledge consists of four portions i.e., i) knowledge construction rather than knowledge transmission and the recording of information conveyed by others; ii) new learning built on prior knowledge; iii) learning was enhanced by social interaction; and iv) meaningful learning developed through authentic tasks.

In contrast, the assimilation of ICT tools into education allowed opportunities for the constructivism approach in collaborative learning. It encouraged collaboration between students and their mentors and made a friendly environment where all students and mentors contributed to learning rather than teaching (Alrasheedi, 2009). Integration of ICT-pedagogy in education allowed learners to play a central role as innovators where their prior knowledge, practices, and preferences were used to guide their learning. It also encouraged investigation and discovery rather than a passive didactic view in the classrooms (Jha, 2017).

The concept of incorporating ICT tools in education was based on constructivist learning theory, which had been used to explore the impact of ICT on teaching-learning (Alrasheedi, 2009). Constructivism was expected to help illuminate curriculum events and realized their connection along with proper guidance for research and practice. Additionally, constructivists argued that the use of ICT in education could be employed efficiently to help constructivist learning theories because they were concerned about the advantages of using modern technologies into teaching-learning activities. It emphasized ICT integration to foster self-guided, reflective, and meaningful learning, focusing on the student-centric teaching-learning process. Furthermore, constructivism showed how ICT supported teachers to change their role from a deductive instructor to a coach who facilitated student academic inquiry (Sicilia, 2005) to find out their own meaning (Chowdhury, 2009).

The theory of constructivism worked as guiding principles to reinforce teaching and learning pedagogy. In constructivist classrooms, facilitators facilitated learning material and created an opportunity to develop their own understanding based on a combination of what they did already know and what they were learning (Dagar & Yadav, 2016). Ertmer, Tondeur, and Leftwich (2016) compared the constructivist approach with traditional teaching methods while traditional approaches focused on teacher explanations and students' repetitive practice. The constructivist approach emphasized understandings with authentic problems where had the opportunity to understand the content deeply.

The emergence of ICT in education changed the traditional to student-centered learning focusing on the collaborative learning environment regarding the constructivism approach. To adapt the collaborative learning environment, pedagogical strategies were required to meet the challenges of integrating ICT in the school curriculum for 21st century learners. Hermans et al. (2008) stated that the teachers who followed constructivist approach tended to use ICT more frequently in classroom activities. In this line, the study followed the constructivism approach to rethink the ICT-pedagogy integration process in BGS classes. Therefore, ICT-pedagogy integration was an important discussion for current teaching-learning activities in BGS classrooms. It seemed that the progress and development of educational pedagogy related to the advancement of computer technology (Jha, 2017).

The government of Bangladesh adopted ICT for pedagogic use in school education like many other countries focusing paradigm shift of the traditional teacher-centric to student-centric learning. However, constructivism teaching and learning emphasized learner-centric learning by using their prior experience in the learning process. In this process, ICT might have a significant role in enhancing the learning environment. Hence, many traditional schools introduced modern ICT tools to support students learning, focusing on constructivism theory. The current appeal for learning environments with the emergence of new technology, constructivism promoted interpersonal interaction, collaboration, and opportunities to experience learning principles that could be allowed through student-centric learning (Alrasheedi, 2009). The integration of new technology helped to encourage constructivist innovation in the teaching-learning activities by facilitating the realization of meaningful, authentic, active-reflective and problem-based learning (Kharade & Thakkar, 2012).

On the other hand, social constructivism had conquered the social sciences as part of the information goal to study social activities systematically. Moreover, as a social science student, the researcher had the self-interest to go through social constructivism. Furthermore, the current study worked with ICT-pedagogy integration as a social phenomenon.

Based on philosophical foundations, the researcher developed perceptions of the nature of existing professional development, pedagogical exercise in the teacher education program and integrating ICT at teaching practices in social science studies with viewing the difficulties students faced in different subjects. Therefore, this study focused on teachers' existing status, their attitudes, practices and challenges of the ICT-pedagogy integration process in secondary school BGS classrooms.

While planning the research design, this study adopted a combination of constructivism and pragmatism. Constructivism emphasized collective learning which could transform human interaction into knowledge generation (Jha, 2017). Similarly this study identified that integration of ICT-pedagogy required more collaboration of ideas among teachers, parents, peers and other communities for successful incorporation in secondary education of Bangladesh. Chand (2018) also revealed that constructivism promoted social and communication skills, ensuring a collaborative learning environment where learners shared and reviewed their ideas together and became enthusiastically involved in solving problems. The researcher also added that constructivism focused on connecting theoretical input and practical knowledge that was directed through the basis of preexisting knowledge. Thus, this research had taken constructivism paradigm as a basis for developing data collection tool and data analysis. The researcher had also taken a pragmatist approach while analyzing the data on teacher's attitudes towards integration ICT because pragmatism focused on beliefs that were more closely linked to human behaviors. Also, pragmatism could allow the investigation of how social interaction shaped individual experience, knowledge and behavior (Salam, 2016).

3.2 Research Design

This study followed a quantitative research design combining descriptive, correlation, and questionnaire survey for collecting quantitative data, whereas classroom observation was somewhat used for a little qualitative data for exploring the current practices of ICT-pedagogy integration in BGS classrooms. According to Creswell (2014), there were two basic types of research surveys: cross-sectional surveys, which collect data about current attitudes, opinions, or beliefs, and longitudinal surveys that intended to study the individuals over time. The descriptive type of research explained the social characteristics of a population or situation. However, this study aimed to investigate one or more variables like participants' education or training, profession, male-female distribution, government against non-government categories and their school location, etc. Then the correlational research was a type of nonexperimental research which had been used to measure the statistical relationships among- the variables (Price, Jhangiani, & Chiang, 2019) in the current study.

In the same way, a survey research design could generalize the situation and quantitatively analyze stakeholders' attitudes towards ICT-pedagogy integration in schools of a large group under study. However, this study followed a cross-sectional survey research design to collect data at one point in time and explored the attitudes and challenges of ICT-pedagogy integration in classrooms. Similarly, Alaugab (2007) collected data through descriptive survey and correlation in the analyzing process while Varol (2013) had administered quantitative methods including two adopted questionnaires and analyzed the results through descriptive statistics and correlations.

Survey research design had also been followed by Lai and Lin (2018), Mwila (2018), Young (2016), Attis (2014), Gopal (2012), Schrey (2008) to collect data. In their research project, the researchers studied teachers' attitudes towards ICT integration in secondary school. Wario (2014) used a quantitative inferential research design to determine the connection between computer attitudes and ICT integration in the classrooms. A number of studies had used descriptive survey design to examine teachers' attitudes towards ICT use [Mahdum, Hadriana, & Safriyanti (2019); Semerci & Aydin (2018); Birwal (2017); Oni, Haruna, & Amugo (2017); Shameem (2016); Lal (2014); Onwuagboke, Singh, & Onwuagboke (2014); Hue & Jalil (2013); Yusuf & Balogun (2011); and Al-zaidiyeen, Mei, & Fook (2010)]. However, the study went through descriptive, inferential analysis (linear relationship like compare mean, t-test, one-way ANOVA and correlation) for investigating the relationship between variables.

The survey research design was employed in this study to determine the teachers' attitudes towards ICT-pedagogy integration and the challenges they face in the integration process. The researcher administered survey instruments to collect data. The survey instruments were blended with adopted and self-prepared questionnaires.

Besides attitudes and challenges, this study also focused on real-time data to what extent ICT had been pedagogically used in the BGS classroom environment. Therefore, this study collected data through classroom observation and a semi-structured reflective survey. The study explained the attitudes in terms of ICT-pedagogy practices and explored the challenges of BGS classrooms that teachers faced during teaching-learning activities. Finally, the correlations had been done to identify the differences among the variables about teachers' views towards ICT-pedagogy integration, pedagogic use of ICT in lessons and their challenges during the integration process in BGS classrooms.

3.2.1 Data Sources

The study mainly focused quantitative approach to explore the research questions based on specific data while classroom observation had obviously been done to collect somewhat qualitative data. Primary data were used to answer the research questions. Moreover, the triangulation approach had been employed to ensure the validity of data. This was done through the following phases:

Phase-I: Opinion Survey (social science teacher)

Phase-II: Classroom Observation (BGS teaching-learning activity)

Phase-III: Semi-structured Reflective Survey (teachers of classroom observation)

3.3 The Population

The defining of population and sample were important steps of a research project because population was the group of curiosity to the researcher, the group to which she or he would like the outcomes of the study to be generalizable (Gay, 1996). Many studies on ICT intervention in science, language and other subject areas were found.

However, little study had been found about the impact of ICT intervention on teaching social science, especially in secondary institutions of Bangladesh. Therefore, the social science teachers of secondary schools were considered as population in this study. According to the latest BANBEIS (2019) statistics, approximately 43,490 social science teachers were working in secondary schools of Bangladesh (excluded primary led secondary, junior secondary and secondary section with higher secondary institutions). Therefore, the full-time secondary school social science teachers who taught BGS (subject name) in secondary schools following the NCTB curriculum for grade VI-X were considered this study's population.

3.4 The Sample and Sampling Strategies

The sample was the cluster of participants in a study who had been nominated from the target population from which the researcher simplified to the target population (Creswell, 2014). Moreover, selecting all teachers as samples or realistic for a small-scale study was impossible. Therefore, primarily 391 social science teachers were considered as a sample for this study. One teacher was selected from each school, making a sample of 391 schools (table-4.1). However, the following sections presented sampling strategies (sub-section 3.4.1) and sample size, which helped to understand the volume of data and made the study relatively easier for the researcher (sub-section 3.4.2).

3.4.1 Sampling Strategies

Multistage stratified sampling and simple random sampling techniques (Cresswell, 2014; Best, Kahn, & Jha, 2016) had been used in this current study. The multistage stratified sampling created strata that were highly representative of homogenous subsets of the population. Therefore, a number of strata had been employed in a different group of samples to maintain consistency among the data. In contrast, different types of samples required different types of sampling techniques that were stated below:

3.4.1.1 Teachers

Multistage stratified sampling technique had been considered for selecting teachers. However, the sample size for teachers in this study had been constructed with the parameters of 95% confidence level (Z) and 5% width of interval or margin of error (α) because of its unknown or approximate population. Therefore, it had been assumed to be 0.5 each as a general practice or norm. On the other hand, the 95% confidence level (Z) had an index score of 1.96 and the margin of error (α) had been provided to be 0.05. Considering these values, the aggregated sample size (n) without consideration of the population size had been calculated as follows:

$$n_i = \frac{Z^2 \times \bar{p} \times \bar{q}}{\alpha^2}$$

$$= \frac{(1.96)^2 \times 0.5 \times 0.5}{(0.05)^2}$$

$$= \frac{3.8416 \times 0.5 \times 0.5}{0.0025}$$

$$= \frac{0.9605}{0.0025}$$

$$= 384.16 \text{ or } 385$$

Note: The sampling technique bears a power of 0.80. Source: Smith, (n.d.)

The two proportionate strata inside each segment of the teacher sample were considered on the basis of gender (i.e., male and female) of the population. The size of each stratum for teachers sampling had proportionately been followed to the ratio on the basis about categories of school (boys, girls and coeducation), school types (government and non-government) and also school location (rural and urban) of the population according to the data of BANBEIS (2019).

3.4.1.2 Schools

The following criterion under multistage stratified sampling techniques was considered in the selection of schools- firstly, schools with ICT facilities (computer, multimedia projector, the Internet facilities, electricity facilities, etc.); secondly, schools in different categories, i.e., rural and urban, government and non-government, types of enrollments (boys, girls and co-education) according to the ratio of a total number of secondary schools in Bangladesh (BANBEIS, 2019).

The following strata were considered during sample selection to represent each segment of data.

Strata-1: focused rural and urban context of sample regarding the ratio of total number of secondary schools in Bangladesh (table-4.1).

Strata-2: represented the school categories by government and non-government that were rationally maintained (table-4.1).

Strata-3: showed the school ratio according to the types of enrollments, i.e., boys, girls, and co-education that were judiciously maintained for selecting of the sample (table-4.1).

Strata-4: denoted the ratio of male and female teachers calculated according to social science teachers employed in secondary schools though it was not found during questionnaire survey in schools (table-3.1 & 4.3).

3.4.1.3 Division and District

Geographically all eight administrative divisions were covered in this study while a multistage stratified sampling technique was followed for selecting the district. There were sixteen districts (two districts from each division) considered as a sample area. All eight divisional headquarters were selected as a district, but the other eight were randomly selected by using a simple random sampling technique. The districts were ordered alphabetically within the division during random sampling and then selected one from each. However, the total sample were selected based on the estimated districts considered in this study (403/16=25); where 25 is the number of school taken from each district. The number of districts could be extended for more representative findings but it was a limitation to fix the number within sixteen districts. Additionally, there had no hill tracts district been considered differently as a sample which was another limitation of this study. On the other hand, the size of the division was not considered either their number of district or number of schools. This was one more limitation of the current study. The number of sample districts was located graphically by inserting the number under division headquarters in the following figure 3.1.

Figure 3.1: Location Map of Sample Divisions with Number of Districts
(Figure created by the author with Wikipedia)

3.4.1.4 Classroom Observation

Classroom observation was an important way to collect real-time data and a researcher could evaluate what was happening in classroom instructions. In this study, one school was selected from each sample district to observe BGS classroom activities. The multistage stratified sampling technique was used to determine the schools. Therefore, 16 (16X1) schools were selected for classroom observation which was comprised of two districts from each of the eight divisions. Each classroom was observed by the presence of researcher himself with observation schedule (section 3.6.2) in two different phases in a single academic year while 2nd phases were done within two to three months from the first phase. The phases were aimed at comparing the teaching-learning activities with technology over time and would observe the differences of ICT integration. The phases also were involved to explore the change process as well as to know the usefulness of ICT-pedagogy integration in classroom. Therefore, the school, the teacher and the subject were similar but lessons might have differed in a few case. In addition, the researcher communicated with school authorities before visits. The researcher himself collected data in real-time classroom activities with the headmaster's due permission and a class teacher. For classroom observation, the schools were selected following different criteria, i.e., rural and urban; girls and boys; government and non-government in types. In case of participants' selection for classroom observation, the ratio between male and female teachers was equally maintained. However, the grade was overlooked during a classroom observation. Altogether 32 (16X2) classroom teaching-learning activities were observed for collecting data regarding the status of the ICT-pedagogy integration process. Although the sample size was small, the researcher collected data vigorously. Therefore, the findings concerning the ICT-pedagogy integration process in classroom activities could be trustworthy.

3.4.1.5 Semi-Structured Reflective Survey

The researcher used semi-structured reflective survey for three reasons. Firstly, this survey allowed the data collection tool to combine both open and close ended questions where participants could elaborate their response in detail (Cohen, 2018). Secondly, the research question required exploring participant’s (secondary school teachers) thoughts, feelings and beliefs and therefore, the use of semi structured survey is regarded as more effective for such exploration (Hobson & Townsend, 2010). Lastly, semi structure survey permits two-way communication between the researcher and the participants which was important for this study during data collection to gather personal experiences and narratives from teachers in an adequate manner (Creswell, 2014).

3.4.2 Sample Size

Diverse sampling approaches were employed to select different sample sizes in the current study as the representative population. Cohen et al. (2003) argued that there was no definite answer for the accurate sample size but a sample size of thirty was the minimum number of cases if the researcher planned to use some statistical analysis on the data. Conversely, it should be noted that the sample size must properly represent the population being targeted. The sample size for different sections for this study was stated below in following sub-sections.

3.4.2.1 Sample Teachers for Opinion Survey

According to the width of interval or margin of error (α) 5%, the total sample was calculated 384 and with adding 5% error, the accumulated sample size was found 403 [384+19 (384 of 5%)] but finally, 391 sample teachers were considered in this study. Although primarily the sample was 403 teachers, there were 391 teachers who given back complete questionnaire, considered as total sample for this study.

3.4.2.2 Sample Schools for Opinion Survey

One teacher for one school was considered for disproportionate multistage stratified sampling techniques. Therefore, 25 (25X1) schools were considered as a sample in each district. Among the sample schools, there were two government schools from each district. Thus, primarily the number of government schools in the sample was 32 (16X2). The table-3.1 demonstrates the total sample of schools with male and female teachers who participated in this study. The table also presented the selected eight divisions and sixteen districts covered in this study.

Table-3.1: The Sample Size at a Glance (teachers and schools)

SL	Division	District	Male Teachers	Female Teachers	Total Teachers & Schools
1	Dhaka	Dhaka	17	7	25
2		Faridpur	15	9	25
3	Chattogram	Chattogram	16	8	24
4		Cumilla	19	6	25
5	Rajshahi	Rajshahi	15	9	24
6		Sirajgonj	16	8	24
7	Khulna	Khulna	16	8	24
8		Bagerhat	14	10	24
9	Sylhet	Sylhet	18	6	24
10		Moulovibazar	16	8	24
11	Barisal	Barisal	17	7	25
12		Pirojpur	16	8	24
13	Rangpur	Rangpur	18	8	25
14		Lalmonirhat	18	9	25
15	Mymensingh	Mymensingh	16	8	25
16		Netrokona	18	6	24
		Total	**265**	**126**	**391**

Note- Regarding the ratio, the sample of female teachers primarily were selected 168 (42% of 403) according to working social science teachers in secondary schools, but finally 126 female teachers (32% of 403) had been found (table 3.3).

3.4.2.3 Sample for Classroom Observation

Sixteen schools in different categories were considered for classroom observations. Detail explanation of school selection had been provided above (3.4.1.3 and 3.4.1.4). The information about the schools was presented below:

Table-3.2: Schools for Classroom Observation

Types	Government School			Non-Government School			Total
	Co-education	Girls	Boys	Co-education	Girls	Boys	
Urban	0	2	1	1	1	1	6
Rural	0	0	0	7	2	1	10
Total	3			13			16X2=32

Classroom observation for this study had been directed for collecting in-depth data to lookout the integration process of ICT-pedagogy in classroom practice through a self-developed check list (Appendix-C).

3.4.2.4 Sample Teachers for Semi-Structured Reflective Survey

As a part of total population sampling, all 16 (16X1) teachers had been observed but humbly requested to provide the data for once in both phases.

3.5 Data Collection Procedure

In this study, the survey instruments were administered to a group of secondary school teachers who taught BGS in schools. The researcher himself and 10 research assistants directly led towards face-to-face primary data collection procedure with the constant direction of respected supervisors of this study. The research assistants were given a day-long training, including a brief introduction and a comprehensive question-answer session about research purposes, questions, and instruments. In addition, three guidelines were developed for questionnaire survey, semi-structured reflective survey and observation checklist as supporting documents for research assistants and also for the researcher (Appendix-G). Research assistants were requested to maintain the decent manner and behaviour code during data collection and requested to show the authorization letter. They were informed that they might need verbal permission from head teachers to complete the questionnaires. Although the research instruments were developed in English, Bangla versions of the printed questionnaires were distributed to the selected BGS teachers. However, the survey had taken on average 25-30 minutes to complete the questionnaire.

The participant teachers were contacted beforehand by the government authorized personnel (District Education Officer, Upazila Secondary Education Officer and Academic Supervisor). The researcher personally contacted each of the government authority and requested them to make the connection with the participants to participate in the study. Although the target group of respondents was limited to 403, the research team finally reached 391 teachers who fully completed the survey questionnaire and given back to the research team member. Teachers' participation in the survey was entirely a voluntary job. The teachers were coded "T" while they were put number from 1-391 (for example, T-07; Appendix-H).

On the other hand, the classroom observation and semi-structured reflective survey from observed teachers were done involvement by the researcher himself directly. The researcher entered the class with due permission from the teacher and one complete class (40-45 minutes) was observed. The researcher took notes during observation. At the end of class, the researcher himself filled up the checklist as early as possible. If needed, the researcher also discussed with the respective teachers for further clarification. The each observed checklist were marked as COB-01, COB-02,….COB-32 (Appendix-I). Although the classroom observation was done twice, a semi-structured reflective survey was employed once and it happened in the 2nd phase immediately after observing the class. They were also allowed to talk with the researcher if needed for language ambiguity or required clarification. Both of the phases had been done by teachers' consent and they were timely informed before observing the class. At a glance, the data had been collected by using a questionnaire survey which was translated in Bangla (Appendix-A), classroom observation and semi-structured reflective survey.

3.6 Research Instruments

Three different types of instruments were used to collect primary data in this study. The used tools and the respondents were presented in table 3.3.

Table-3.3: Employed Instrument and Respondents

SL	Instruments	Respondents
1	Section-A: Personal Information	Teachers
	Section-B: TA_ICTPI Scale	Teachers
	Section-C: TC_ICTPI Scale	Teachers
2	Classroom Observation Checklist	Teachers
3	Semi-structured Reflective Survey	Teachers Participated in Classroom Observation

3.6.1 Survey Questionnaire

The primary data were collected through a survey questionnaire because it was the most popular method of collecting quantitative study data (Cohen et al., 2008). Survey research design could be explained in nonexperimental research, in which information about the activities, beliefs, preferences, and attitudes of participants could be collected through a questionnaire (Martin, 2009). However, the survey questionnaire had three different parts as states below:

Section-A had been blended of demographical data such as education, training, teaching experience, teaching position, ICT skills, ICT experience, level of confidence in ICT and current status of ICT equipment in school. These idea had been developed from Dr. Hamed Alrasheedi of Ohio University (Alrasheedi, 2009); Dr.

Cynthia S. Mierzejewski of Immaculata University (Mierzejewski, 2009). One question had been set at the end of this section based on researchers experience and societal condition in secondary school and in Bangladesh. This was intended to identify the regular challenges faced in ICT-pedagogy integrated classrooms by teachers which were coincided with section-C of the survey questionnaire (Appendix-B; Section-A). The cohesive items indeed involved the ICT-pedagogy integration process of the school curriculum, especially in BGS classroom teaching-learning activities. There were 15 closed-ended questions and one open-ended question. The teachers were first asked to put tick (√) mark at first and then rearranged the items according to the order of priority from 1 to 15 as they had to meet during the ICT-pedagogy integration process in the classrooms. The priority-1 represented most challenge while priority-15 was least in serial but respondents had the freedom to choose as many as they put tick. The collected data of this part were presented with identified challenges (section-4.7.5.2) in chapter four.

Section-B aimed to collect data about the teachers' attitudes towards ICT-pedagogy integration process in classroom instructions. Both self-developed, adopted but modified questionnaires with rating scales had been administered after piloting the questionnaire consisting of 30 items (Appendix-B; Section-B). This section was divided into i. attitudes (9 items), ii. perceived usefulness (9 items), iii. perceived ease of use (6 items) and iv. affective components (6 items). The attitudes scale had been adopted from four different scales. These were Dr. Abdulkafi Albirini of the Ohio State University (Albirini, 2006), Dr. Abdullah Mohammad Alaugab of the University of Kansas (Alaugab, 2007), Dr. Hamed Alrasheedi of Ohio University (Alrasheedi, 2009) and Dr. Cynthia S. Mierzejewski of Immaculata University (Mierzejewski, 2009). The selected items were matched and blended with pedagogical aspects and contextualized in consideration of research questions and perspective of Bangladesh.

Section-C focused on challenges faced by teachers during the implementation of ICT-pedagogy in classroom instruction. There were 33 items of questionnaire (Appendix-B; Section-C) based on an extensive review of several research studies (Amengor, 2011; Albirini, 2006; Alaugab, 2007; Kurt, 2007; and Bingimlas, 2009) and the practical experience of researcher from teacher education program. The challenges scale was separated into five sections those were: *i.* technology support in classrooms (5 items) *ii.* integration of technology-pedagogy (7 items) *iii.* teachers' pedagogical knowledge (11 items) *iv.* motivation & reward (6 items) and *v.* other challenges (4 items). The items were involved with positive and negative statements but negative statements were reversed to a positive manner in data analysis for sections B and C.

The scale for Section-B and C represented Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4), and Strongly Agree (5). Both positive and negative items had been involved in the questionnaire while the negative items were reversed positively during the analysis of results. The prepared instruments made this journey more relevant with understanding the Bangladesh context.

3.6.2 Classroom Observation Checklist

The classroom observation checklist was used to point out the actual classroom teaching-learning activities in respect of ICT-pedagogy integration. It helped to distinguish the ICT use by teachers in a natural setting. Through observation, the use of immediate awareness, or direct cognition, as a principal mode of research had the potential to yield more valid or authentic data than would otherwise be the case with mediated or inferential methods (Cohen et al., 2007). The observation checklist consisted of 26 items with five sections, i.e., *i.* lesson preparation (2 items), *ii.* content knowledge (4 items), *iii.* pedagogical knowledge (4 items), *iv.* integration of ICT-pedagogy and content knowledge (11 items) and *v.* assessment and others (5 items).

The Observation Checklist had been developed by the researcher with rigorous consultation of supervisors. The items had been included considering the context of the country based on the experience of different kinds of literature and websites. Somewhat the items had been merged from earlier studies on their relevance to ICT-pedagogy integration in relation to the research question of this study. The five-point Likert scale represented Minimum (1), Poor (2), Moderate (3), Good (4), and Excellent (5) for the observation checklist (Appendix-C).

3.6.3 Semi-structured Reflective Survey

The semi-structured reflective survey had been done on the basis of qualitative interview questions from Dr. Brent Williams of the University of Nebraska, Lincoln (Williams, 2009) and Dr. Serhat Kurt of the University of Illinois at Urbana (Kurt, 2007). However, the alternative options of questionnaires had been added according to the nature of the study from different types of literatures, websites and documents. It had been administered to classroom teachers who were observed. Through the semi-structured reflective survey, teachers assessed themselves and suggested effective measures focusing on ICT-pedagogy practices in a classroom environment. A self-assessment survey had also been employed by Cubeles and Riu (2018) who had worked on the TPACK model. The survey questionnaire was presented with 10 close-ended but multiple responses except for one item, whereas one open-ended question was aimed at exploring the future plan of teachers' ICT use whether the schools would provide all opportunities (Appendix-D).

3.6.4 Developing Process of Questionnaire

The survey questionnaires and observation checklist had been gone under development process. There had been several changes in the survey questionnaire, including a classroom observation checklist for contextualizing in the local education system. In the developing stage, the changes had been done through massive discussion with supervisors, secondary school teachers and in light of the researcher's decade of teaching experience in teacher education programs. However, the developed questionnaires were finalized after administering under piloting of the set (section-3.6). There were minor changes like language ambiguity, adding or revising the question with consideration of comments, feedback, and pilot test findings.

3.7 Piloting of Survey Instruments and Observation Checklist

The pilot test improved the instrument and determined its ability to reach the proposed respondents (Light, Willett, & Singer, 1990 cited in Alrasheedi, 2009). Therefore, the piloting of instruments was directed to test the reliability and validity of the proposed questionnaire and classroom observation checklist. A group of respondents (n=36) were selected for the piloting of the questionnaire and four classroom activities (n=4) had been observed from different schools. The selected respondents and classrooms were not included as samples, although they were parallel. The respondents had been asked to provide notes and ideas to improve the final questionnaire used for the study. On the other hand, the piloting of the instrument was conducted during February and March of 2019.

3.7.1 Reliability of Survey Instruments and Observation Checklist

The piloting of instruments was performed to measure the Cronbach's alpha for reliability test of the instruments. The Cronbach's alpha coefficient was mostly used to measure internal consistency when using Likert scales for collecting data (Taherdoost, 2016). In this study, Cronbach alpha coefficients had been calculated to identify the internal reliability of the scores for the instrument of Attitudes scale and Challenges scale including Classroom Observation Checklist. The following table presented the Cronbach's Alpha coefficient of reliability analysis.

Table-3.4: Reliability Statistics for Piloting of the Instruments

Instruments		Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No of Items
Questionnaire	Attitude Scale	.864	.883	30
	Challenges Scale	.868	.865	33
Observation Checklist		.930	.949	26

The above table-3.4 explained that the Cronbach's alpha degree for the attitudes towards ICT-pedagogy integration scored 0.86 while it was 0.87 for the challenges about integration process in the classroom instruction. On the other hand, Cronbach's alpha degree for the classroom observation checklist scored 0.93. The results suggested that the items of all parts were highly reliable for collecting information because reliability coefficients range from 0.00 to 1.00, with higher coefficients indicating higher levels of reliability for the questionnaire survey (Kimberlin & Winterstein, 2008). According to Tuckman (1999), an alpha of 0.75 or greater stood acceptable for instruments that measured knowledge and skills and 0.50 or greater was acceptable for instruments that assessed attitudes and preferences (cited in Prescod, 2008). Moreover, the feedback from respondents helped to finalize the tools. The pilot test went under minor revisions and somewhat changed the language ambiguity according to the suggestions, feedback, and comments of participants. The final questionnaires had been prepared with the help of a comprehensive discussion of supervisors, and team of expert members (section-3.7.1).

3.7.2 Validity of Survey Instruments and Observation Checklist

Validity referred to the degree of measuring the instrument's accuracy and effectiveness (Martin, 2009), which could be perfectly used in a quantitative study (Heale & Twycross, 2015). Validity tested the instruments which reflected the trustworthy and apposite interpretation of acquired data concerning the purpose of the research (Sürücü & Maşlakçi, 2020). In this study, validity was detailed to the appropriateness of interpretations made about the results which intended to measure the importance of attitudes and challenges towards ICT-pedagogy integration. The validity of the questionnaire had been aimed to ensure the contextualization of the instrument considering the local environment and accustomed it for accuracy and relevancy.

The survey questionnaires and classroom observation checklist were verified using content validity which was established by a panel of experts involving seven faculty members from different universities and teachers' training colleges (Appendix-E). The panel of experts was combined with Curriculum Knowledge, Pedagogy Knowledge and Technology Knowledge, including the expert on Statistics and Evaluation Process. The panel members reviewed the survey questionnaires (Appendix- A & B; section-B & C) and Observation Checklist (Appendix-C). With the feedback from the panel of experts, the language ambiguity and the order of the questionnaire were revised.

3.8 Ethical Consideration

The researcher followed the ethical consideration while preparing research instruments and data collection procedures. The researcher sent a request letter for permission to use previously developed instruments. On the other hand, another request letter had been forwarded through the proper channel to the teachers' authority (DSHE) to provide the authorization letter for seeking permission for data collection in this study. Written consent had been taken from each of the teachers before they participated in the survey and Classroom Observation. Finally, the researcher had obtained permission from DSHE for collecting data.

3.9 Description of the Variables

The study followed a quantitative research approach where the survey research design was used to collect the data. The key variables were checked under the study to examine in this study. Those were-

a. The dependent variables- The dependent variable of this study was the attitudes of BGS teachers and challenges towards ICT-pedagogy integration in BGS classrooms.

b. The independent variables- The considered independent variables of the study were i. sex (male and female), ii. school types (govt. and non-govt.), iii. school location (rural and urban), iv. enrolment of students (co-education, girls and boys), v. number of students in class, vii. academic degree, viii. professional degree, ix. length of teaching experience, x. age, xi. teaching position, xii. ICT training and experience, xiii. level of confidence and skill on ICT, xiv. ICT equipment in school, *xv.* access to the internet in school etc.

3.10 Analysis of Data

The collected quantitative data were analyzed through descriptive statistics. Whereas, the quantitative data were statistically analyzed by using Statistical Package for the Social Science (SPSS-V25) software accordingly the school location, school types, gender, enrollment of students, teachers' age and teaching position, level of confidence on ICT skills, confidence in overall ICT attitudes and challenges they faced in schools to integrate ICT-pedagogy in BGS classrooms.

Frequency, mean, and standard deviation were used for demographic data analysis. On the other hand, t-test, ANOVA and correlation with frequency, mean and standard deviation had been used for identifying the teachers' attitudes and the challenges they faced towards ICT-pedagogy integration along with what extent teachers used ICT-pedagogy in BGS classrooms. The independent sample t-test was used for measuring significance level having two variable items. Martin (2009) stated that the t-test was a type of statistical analysis that was used to test many different hypotheses about scores on quantitative variables and whether the means on a quantitative variable differ between two groups. At the same time, one-way analysis of variance (ANOVA) had been used to analyze the independent variables with more than two levels to explore the significance level. Martin (2009) also added that ANOVA compared means on a quantitative variable across any number of groups. The correlation was used to determine the relationships between multiple variables. On the other hand, t-test and ANOVA based on p=0.05 significance level had been examined to clarify the significance level. The p value level that was derived alpha value, was below .05 and for correlation was .01 or .05. However, the listed below table-3.5 followed for the internal value scale of the questionnaire. The interval value had been calculated as follows 5-1/5=0.80 and it had been added sequentially to consider the degree of choice.

Table 3.5: Interval Value of Scale

Interval Value	Degree of choice
1.00-1.80	Strongly Disagree
1.81-2.60	Disagree
2.61-3.40	Neutral
3.41-4.20	Agree
4.21-5.00	Strongly Agree

3.11 Overview

The research methodology was designed to attain the research questions which intended to identify attitudes, practice and challenges of the ICT-pedagogy integration process. However, the survey research design focusing on a questionnaire survey, semi-structured reflective survey and classroom observation were occupied in this study to collect data. The table-3.6 in next page presented at a glance the research design, respondents and instruments used in this study according to the research question.

Table 3.6: Overview of the Methodology

SL	Research Questions	Respondents	Instrument	Design
1	What was the existing situation of ICT-pedagogy integration in secondary schools for BGS teachers?	Teachers	Questionnaire for Demographic part	Questionnaire Survey
2	What attitudes did the BGS teachers possess regarding ICT-pedagogy integration in secondary school classrooms?	Teachers	Questionnaire for Attitude Scale	Questionnaire Survey
3	How did ICT-pedagogy use in BGS classroom practices?	Teaching-Learning Activities	Classroom Observation Checklist	Classroom Observation
4	What were the challenges to integrating ICT-pedagogy in BGS classrooms?	Teachers	Questionnaire for Challenges Scale	Questionnaire Survey
		Observed Teachers	Teachers Questionnaire Survey Schedule	Semi-structured Reflective Survey

The above table-3.6 defined the respondents of this study as teachers and their teaching-learning activities, specifies the instruments involved to collect data and demonstrates research techniques used in this study.

The next CHAPTER IV presented the data, findings and interpretation according to the findings of this study. However, CHAPTER IV offered the existing school situation, teachers' status, existing practice of ICT tools, attitudes towards ICT-pedagogy integration, practices of ICT-pedagogy in BGS classrooms, attitudes against practice: research reflection, challenges in ICT-pedagogy integration process, and teachers' classroom experience.

CHAPTER IV

DATA PRESENTATION, FINDINGS AND INTERPRETATION

4.0 Introduction

This chapter analyzed the data, enlarged data interpretation and presented findings regarding the study. The analysis had been done in four different sections (4.1, 4.2, 4.3 & 4.4) following the four research questions. The section-4.1 offered insights about the existing situation for ICT-pedagogy integration in schools regarding ICT-pedagogy integration; section-4.2 expressed the attitudes towards ICT-pedagogy integration; section-4.3 demonstrated the ICT-pedagogy use in BGS classroom practices; and section-4.4 addressed the challenges to ICT-pedagogy integration in BGS classrooms regarding ICT-pedagogy integration in secondary school classrooms. The findings were presented through statistical analysis such as descriptive and inferential statistics (linear relationships like compare mean, standard deviation, t-test, one-way ANOVA and correlations). Moreover, the chapter outlined the dependent and the independent variables which intended to explore whether there were any significant differences between variables regarding overall attitudes towards ICT-pedagogy integration in classroom practice. On the other hand, the correlations had been administered for determining to what extent the relations persisted among different variables. The chapter also presented the data interpretation. It was reviewed based on previous findings to attain at a suitable conclusion about ICT-pedagogy integration process by this study. Finally, the key findings were added at the end of each section. The following sections with reference to the answer of research questions were presented below.

4.1 Existing Situation for ICT-pedagogy Integration in Schools

The present scenario of schools represented the overview of ICT infrastructure in classrooms as well as the status of BGS teachers employed in secondary schools. The data also had been grouped, including educational qualification, professional training, teaching experience, level of confidence in ICT skill, ICT competency and ICT experience. However, the accumulated data presented through frequencies, mean, standard deviations and percentage. The following discussion might provide insights into schools and teachers differently.

4.1.1 Existing School Situation

This sub-section elaborately presented existing school situations regarding ICT-pedagogy integration in schools.

4.1.1.1 Schools by Location, Types and Categories

The secondary schools could be segregated in rural and urban (location), government and non-government (types) along with boys, girls and co-education (categories). However, this study followed the government high schools and affiliated schools that received the financial benefits from Government by MPO. The sample size of this study was closely represented the population focusing on the ratio among the different forms of secondary schools in Bangladesh. Overall, it had also been carefully selected the schools that ran from VI to X grade of students and followed the curriculum of NCTB unlikely the version. The following table demonstrated the comparative analysis of the sample in different aspects with the country scenario.

Table 4.1: Number of Schools by Location, Types and Categories

SL	Clusters		Sample		Country Scenario	
			n	**%**	**f**	**%**
1	School Location	Urban	76	19	3558	22
		Rural	315	81	12666	78
2	Types of School	Govt.	30	8	599	4
		Non-govt.	361	92	15587	96
3	School Categories	Boys	11	3	287	2
		Girls	72	18	2542	16
		Co-Education	308	79	13357	82
	Total (N for each category)		391	100	16186	100

(Primary data compared to BANBEIS, 2019)

The table-4.1 demonstrated the number of secondary schools (N=391) and teachers those were covered in this study. The schools and teachers were selected rationally following the location of school (urban and rural), types of school (govt. and non-govt.) and school categories (boys, girls and co-education) against country wide scenario of Bangladesh. The total sample in this study had been selected regarding the ratio of different types of secondary schools continuing in Bangladesh.

The data against Types of Schools revealed that the government schools were 4% (out of 599) while non-government schools were 96% (out of 15587) from secondary schools in Bangladesh. However, the sample for government schools was 8% (n=30) while non-government was 92% (n=361) those were nearly similar according to their ratio. The government schools were selected from division level and the non-government schools were selected from districts of the selected divisions. The following charts showed the number of government and non-government schools including their ratio (figure-4.1 & 4.2).

Figure 4.1: Sample Size

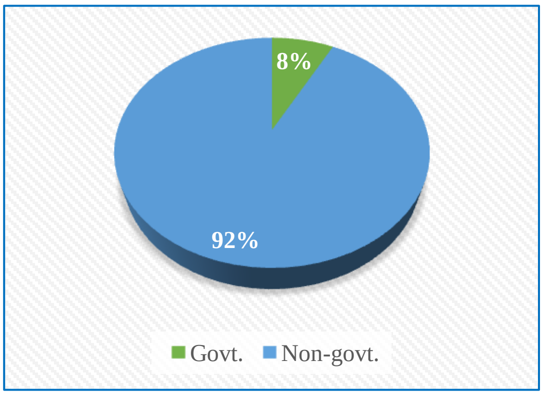
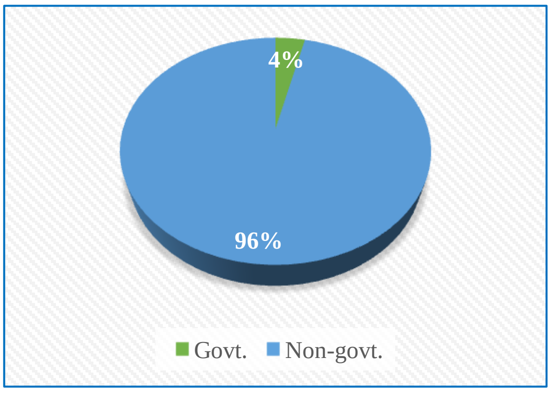


Figure 4.2: Bangladesh Scenario



On the other hand, the data from school location (figure-4.3 & 4.4) represented the rural and the urban schools. The number of rural and urban schools were selected accordingly their number of secondary schools in Bangladesh enlisted in BANBEIS (2019). In relation to the ratio, the sample from urban (19% compared to 22%) and rural (81% compared to 78%) were almost equal proportions regarding the number of secondary schools. The figures-4.3 & 4.4 presented below, illustrated the statistics of schools chosen from rural and urban areas.

Figure 4.3: Sample Size

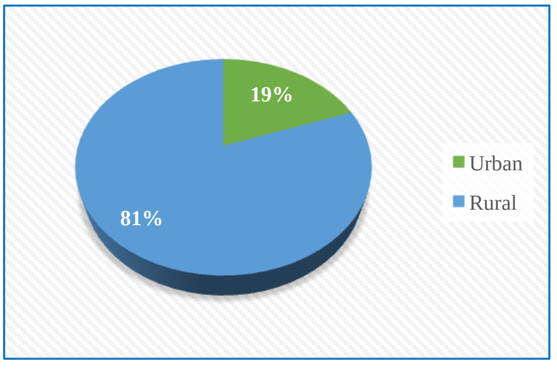
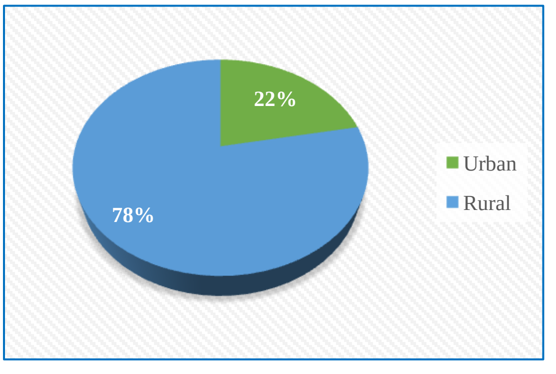


Figure 4.4: Bangladesh Scenario



Similarly, considering the School Categories, vast majority of the nominated schools were co-education type (n=308; 79% against n=13357; 83%) in this study. Conversely, girls (n=72; 18% against n=2542; 16%) and boys (n=11; 3% against n=287; 2%) schools were small in number compared to co-education type of secondary schools in Bangladesh. The comparative analysis of above data pictorially presented in listed below figures-4.5 & 4.6

Figure 4.5: Sample Size

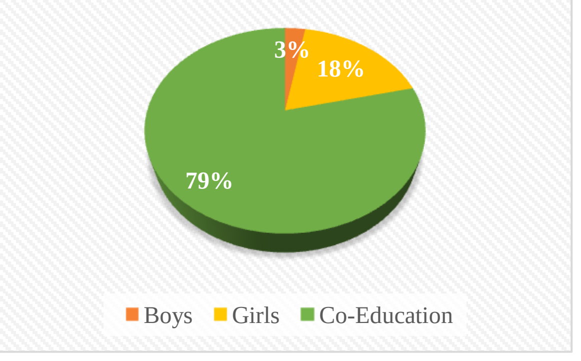
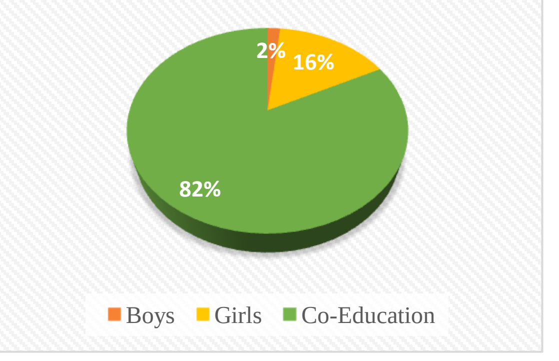


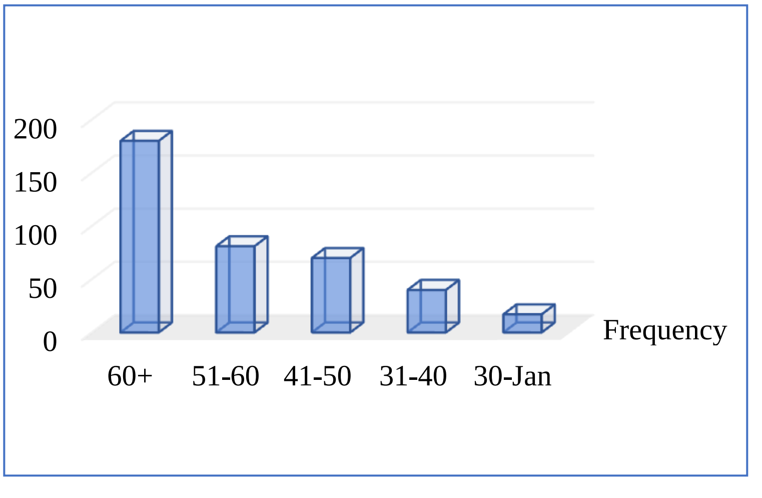
Figure 4.6: Bangladesh Scenario



4.1.1.2 Class Size

The data from figure-4.7 illustrated that almost half (47%) of the schools had to manage 60+ students in a class. If the class size was calculated from 51+ students, exactly two-thirds (67%) of the schools were found which managed large class size. On the other hand, only 4% of classrooms had been found in this study where the number of students in a class was below 30. If it was again calculated from 41-50 students in a class, 15% classrooms were found in this study which managed comparatively ideal classrooms in perspective of Bangladesh (Appendix-J).

Figure 4.7: Number of Students in Class

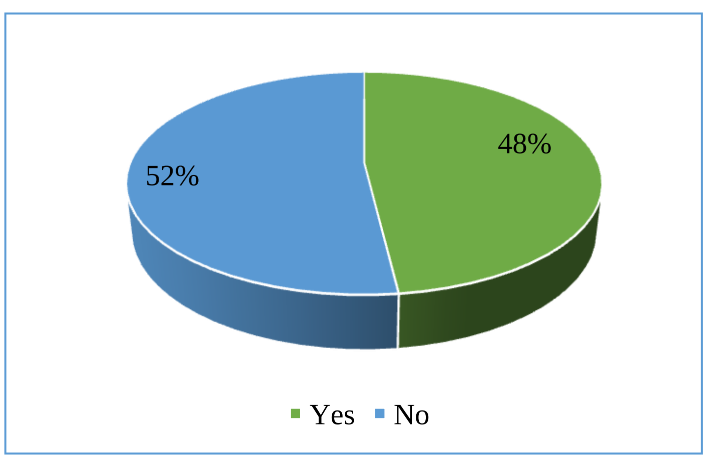


It had been recognized that the small class size was more helpful for effective teaching-learning activities in the classrooms (Murphy, 2010; Egbedokun & Adeyanju, 2016; Ruffina, Esther, & Anastecia, 2018). The teachers could manage the students easily in small class, could employ participatory teaching-learning process appositely, could engage learners in lesson, might have opportunity to know their learners well, and might perhaps organize the learning material timely in small class.

4.1.1.3 Internet Facilities in Classroom

The number of internet facilitated classroom made it easy to reach the teaching material, which might help to learn interesting and encouraged teachers and students to participate in ICT-pedagogy classroom activities. The following figure-4.8 represented the internet facilitated classroom in the schools under this survey study.

Figure 4.8: Internet Facilitated Classroom



The data disclosed that the required number of classrooms had not yet been connected (N=391; n=203; 52%) with the internet facility. On the other hand, the number of the internet facilitated classrooms (N=391; n=188; 48%) were found in this study whereas the BANBEIS (2019) reported that most of the secondary schools (N=16186; n=13956; 86%) were found with internet facilities. It could be assumed based on classroom observation that the internet facility had been connected in schools for their official work not for teaching-learning purposes (Appendix-L).

4.1.1.4 Status of ICT Equipment in Schools

The status of ICT equipment in secondary schools for teaching-learning purposes was poor except for one computer or laptop (83%) in each school. The table given below presented the available ICT equipment in school which might teachers used in their teaching-learning activities.

Table 4.2: Status of ICT Equipment

SL	Statements	n	Yes	%	No	%
1	Presence of computer or laptop for teaching	391	323	83	68	17
2	Have of internet facilitated classroom		188	48	203	52
3	Number of multimedia classroom/having multimedia		278	71	113	29
4	Active multimedia classroom (multiple classroom)		269	68	--	--
5	Opportunity of videoconferencing		41	11	350	89
6	Smart board connected classroom		23	6	368	94
7	Audio system connected classroom		82	21	309	79
8	Number of scanners		194	50	197	50
9	Number of document camera		17	4	374	96
10	Number of OHP		152	39	239	61
11	Other related ICT equipment in schools	Sheikh Rasel/computer lab, Printer, Photocopier, CC/Camera				

About half of the schools (48%) had internet facilitated classrooms although it was not true for all schools because it was missing at the time of classroom observation. Nearly one-third of schools had multimedia classrooms (71%) while the active multimedia classrooms were limited to only (68%). On the other hand, A2I (2011) expected that every primary and secondary school would establish a multimedia classroom with a power-saving internet-connected laptop, projector/large-screen TV. Conversely, most schools had not been fixed the multimedia classrooms yet despite having equipment. Moreover, teachers should carry out multimedia if they desired to use it as teaching aids in lesson presentations. However, modern ICT tools like videoconferencing (11%) smartboard (6%) and document camera (4%) were absent in maximum schools. However, the schools had traditional types of ICT material i.e., scanner (50%), OHP (39%) and audio system (21%). Additionally, there were some other types of ICT facilities in some schools i.e., Sheikh Rasel computer lab, printer, photocopier, and CC/Camera for official use or only for ICT classes mentioned by teachers (T-12, 89, 122, 155, 161, 247, 298, 312, & 376).

4.1.2 Existing Situation of Teachers

The participants of this study were selected following the ratio of secondary school teachers in relation to location, types and categories considering country scenario (table-4.1). However, the existing pattern of teachers was presented below by their gender differences, age, experience, position, academic qualification, professional qualification, in-service training with a level of confidence and ICT competency.

4.1.2.1 Gender Diversities

The table-4.3 demonstrated that the number of male teachers 265 (68%) was higher than the number of female teachers 126 (32%) selected as participants for this study associated with countrywide teachers' ratio. The male teachers were dominated in number (75%) which was almost three times higher than the female teachers (25%) in accordance with existing pattern of teachers (BANBEIS, 2019). However, the current trend of social science teachers regarding gender distribution (male 57% and female 43%) made hopeful that the female teachers were higher in number than the overall ratio in Bangladesh (male 75% and female 25%) considering the total teachers in secondary schools. The following table presented sample size regarding gender differences compared to social science teachers accompanied by total secondary school teachers in Bangladesh.

Table 4.3: Teachers by Gender Differences

SL	Gender	Sample Teachers		Social Sciences Teachers		Total teachers in Secondary School	
		N	%	n	%	n	%
1	Male	265	67.8	30832	57.49	142629	75.43
2	Female	126	32.2	13108	42.51	46452	24.57
	Total	391	100.0	43940	100.0	189081	100.0

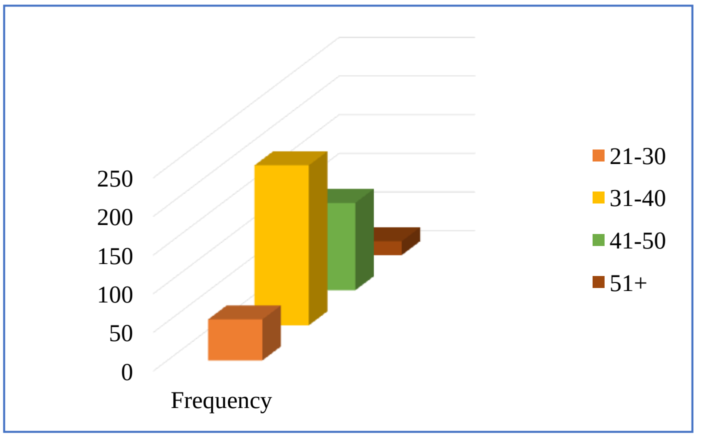
Source: Secondary Education Statistics_BANBEIS-2019

The data from the above table-4.3 stated that the ratio between male and female teachers had not been exactly followed for this study regarding the existing teachers' pattern of social science. However, the sample of female teachers primarily was selected 168 (42% of 403) concerning the ratio of social science teachers who worked in secondary schools, but finally, 126 female teachers (32% of 403) were found who completed the survey questionnaire.

4.1.2.2 Age

The statistics in figure-4.9 illustrated the four age groups of teachers in this study while the lowest range of age was 21-30 and 51+ was the highest. However, the age group 31-40 represented more participation in this study. The figure listed below offered the age range of teachers.

Figure 4.9: Teachers' Age

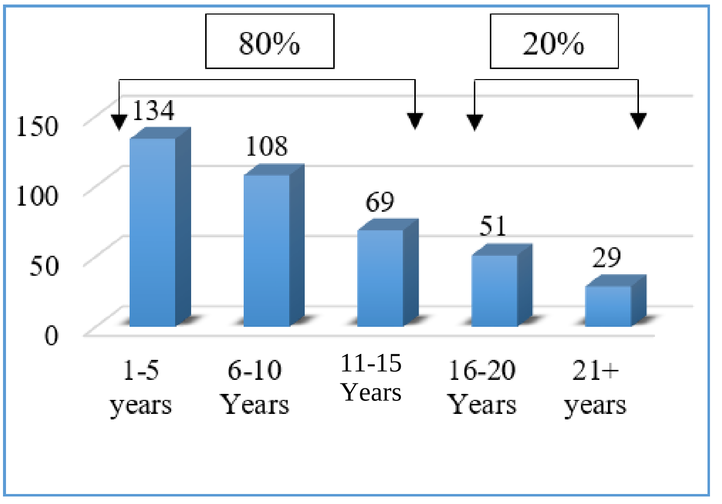


The above figure-4.9 displayed the age distribution of participants. Most of the teachers' (53%) age range was 31-40 (n=207). The age ranges of teachers from 41-50 (n=113; 29%) were in second-highest in accordance with the number of participants in this study. Relatively the beginners' (age range 21-30) participation was smaller (n=53; 14%) compared to earlier stated two groups. On the other hand, the involvement of relatively older teachers (age group 51+) was a bit smaller (n=18; 5%) than the other three groups. It could be concluded that the sample designated the population proportionately, although the teachers' age of 31-50 was higher compared to the other two groups (Appendix-K).

4.1.2.3 Experience

The length of experience demonstrated five different groups starting from 1-5 and closing in 21+ years of experience in teaching professions. The following figure-4.10 explained the teaching experience which might have a significant role in developing the skill required for effective teaching.

Figure 4.10: Teachers' Teaching Experience

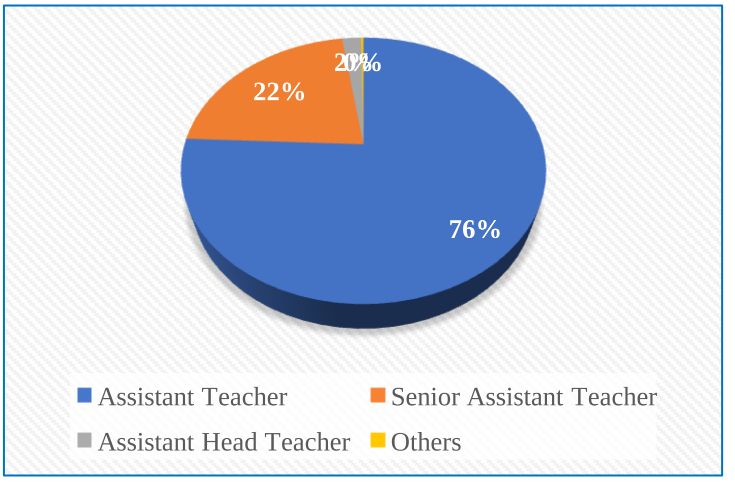


The data revealed that most teachers had relatively lower experience who taught BGS in schools than aged teachers. The data indicated that the teachers (34%) were found with 1 to 5 years of teaching experience and there were 28 % of teachers who had 6 to10 years of teaching experience. If the experience would extend up to 15 years, exactly four-fifths (80%) of the teachers were found who taught BGS in their institutions, while 20% of respondents had 16+ years of experience (Appendix-K).

4.1.2.4 Teaching Position

The data had been collected from different positions of teachers according to their seniority in schools. The teachers were categorized into four positions in this study such as assistant teachers, senior assistant teachers, assistant head teachers and other teachers. However, the seniority of teachers played a vital role in the decision-making process regarding ICT-pedagogy integration in schools which became more and more critical and often had frustrating (Buza & Mula, 2017). Different researchers also revealed that teachers had to play a key role in making the classroom enjoyable because ICT integration began in their hands. The pie chart given in next page illustrated the teachers' teaching position, which was considered a significant factor for integrating ICT-pedagogy in classrooms.

Figure 4.11: Teachers' Teaching Position

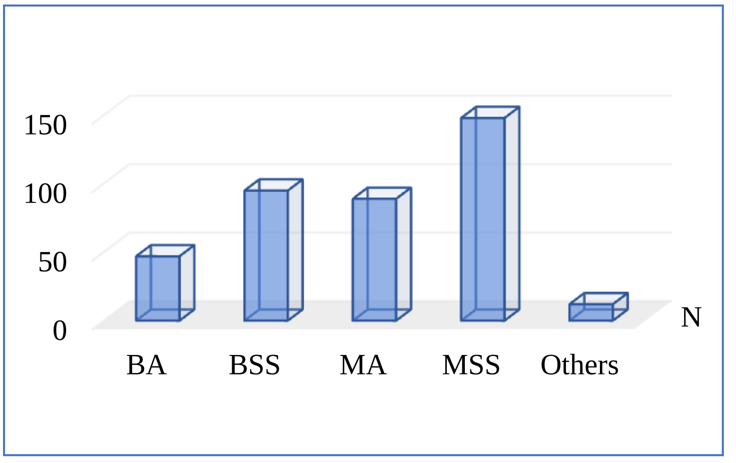


The above figure-4.11 exposed that there were the three-fourth majority of teachers (76%) who participated in this study took the position of Assistant Teachers. Senior Assistant Teachers (22%) were the second-highest participation in this study with a large distance from Assistant Teachers. On the other hand, only 2% of teachers participated in this study who were the Assistant Head Teachers and teach BGS. No head teachers were found in this study who were involved in BGS teaching in schools (Appendix-K).

4.1.2.5 Academic and Professional Qualification

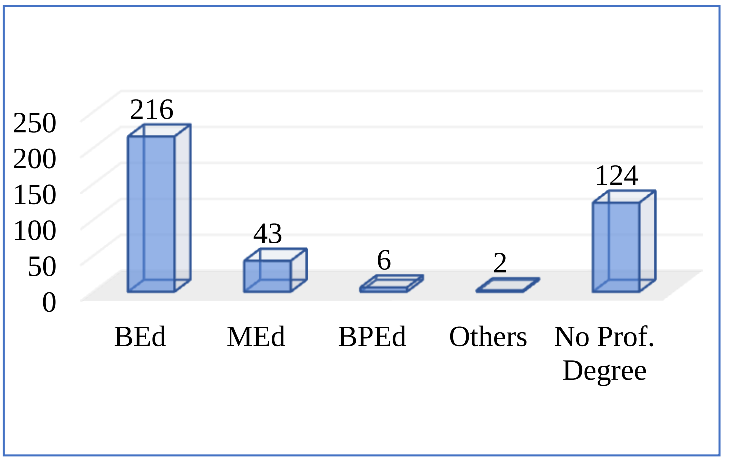
The teachers who taught BGS in their respective schools were selected as samples for this study. This sub-section revealed the academic and professional qualifications with the frequency and percentage of participants who contributed to this study. The results illustrated that most teachers obtained Master's Degree. However, many teachers were out of professional degree i.e., Bachelor of Education (B.Ed) or Diploma in Education but taught BGS in schools. The following figures 4.12 and 4.13 disclosed academic and professional degree of participants sequentially.

Figure 4.12: Academic Qualifications



The above figure-4.12 revealed that most teachers (61%) were found either having Master of Social Science (MSS; 38%) or Master of Arts (MA; 23%) compared to Bachelor Degree (36%) who obtained either Bachelor of Social Science (BSS; 24%) or Bachelor of Arts (BA; 12%). Unexpectedly, there were some teachers found (3%) who taught BGS with a background of studying other disciplines (Appendix-M). The figure-4.13 given below presented the professional qualifications of the participants.

Figure 4.13: Professional Qualification

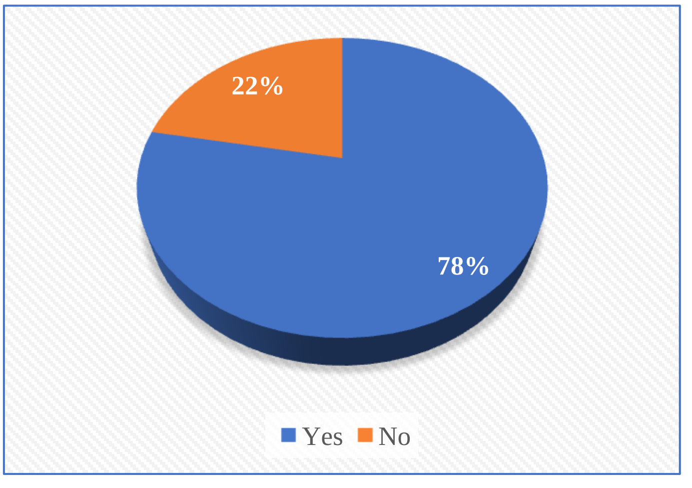


The above data disclosed that 66% of teachers accomplished their professional degree either BEd (59%) or MEd (11%) participated in this study. Conversely, a big part of teachers (N=391; n=124; 28%) taught BGS without professional degree and 2% of them were found with other professional degrees including BPEd (Appendix-M).

4.1.2.6 In-service Training

The in-service training was important indicator to adapt practical skill about new innovation which boosted up confidence of teachers to use it in teaching. The use of ICT-pedagogy in teaching required ICT skills and experience which were considered as a significant factor and played a central role in the integration process. The ICT training was also a necessary aspect for planning the lesson which helped teachers to teach confidently with ICT. The figures listed below explained the teachers' participation in training, use of internet for educational purposes and level of confidence in ICT skill.

Figure 4.14: Participation in ICT Training Courses



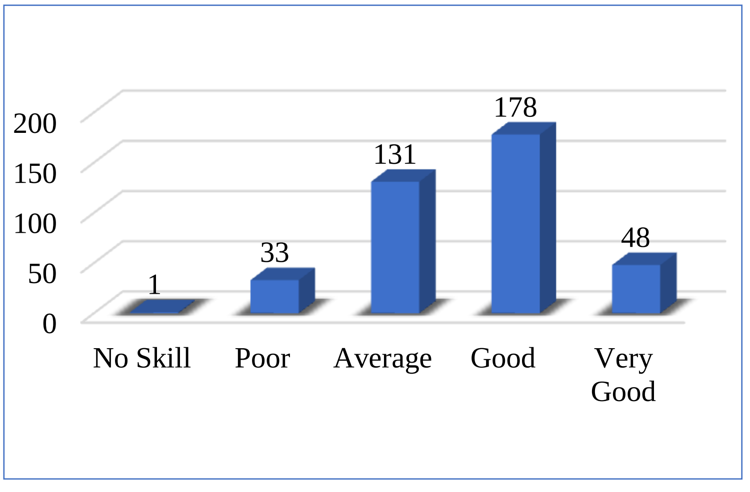
A2I (2011) reported that more than 50% of the teachers had little or no professional training. While, the above figure-4.14 illustrated that more than three-fourth of the teachers (N=391; n=305; 78%) participated in in-service training courses conducted by different organizations in the country or abroad. Conversely, a large number of teachers (N=391; n=86; 22%) were found who did not participate in any in-service training courses (Appendix-L). In contrast, most of the training courses had been directed by GoB through Teachers' Training College (TTC), Higher Secondary Teachers' Training Institute (HSTTI), Upazila ICT Training Resource Center for

Education (UITRC), Bangladesh Bureau of Educational Information and Statistics (BANBEIS), National Training and Research Academy for Multilingual Shorthand (NTRAMS) and Bangladesh Institute of Administration Management (BIAM) while overseas training had been organized mostly in India (T-55, 63, 287, 321, & 338). However, four teachers (T-11, 14, 34, 125, 248, & 371) demanded training on ICT-pedagogy either in-house or by government intervention for renewing their skills and experience. In addition, some teachers suggested (T-95, 179, 233, 234, 260, & 357) that training could be arranged differently only for rural or comparatively weak teachers in consideration of their level of skill and knowledge on ICT.

4.1.2.7 Level of Confidence

The following figure-4.15 demonstrated the level of confidence in ICT skill by teachers. The data exposed that almost all of the participants were pursuing confidence in ICT knowledge. Remarkably 12% (N=391; n=48) of teachers were found strongly confident on ICT material to use it in their classrooms.

Figure 4.15: Confidence Level in ICT Skill



On the other hand, more than half of the participants (N=391; n=226; 58%) represented themselves as clearly confident on ICT skills based on good and very good options unitedly. While, one-third (N=391; n=131; 34%) of them possessed a moderate confidence level in ICT skills (Appendix-L).

4.1.2.8 ICT Competency

The table-4.4 illustrated the level of ICT competency in different types of ICT tools. The teachers possessed a moderate level of ICT competency (M=3.41; SD=.99) which was fairly above the average line. According to their self-observations, it had been found that the teachers represented themselves better in application software i.e., MS PowerPoint (M=3.72; SD=1.05) and MS Word (M=3.71; SD=1.12) compared to other competency. However, in between MS Word and PowerPoint, the results indicated that the teachers gradually developed their competency in presentation software for multimedia classrooms.

Table 4.4: Teachers' Level of ICT Competency

SL	Competency	n	M	SD
1	MS Word	391	3.71	1.12
2	MS PowerPoint		3.72	1.05
3	Mailing Service		3.63	1.23
4	Google Service		3.71	1.14
5	YouTube Material		3.44	1.27
6	Smart Board		1.85	1.18
7	Imaging Devices		2.54	1.30
8	Online Platform like Teachers Portal		3.18	1.30
9	Social Media for Teaching		3.22	1.35
10	Students Centric Lesson by ICT		3.62	1.12
11	Problem Solving Ability by ICT	390	3.25	1.20
	Total		3.41	.99

Considering above data, the teachers had developed their competency in using google service (M=3.71; SD=1.14) for collecting, restoring and using material to enhance efficiency of teachers and students, browsing YouTube (M=3.44; SD=1.27) for making contextual content and surfing mail (M=3.63; SD=1.23) sharing idea with professionals. These all activities were directed as driven force to promote ICT-pedagogy integration for involving students in lesson.

Concurrently, the teachers assessed their competency to engage students in ICT related activities (M=3.62; SD=1.12) and helped students to improve problem solving skills (M=3.25; SD=1.35). Conversely, the using Teachers Portal or Social Media for teaching purpose, they possessed themselves as lesser competent (M=3.18; SD=1.30) and (M=3.22; SD=1.35) separately. Unfortunately, the almost all of teachers showed poor performance (M=2.54; SD=1.30) on using imaging devices i.e., scanner, digital or video camera, document camera whereas the lowest competency had been observed on smart board operation (M=1.85; SD=1.18) by teachers.

Competency in MS Word

The findings (table-4.5) regarding competency in using MS Word, the urban teachers possessed more competency (M=3.83; SD=1.20; n=76) than the rural teachers (M=3.68; SD=1.10; n=315). Concurrently, the government teachers disclosed themselves more competent (M=4.13; SD=1.01; n=30) than non-government teachers (n=361; M=3.67; SD=1.13). Simultaneously, the male teachers' level of competency designated them as more confident (M=3.72; SD=1.12; n=265) than female teachers (M=3.69; SD=1.14; n=126) on using MS Word.

Table 4.5: Competency in MS Word

Categories with Frequency (N=391)	School Location		School Types		Gender	
	Urban (76)	Rural (315)	Govt. (30)	Non-govt. (361)	Male (265)	Female (126)
M	3.83	3.68	4.13	3.67	3.72	3.69
SD	1.20	1.10	1.01	1.13	1.12	1.14
t- test/Sig. (.05)	.30		.03		.83	

Moreover, the statistical findings regarding the independent sample t-test claimed that there were no significant variations between urban against rural (α=0.30; $p > .05$) and male compared to female (α=0.60; $p > .05$) teachers where significant differences were observed between government and non-government (α=0.03; $p < .05$) teachers regarding the competency in MS Word.

Regarding the age (figure-4.16) of the teachers on using MS Word, it had been found that the age group of 31-40 comparatively demonstrated better competency in MS Word (M=3.78; SD=1.09; n=207) than the other three age groups. The teachers' age group 41-50 exposed comparatively lesser competency (M=3.71; SD=1.09; n=113) than the earlier stated group but more than the age group of 21-30 (M=3.70; SD=1.15; n=53). On the other hand, the teachers of the age group 51^{+} showed the lowest competency in using MS Word than the rest of the three groups. However, the figures given below presented the competency in MS Word based on teachers' age and their level of experience.

Figure 4.16: Competency on MS Word by Age

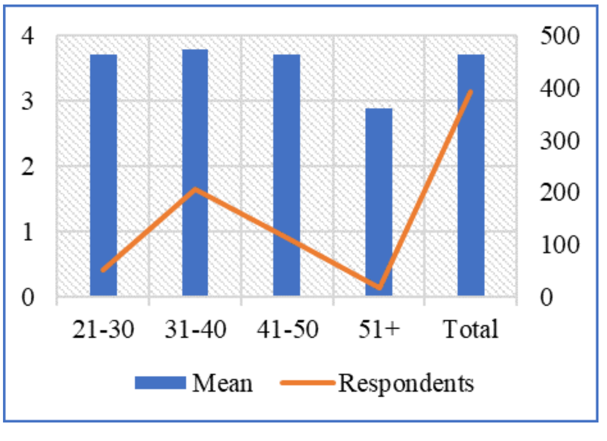


Figure 4.17: Level of Competency on MS Word

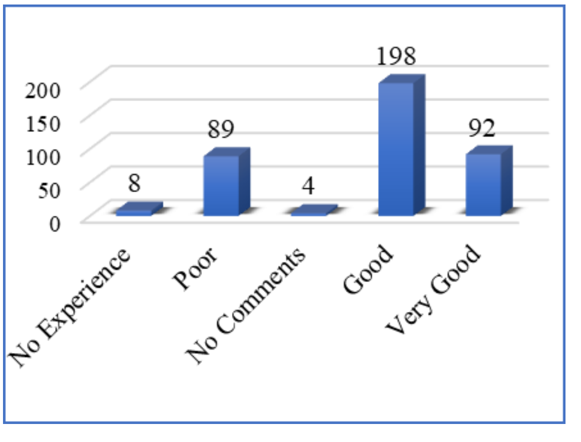


Figure-4.17 demonstrated the teachers' level of competency in MS Word. The data revealed that 24% (N=391; n=92) of teachers had expertise level of competency in MS Word whereas a nearly similar number of teachers 23% (N=391; n=89) displayed poorer competency. On the other hand, the most teachers 51% (N=391; n=198) showed better competency in word processing software. The results indicated that the teachers were habituated to use MS Word for their daily teaching-learning activities. Therefore, it could be said that teachers were accustomed to utilizing word processing software for developing their lecture scripts as well as could make diagram and shapes for creating better understanding of the content. Moreover, they might insert smart art or image to offer students visual explanations and perhaps might explore the creativity of students by giving different tasks like assignment writing by MS Word.

Competency in MS PowerPoint

MS PowerPoint was used in classroom instruction by teachers as an effective pedagogical tool (Lari, 2014) which was evidence among secondary school teachers. The findings (table-4.6) from the study suggested that the teachers were gradually performed better day by day in PowerPoint for presenting their lesson, although differences were found among them in terms of competency. The table and figures listed below displayed the competency in the use of presentation software by teachers.

Table 4.6: Competency in MS PowerPoint

Categories with Frequency(N=391)	School Location		School Types		Gender	
	Urban (76)	Rural (315)	Govt. (30)	Non-govt. (361)	Male (265)	Female (126)
M	3.83	3.69	4.07	3.69	3.72	3.71
SD	1.09	1.05	.83	1.07	1.05	1.08
t- test/Sig. (.05)	.30		.05		.98	

The data from above table illustrated the mean scores of urban teachers (M=3.83; SD=1.09; n=76) which were better than rural teachers (M=3.69; SD=1.05; n=315). Government teachers performed (M=4.07; SD=.83; n=30) better than non-government teachers (M=3.69; SD=1.07; n=361), whereas male teachers (M=3.72; SD=1.05; n=265) were slightly ahead of female teachers (M=3.71; SD=1.08; n=126).

However, there were no significant differences found by the independent sample t-test between the pairs.

Figure 4.18: Competency in MS Word and MS PPT by Age

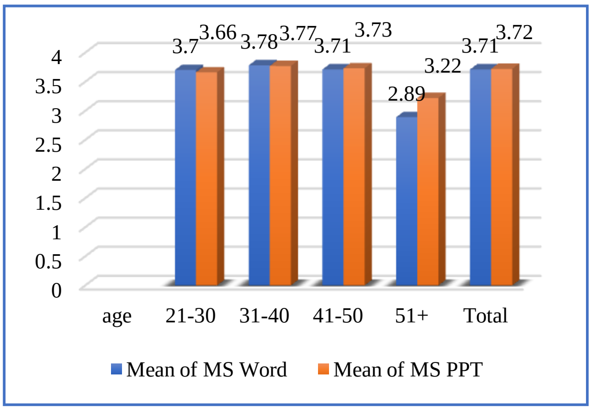


Figure 4.19: Competency in MS PowerPoint

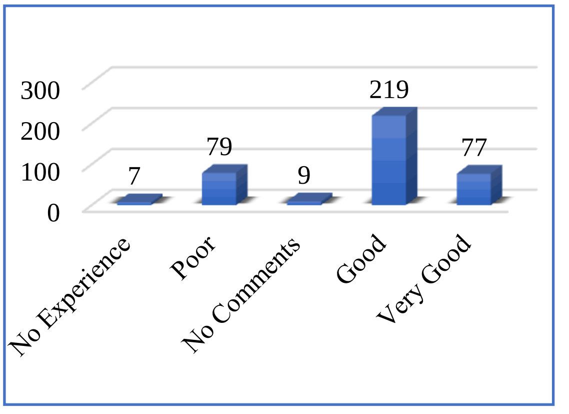


Figure-4.18 stated the comparative analysis about the competency in MS Word and MS PowerPoint based on age differences. There was similarity based on the mean average of MS Word and MS PowerPoint. According to the overall results, teachers better used MS PowerPoint (M=3.72; SD=1.05) than MS Word (M=3.71; SD=1.12). Conversely, the teachers of age group 31-40 and 41-50 performed comparatively better. The age group of 21-30 demonstrated better competency in Word than PowerPoint but a little bit lower than the age group of 31-40 and 41-50 in both software. On the other hand, the teachers of the age group 51^{+} showed lower skills on both application software but it had been remarkably found that relatively older teachers had better competency in MS PowerPoint than MS Word. Similarly, figure-4.19 exposed the level of expertise in presentation software of teachers which was similar to MS Word. The largest part of teachers (n=219; 56%) demonstrated better competency in MS PowerPoint while expertise level (n=77; 20%) and minimum skills level (n=79; 20%) were found the nearly equal percentage of teachers.

Competency in the Use of ICT Devices

The data from the following table-4.7 demonstrated that the competency in using imaging Devices, Smart board along with Teachers Portal was the poorest in this study than other competency measured on the basis of mean scores. However, the professional use of the Teachers Portal made optimistic because a lot of teachers were connected across the country through the portal. Teachers Portal created an appeal to its users by stimulating through different types of content which ensured students' creativity and encouraged students' active participation in classroom learning. On the other hand, a few schools were found with Smart board attached classrooms (N=391; n=23; 06%). The following table presented the differences of competency in different devices by school location, school types and gender.

Table 4.7: Competency in ICT Devices

Categories		n	**Imaging Device**			**Smart Board**			**Teachers Portal**		
			Mean	**Std. Deviation**	**t-test (p>.05)**	**Mean**	**Std. Deviation**	**t-test (p>.05)**	**Mean**	**Std. Deviation**	**t-test (p>.05)**
School Location	Urban	76	2.76	1.35	.09	2.01	1.39	.19	3.30	1.23	.38
	Rural	315	2.48	1.29		1.81	1.13		3.16	1.31	
School Types	Govt.	30	2.73	1.23	.39	2.47	1.61	.00	3.40	1.25	.34
	Non-Govt.	361	2.52	1.31		1.80	1.13		3.17	1.30	
Gender	Male	265	2.63	1.33	.04	1.88	1.20	.56	3.23	1.26	.27
	Female	126	2.35	1.22		1.80	1.14		3.08	1.38	

In case of imaging devices, the teachers from urban (M=2.76; SD=1.35) compared to rural (M=2.48; SD=1.29) and govt. (M=2.73; SD=1.23) compared to non-govt. (M=2.52; SD=1.31) were found relatively more competent. Whereas the independent sample t-test disclosed significant difference only for male (M=1.88; SD=1.20) and female (M=1.80; SD=1.14) teachers (α= 0.04; $p < .05$).

Conversely, the teachers were found with a little competency in smart board use regarding their mean scores. Moreover, there were differences by school location, school types and gender differences based on competency in ICT devices. The differences indicated that urban teachers were better than rural, while government teachers exposed themselves well competent than non-government as well as male teachers had better competency in ICT devices compared to female teachers.

However, the significant differences had been found between government with non-government teachers ($p < .05$) in respect of smart board use.

On the other hand, there were some online platforms i.e., Teachers Portal, Khan Academy and some other sites which were the sources of content embedded with ICT. These content were helpful for teachers and students as well. In Bangladesh, the Teachers Portal was a platform for primary, middle and high school teachers for sharing content on this platform for collaboration and co-creation to develop qualitative content for digital education (MoE, 2019). However, the online platforms were not expectedly used in classroom according to teachers' self-assessment (M=3.18; SD=1.30; N=391). In contrast, t-test results did not display any significant variances among the pairs.

From the above discussion, it could be said that the teachers had a little competency in using smart board for teaching-learning purposes. Conversely, there were very few smart board connected classroom either urban or rural schools as well as government or non-government schools. The teachers from government schools possessed slightly better competency in smart board use. On the other hand, teachers demonstrated poorer competency in using imaging devices than smart board use. The teachers proved them more efficient in using Teachers Portal than imaging device and smart board use. In concluding remarks, it could be said that the teachers were familiar on basic application software and emailing ability rather than the professional use of ICT devices at all.

Competency in Online Application

The trend of ICT use by younger teachers was much higher than older teachers which had been shown in table-4.8 and figures-4.20 & 4.21.

Table 4.8: Competency in Online Application by Teachers' Age

Respondent's Age Group	n	MAIL services		YouTube		Online Services	
		M	SD	M	SD	M	SD
21-30	53	3.92	1.11	3.60	1.25	3.83	1.11
31-40	207	3.73	1.21	3.53	1.26	3.80	1.13
41-50	113	3.46	1.23	3.38	1.21	3.61	1.12
51+	18	2.61	1.24	2.33	1.33	2.94	1.26
Total	N=391	3.63	1.23	3.44	1.27	3.71	1.14

The data (table-4.8) enlightened that the younger teachers (age group 21-30) exposed more competency in online services i.e., email processing (M=3.92; SD=1.11), YouTube material (M=3.60; SD=1.25). They also exposed more competency in using google services which was treated as online services (M=3.83; SD=1.11) than other three age groups. The figures-4.20 & 4.21 below presented the comparative analysis of using online application by teachers different age groups.

Figure 4.20:Using Mail by Age

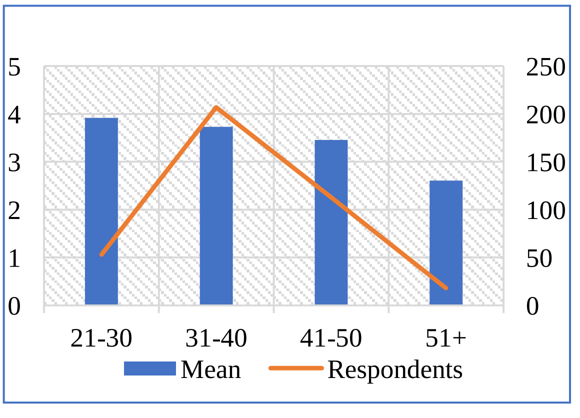
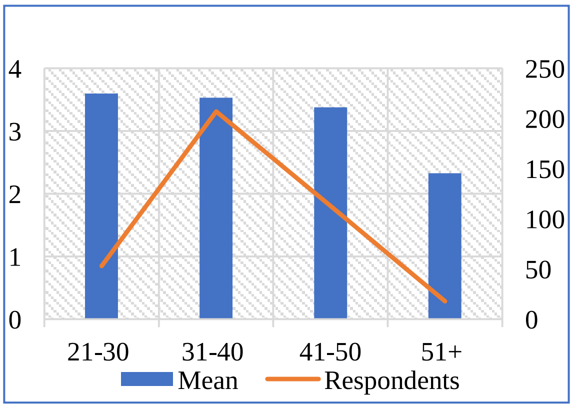


Figure 4.21: Using YouTube by Age



The competency in email services exposed the level of using email services by teachers for teaching purpose. The data of table-4.9 below indicated that the male teachers used email service more (M=3.69; SD=1.18; n=265) than their female colleagues (M=3.49; SD=1.33; n=126). On the contrary, urban teachers practiced email service more (M=3.93; SD=1.15; n=76) than rural teachers (M=3.56; SD=1.24; n=315). On the other hand, the government teachers (M=4.10; SD=1.10; n=30) claimed better themselves on mail processing than the non-government teachers (M=3.59; SD=1.24; n=361).

Table 4.9: Competency in Mail Services

Categories with Frequency (N=391)	School Location		School Types		Gender	
	Urban (76)	Rural (315)	Govt. (30)	Non-govt. (361)	Male (265)	Female (126)
M	3.93	3.56	4.10	3.59	3.69	3.49
SD	1.15	1.24	1.00	1.24	1.18	1.33
t- test/Sig. (.05)	.01		.03		.13	

Similarly, t-test results exposed significant differences in using mail services between rural and urban (α=0.01; p<.05) and government compared to non-government (α=0.03; p<.05) teachers. However, there was no significant difference between male and female teachers (α=0.13; p>.05) in terms of professional use of email.

The data in following table-4.10 exposed that there were differences in using YouTube material for classroom use by urban (M=3.70; SD=1.24; n=76) and rural (M=3.38; SD=1.27; n=315) as well as male (M=3.47; SD=1.26; n=265) compared to female (M=3.38; SD=1.28; n=126) teachers. However, the t-test did not show any significant differences in above-stated pairs.

Table 4.10: Competency in YouTube

Categories with Frequency (N=391)	School Location		School Types		Gender	
	Urban (76)	Rural (315)	Govt. (30)	Non-govt. (361)	Male (265)	Female (126)
Mean	3.70	3.38	3.90	3.40	3.47	3.38
Std. Dev	1.24	1.27	1.10	1.28	1.26	1.28
t- test/Sig. (.05)	.05		.03		.51	

On the other hand, the both of t-test and mean scores demonstrated significant differences (α= 0.03; p < .05) in competency in using YouTube material between govt. (M=3.90; SD=1.09; n=30) and non-govt. (M=3.40; SD=1.28; n=36) teachers.

Concurrently, the use of google resources could play important roles in teaching-learning activities. However, teachers could use internet resources for developing content to make learning understandable, especially for BGS subject. The following table-4.11 described the teachers' competency in browsing online material according to school location, types and gender distribution.

Table 4.11: Competency in Searching Online Resources

Categories with Frequency (N=391)	School Location		School Types		Gender	
	Urban (76)	Rural (315)	Govt. (30)	Non-govt. (361)	Male (265)	Female (126)
Mean	3.93	3.66	3.97	3.69	3.72	3.68
Std. Dev	1.05	1.16	1.10	1.14	1.15	1.13
t- test/Sig. (.05)	.06		.20		.73	

The average mean scores illustrated the differences on browsing online resources among earlier stated three categories. The urban teachers (M=3.93; SD=1.05; n=76) were better than rural teachers (M=3.66; SD=1.16; n=315). The government teachers (M=3.97; SD=1.10; n=30) exposed more competency compared to non-government (M=3.69; SD=1.14; n=361) teachers, whereas the male teachers (M=3.72; SD=1.15; n=265) demonstrated more competency than their female counterpart (M=3.68; SD=1.13; n=126). Conversely, the independent sample t-test did not show any significant differences between pairs.

Competency in Social Media in Education

The use of social media in education had significant effects on students' learning activities. It created more learning opportunities for students to get more helpful information and helped students to connect with others. The different educational systems could be introduced through Social Media which could make learning convenient. The table-4.12 explained the use of Social Media in education by teachers about school location, types and gender distribution.

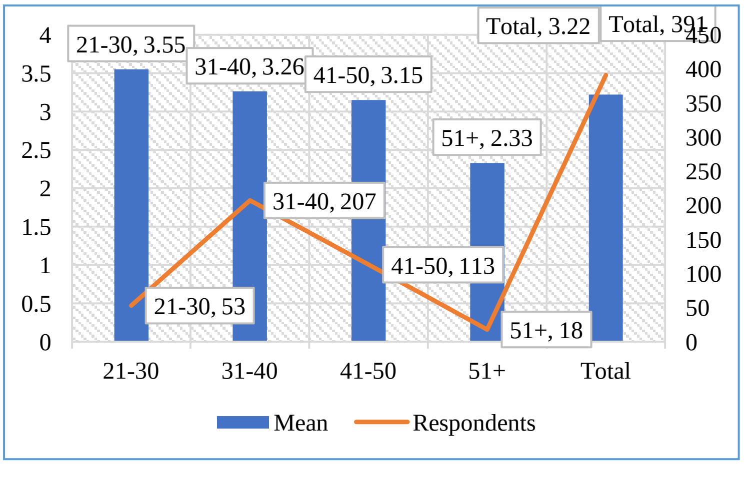
Table 4.12: Competency in Social Media in Education

Categories with Frequency (N=391)	School Location		School Types		Gender	
	Urban (76)	Rural (315)	Govt. (30)	Non-govt. (361)	Male (265)	Female (126)
Mean	3.37	3.19	3.67	3.19	3.29	3.09
Std. Dev	1.39	1.34	1.42	1.34	1.32	1.40
t- test/Sig. (.05)	.29		.06		.17	

However, the data reported that younger teachers were more interested (N=391; n=53; M=3.55; SD=1.37) in using social media for teaching than their older colleagues. This result was similar to mail processing ability, browsing online resources, passing the time on searching YouTube material (table-4.8). The results indicated that younger teachers were fascinated to spend more time on internet than older for teaching-learning activities as their opinion.

Conversely, the competency in Social Media in education indicated that the differences were continuing between urban (M=3.37; SD=1.39; n=76) and rural (M=3.19; SD=1.34; n=315) teachers; govt. (M=3.67; SD=1.42; n=30) against non-govt. (M=3.19; SD=1.34; n=361) and male (M=3.29; SD=1.32; n=265) compared to female (M=3.09; SD=1.40; n=126) teachers. However, the t-test demonstrated that the differences were not significant in above stated pairs. The next figure-4.22 described pictorially the differences of using social media in education by teachers' age.

Figure 4.22: Using Social Media in Education by Age



According to the figure-4.22, the younger teachers were more active in using social media in education. The results revealed that the teachers of age group 21-30 used more (M=3.35; n=53) than other three age groups of 31-40 (M=3.26; n=207), 41-50 (M=3.15; n=113) and 51+ (M=2.33; n=18).

Therefore, it could be said that there were differences between the teachers in terms of social media use in education regarding male and female; urban and rural; govt. and non-government. The differences were also found among the various age groups in using online services for the classroom teaching-learning arena. However, the differences should be reduced or minimized as early as possible for the betterment of students as well as the successful integration of ICT-pedagogy in teaching BGS.

Competency of Using ICT

The table-4.13 stated what extent the teachers could involve students in the lesson through ICT-related activities. The independent sample t-test had been administered separately on student-centric learning and problem-solving ability by school location and gender disparity. The results regarding competency in using ICT were as follows.

Table 4.13: Competency in Student-Centric Learning and Problem-Solving Skill

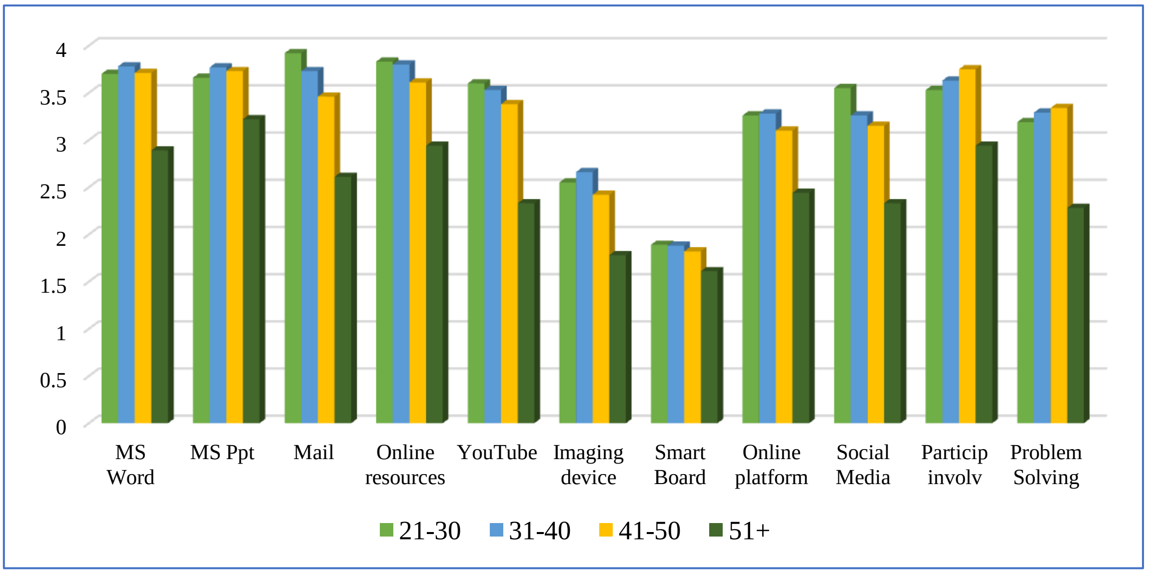
Categories with Frequency (N=391)	Student Centric Learning				Problem Solving Ability			
	School Location		Gender		School Location		Gender	
	Urban (76)	Rural (315)	Male (265)	Female (126)	Urban (76)	Rural (315)	Male (265)	Female (126)
Mean	3.80	3.57	3.63	3.60	3.48	3.19	3.22	3.30
Std. Dev	1.05	1.14	1.09	1.18	1.18	1.20	1.19	1.12
t- test/Sig. (.05)	.05		.77		.06		.57	

According to the findings, teachers were deficient in involving students in the lesson, either creating a student-centric learning environment or giving them the opportunity of problem-solving ability. The t-test demonstrated no significant difference between teachers in terms of school location or gender disparity. On the other hand, it had been found reverse results while the male (M=3.63; SD=1.09) teachers possessed slightly more competency for creating a student-centric learning environment than female colleagues (M=3.60; SD=1.18). Oppositely, female teachers (M=3.30; SD=1.12) were more capable than their male counterparts (M=3.22; SD=1.19) of employing problem-solving ability in teaching-learning activities.

As a Whole ICT Competency by Age

The teachers were asked to evaluate themselves in different ICT competency in a 5-points Likert's scale while 5 represented more competency and 1 showed comparatively lower whereas 3 represented 'no comment'. The figure-4.23 demonstrated the differences among different ICT competency addressing the four age groups of participant

Figure 4.23: ICT Competency by Teachers' Age



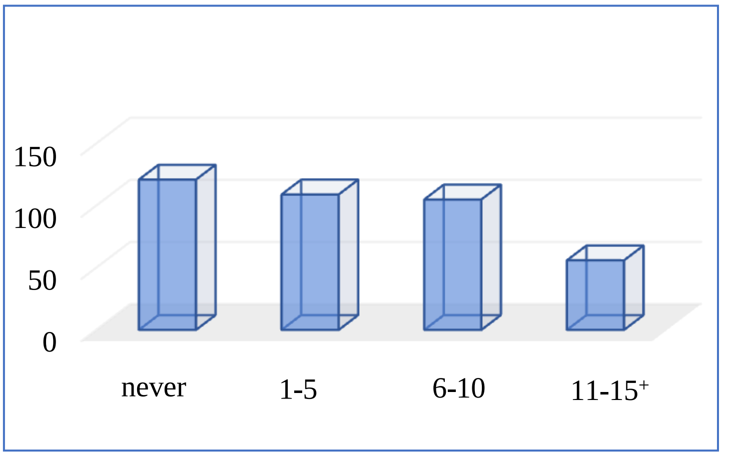
The above figure-4.23 presented a comparative analysis of various competency possessed by teachers. The data explained that the age group of 21-30 (group-1), 31-40 (group-2) & 41-50 (group-3) showed closely similar competency in different ICT tools while the age group of 51^{+} (group-4) were behind in all sectors of measured ICT competency. However, age group-1 and 2 demonstrated better performance than the other two age groups while age group-1 exposed higher scores on five sub-sections and age group-2 in four sub-sections. The age group-2 possessed better competency in MS Word, MS PowerPoint, using of imaging devices and online platform (teachers portal) for sharing content virtually. Conversely, age group-1 showed interest in mailing, resource collection from internet i.e., google, browsing YouTube for collecting video material, using smart board to deliver their lesson smartly, and social media to share learning resources.

It was remarkably found that the age group-2 showed the competency mostly in application software which was used to design content. On the other hand, the age group-1 exposed themselves as skilled in browsing online resources that helped to prepare meaningful and attractive content. However, the average mean scores had recognized that the older teachers were constantly deteriorating to use ICT material, whereas their experiences led them to make the classroom more interactive and creative through the use of ICT material. From the above discussion, it could be concluded that the aged teachers were less skilled rather than young teachers regarding the ICT-pedagogy integration in teaching-learning activities.

4.1.2.9 Uses of ICT Tools

The figure-4.24 disclosed that a majority of teachers (N=391; n= 270; 69%) conducted a class at least once a week with ICT while nearly one-third of teachers (N=391; n=121; 31%) never used ICT in classroom activities.

Figure 4.24: Conducted Class by ICT in a Week



However, it was remarkably found that some teachers (n=56; 14%) usually conducted 11^{+} classes with ICT per week. Similarly, the table stated that the teachers (N=391;

n=105; 27%) used to conduct class 6-10 per week by using ICT whereas the almost equal number of teachers (N=391; n=109; 28%) managed class 1-5 in a week (Appendix-L).

The figure-4.25 represented that the majority of the teachers possessed interest in using internet for classroom teaching-learning activities.

Figure 4.25: Use of the Internet by Teachers

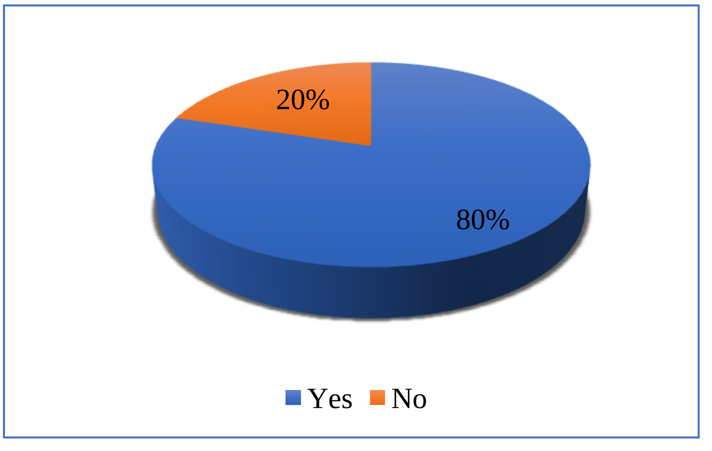


Figure-4.25 boosted up the confidence for integrating ICT-pedagogy in education. The vast teachers agreed (N=391; n=309; 80%) that they usually wanted to use internet for teaching-learning activities. On the other hand, a relatively large number of teachers were not interested in to use of internet (N=391; n=78; 20%) in classroom teaching-learning activities (Appendix-L).

Key Findings of Existing Situation in Schools for ICT-pedagogy Integration

This study covered boys, girls and co-education types of schools. Among the schools, there were 92% from non-government while only 8% was government type schools. There were 81% schools from rural and 19% from urban. Most of the schools had 60^{+} students in a class. At least one laptop or computer for multimedia class with 48% internet coverage was in 83% schools. On the other hand, there was shortage of ICT-related infrastructure and scarcity of modern ICT tools i.e., computer or laptop, multimedia projector, smart board, interactive whiteboards, web boards, digital cameras, etc. in maximum schools for classroom activities.

On the other hand, the 68% teachers were male while 32% female and their age range mostly in 31-40 years. Most of teachers attended in professional degree courses and had 1-5 years of teaching experience. Among the teachers, 78% attained in ICT training courses and 58% were satisfied with their ICT competency. Availability of ICT facilities in school were investigated through self reported survey from the teachers. The findings disclosed that multimedia classrooms were absent in 29% of the sample school either because of malfunction or lack of budget. Internet facilities were not found for classroom use in 52% school. The presence of computer/laptop for teaching purpose was not found in 17% school whereas smart board was found only in 6% schools.

On the other hand, most teachers (80%) were positive towards internet use in their classrooms. Although the teachers felt more or less confidence in ICT knowledge, it was not reflected during classroom observation. Concurrently, teachers were more familiar with MS PowerPoint and MS Word than other ICT skills but the differences were found in ICT competency of teachers regarding school types and gender diversities.

4.2 Attitudes towards ICT-pedagogy Integration

Attitudes were engaged in identifying teachers' views about the ICT-pedagogy integration process in the BGS classrooms. It also determined the perceived ease of use and usefulness regarding ICT-pedagogy integration (Alwahaishi & Snasel, 2013). However, the usefulness measured a person's believed in the benefits of his or her job performance while ease of use led to knowing the free of effort for assimilation (Davis, 1989) of new innovation regarding ICT-pedagogy integration. On the other hand, affective components reflected behavioral intension of attitudes that described an individual's perceptions regarding the absence or presence of resources required to integrate ICT in classroom activities (Alwahaishi & Snasel, 2013).

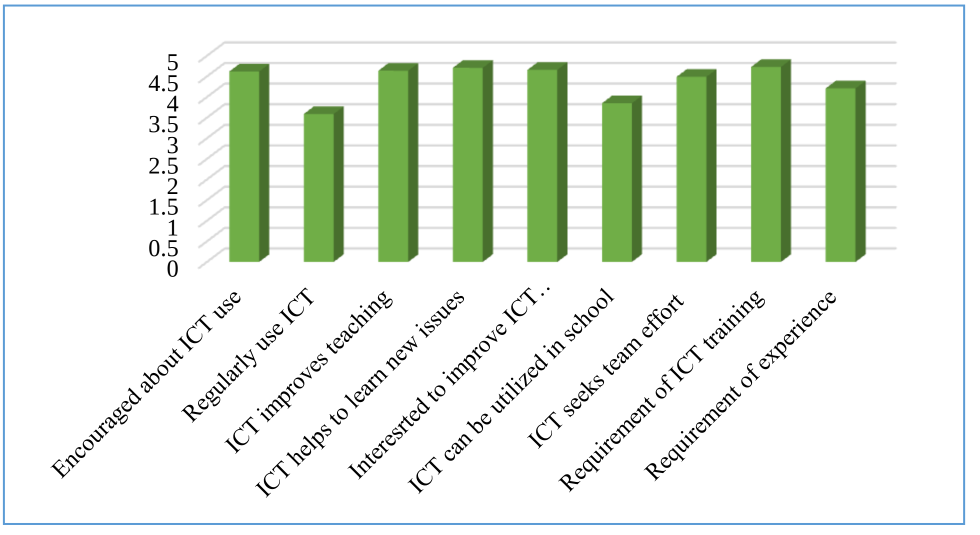
Hence, the four sub-sections entitled Attitudes, Usefulness, Ease of Use and Affective Components were included in the overall attitudes scale to explore the teachers' attitudes towards ICT-pedagogy integration in secondary school BGS classrooms in Bangladesh (section-B of 3.6.1). Altogether there were 30 items in four parts, where Attitudes and Usefulness each consisted of 9 items; and Ease of Use and Affective Components entailed of 6 items for each (Appendix-B). The findings were presented in the following sections.

4.2.1 Attitudinal Views

The sub-scale of attitudinal views consisted of nine (09) items focused on attitudes towards ICT-pedagogy integration in the school curriculum. These items provided positive insights about teachers' intrinsic attention to incorporate ICT in teaching-learning activities, which might significantly affect ICT-pedagogy integration in education. The following figure-4.26 pictorially presented attitudes sub-scale based on mean attitudes. The participants demonstrated a remarkably positive attitudes

(M=4.39; SD=.41; N=391) towards teachers' ICT-pedagogy integration in teaching BGS (Appendix-O).

Figure 4.26: Attitudinal Views towards ICT-Pedagogy Integration



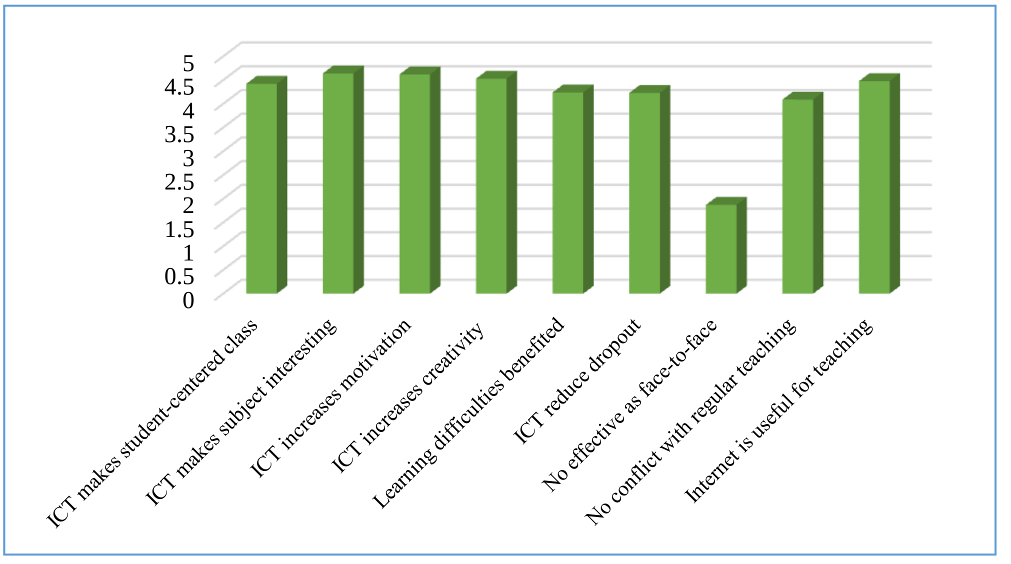
The figure exposed that successful integration of ICT-pedagogy in classroom practice required teacher training before going to integrate technology (M=4.73; SD=.49). The teachers believed that the ICT flourished a lots of opportunities to learn new knowledge for effective ICT-pedagogy integration (M=4.71; SD=.48) for classroom teaching-learning activities. Similarly, the teachers wondered if they wanted to improve their skill in using ICT, including internet browsing (M=4.66; SD=.52) and also could enhance their teaching approaches (M=4.64; SD=.60) in teaching BGS. It could be possible because most teachers (M=4.62; SD=.58) were encouraged and felt confident to practice ICT-pedagogy in education. Several researchers also identified confidence as an important mediator in ICT integration (Bozdogan & Ozen, 2014; Teo, 2008; Wang, 2007). However, they were not accustomed to using ICT in teaching (M=3.59; SD=1.13) compared to their possessed confidence. Conversely, the teachers believed that the fruitful integration of ICT-pedagogy in schools required highly team efforts of every member of the concerned school (M=4.49; SD=.76) and previous experience of using ICT material (M=4.21; SD=.99).

The teachers' attitudinal views were the highest (M=4.39; SD=.41) compared to perceived usefulness (M=4.08; SD=.43), perceived ease of use (M=3.51; SD=64), and affective components (M=4.08; SD=.43) of attitude sub-scale measured in this study. The average mean score indicated that teachers had strongly positive attitudes towards ICT-pedagogy integration. The possessed attitudes had significant impact the integration process in classroom practice but might depend on how effectively the possessed attitudes could be used. They also believed that ICT might enhance enough potentiality for teachers to learn many new things and might improve their teaching practice. The data also indicated that the teachers needed to be trained up before they entering into ICT-pedagogy integration process in schools because it required a high level of skills and experience. However, the integration process might be helpful to remove anxiety and built up confidence to use ICT-pedagogy frequently in the classrooms. Similarly, the team effort was appeared an important factor for successful integration of ICT-pedagogy in BGS classrooms. Therefore, it could be exposed that teachers had significant positive attitudes and they were keen to integrate ICT-pedagogy in their everyday classroom activities. Moreover, these positive attitudes could be utilized for smooth ICT-pedagogy integration in curriculum materialization.

4.2.2 Perceived Usefulness

This was important to explore what extent teachers thought about the usefulness of ICT-pedagogy integration in teaching-learning activities. According to data (Appendix-O), the teachers were optimistic about the usefulness of the integration process. The findings were presented below in figure-4.27.

Figure 4.27: Usefulness of ICT-pedagogy Integration



The figure exhibited that BGS teachers of secondary schools demonstrated highly positive (M=4.08; SD=.43; N=391) attitudes about the usefulness of ICT-pedagogy integration in teaching BGS. However, the teachers believed that the ICT-pedagogy integration was donated to make the BGS classrooms more interesting (M=4.64; SD=.57). They also revealed that the use of ICT-pedagogy made students motivated towards learning (M=4.62; SD=.54) and increased students' level of creativity (M=4.53; SD=.60). NEP-2010 also emphasized that developing learners' latent intellectual ability and ICT-pedagogy could enhance the development of students' learning. Concurrently, Bozdogan and Ozen (2014) claimed that the ease use of technology had a momentous role during the ICT integration process in schools. In addition, Afshari et al. (2010) stated that school principals were required to be cognizant of the benefits of new technology. They also disclosed that technology implementation in classroom instruction depended on whether principals understand the value of ICT and its benefits.

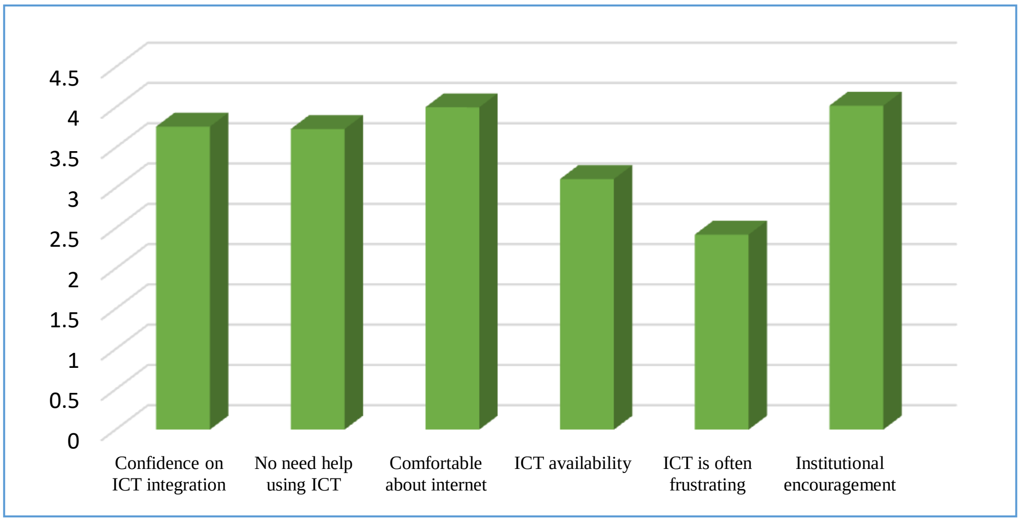
The teachers highlighted that the students with learning difficulties were strongly benefited (M=4.24; SD=.76) from ICT-pedagogy integration in classrooms. They also claimed that the integration process helped children with learning difficulties and reduced the dropout rate of regular students (M=4.23; SD=.71) in classroom activities. Furthermore, the teachers believed that ICT-pedagogy integration altered BGS classroom from teacher-centric to student-centric (M=4.42; SD=.74). They also claimed that their teaching became intensely benefitted from the use of internet resources (M=4.48; SD=.65) and harmonized to their regular teaching-learning process (M=4.09; SD=.76). Surprisingly, teachers exposed their vote to face-to-face classroom activities because they strongly believed that ICT was not an alternative to face-to-face classroom teaching (M=1.87; SD=.76). Jhurree (2005) claimed that technology worked as a significant learning tool, it could not be replaced of face-to-face classroom teaching.

The attitudes towards usefulness of ICT-pedagogy integration could be greatly used in teaching BGS. It also be helped to facilitate student-centric teaching and improve their learning capacity in friendly environment. Moreover, integration of ICT-pedagogy motivated students to deeper learning which transformed them into the creative learner. Concurrently, teachers were fairly confident about using ICT-pedagogy in teaching BGS because it worked as an effective teaching tool in face-to-face teaching-learning activities. Ghavifekr and Rosdy (2015) stated that ICT-embedded teaching-learning was more effective than the traditional classroom environment. The use of ICT-pedagogy in education also significantly helped learners with learning difficulties, making self-learning opportunities, which ultimately reduced the dropout rate. However, the teachers were moderately aware about the usefulness of ICT-pedagogy integration in BGS classrooms. They wanted to prioritize ICT-embedded classrooms but did not support ICT as alternative teaching tools replacing face-to-face teaching-learning activities.

4.2.3 Perceived Ease of Use

Ease of use represented the measurement of the ICT-pedagogy integration process that kept the comfort of using ICT in the classrooms or ease access to ICT tools. The figure-4.28 given below illustrated the data graphically and displayed a fairly positive attitudes of teachers (M=3.51; SD=.64; N=391) considering the ease of access about ICT-pedagogy integration process in teaching BGS at schools (Appendix-P).

Figure 4.28: Ease of Use towards ICT-Pedagogy Integration



The above figure revealed that most teachers had little access to ICT material (M=3.51; SD=.64) for their classroom activities. However, Lu, Tsai, and Wu (2015) claimed that ICT equipment and teachers' access were key factors in ICT-pedagogy integration. On the other hand, it was stimulating news that some schools were found those were aware enough (M=4.02; SD=1.04) about the benefits of ICT-pedagogy integration in classroom activities. Simultaneously, they encouraged their teachers, but there was no reward for practicing ICT-pedagogy in teaching BGS (table-4.42).

On the other hand, the teachers exposed themselves as an admirer of ICT-pedagogy integrators (M=4.00; SD=.97) as they felt at ease on using internet for instructional purpose. They seldom became confused (M=3.76; SD=1.13) to integrate ICT-pedagogy for teaching and hardly required help (M=3.73; SD=1.16) during ICT use. They also refuted their frustration (M=2.42; SD=1.12) of using ICT-pedagogy in BGS teaching. Moreover, some teachers were found who used personal laptop and modem for teaching despite having no laptops or multimedia projector in schools. They sometimes used their laptop monitor as an alternative tool of multimedia projector because they were short or absent. Conversely, they were somehow discouraged (M=3.11; SD=1.38) for not having easy access to ICT in the classrooms both for teachers and students.

In contrast, teachers evaluated themselves moderately confident about ICT-pedagogy user in classroom teaching-learning activities. They felt comfort during internet use for the preparation of ICT embedded classrooms. Similarly, the data indicated that the teachers more or less utilized ICT tools and internet resources that might make classroom activities meaningful. However, it was observed that either institution or teachers were reluctant about their preparation despite having informed visit rather than surprise visit. However, teachers presented themselves with adequate ICT maintenance skills and rarely required help from others. Conversely, gaps were found between teachers' possessed ICT skills and their teaching-learning practices in ICT pedagogy integrated classrooms (table-4.38).

A few of teachers confidently used multimedia classroom whereas the others were dependent on setting the equipment. The study also revealed that teachers and students both had a moderate level of access to ICT material but in fact, only one laptop and multimedia projector were available in most of the visited schools. It was disappointing that teachers were not always welcoming about using ICT equipment while students were not at all allowed to use the equipment. However, the ICT division (2018) aimed to make education and learning more effective and enjoyable for both students and teachers through using multimedia classroom.

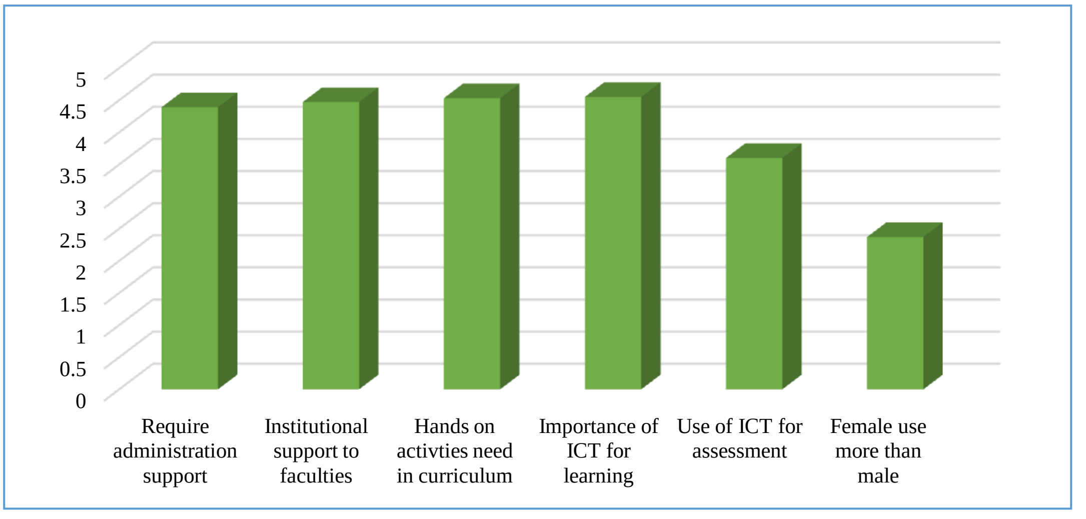
Moreover, the accessibility of ICT equipment in schools was not in favor of the ICT integration process (Tezci, 2009). However, the effective and speedy ICT-pedagogy integration in schools required technology support, including internet facilities in classroom for teachers and students. Therefore, the schools and concerned authorities needed to create opportunities for using ICT equipment in classroom use.

4.2.4 Attitudes towards Affective Components

Personal feeling about technology was an important factor in the integration process of ICT-pedagogy in the BGS classrooms. The teachers were found to have positive attitudes towards affective components regarding ICT-pedagogy integration in teaching BGS. The figure-4.29 disclosed positive attitudes towards affective components (M=3.99; SD=.55; N=391), i.e., earlier discussed three sub-scales of attitudes. However, most teachers strongly believed that ICT-pedagogy integration positively affected students learning (M=4.55; SD=.70). They also believed that applied knowledge and real-world experience (M=4.53; SD=.68) should be integrated into the BGS curriculum for making teaching-learning enjoyable and making hands-on learning opportunities for students. For the integration of ICT-pedagogy, teachers strongly required a caring team-teaching environment from administration (M=4.39; SD=.88) and school authorities (M=4.47; SD=.72) who could meet their needs practically to accomplish the daily classroom activities. On the other hand, despite demonstrating positive attitudes (M=3.60; SD=1.11), the teachers seemed nervous in students' assessment by using ICT.

On the other hand, teachers were asked whether the male or female teachers used more ICT-pedagogy in teaching BGS. Interestingly, the data exposed that both of the groups slightly practiced ICT-pedagogy (M=2.37; SD=1.21) where the male teachers practiced lower (N=391; f=265; M=2.11; SD=1.04) compared to female teachers (N=391; f=126; M=2.91; SD=1.37). The figure-4.29 given below graphically presented the level of attitudes towards affective components (Appendix-Q).

Figure 4.29: Attitudes about Affective Components for ICT-Pedagogy Integration



The above figure revealed the behavioral intention and provided insights of teachers' rational thoughts on ICT-pedagogy integration process. According to the data, teachers put highest importance upon hands-on activities in the BGS curriculum that might be used to deepen and sustainable learning opportunities for students. On the other hand, teachers required administrative and institutional support to effectively integrate ICT-pedagogy in classroom instruction. Additionally, males or females had been compared their uses of ICT-pedagogy in BGS classroom activities. Interestingly, the data argued that females practiced more in ICT-pedagogy integration than their male counterparts, although the level of practice was lower in both groups. Conversely, the teachers acknowledged that use of ICT in assessment was important for rational and judgment. However, the practice of ICT in formative assessment had not been used at all but teachers were habituated to the traditional type of formative assessment during teaching-learning activities.

4.2.5 Correlations of Attitude Sub-Scales

The table-4.14 demonstrated the correlations among the attitudes, perceived usefulness, perceived ease of use and affective components regarding ICT-pedagogy integration in the BGS classrooms. The data claimed that the attitude subscales correlated with each other, shown in the following table. These results were similar to Chanlin et al. (2006); Mumtaz (2000) who disclosed that the use of ICT as a pedagogical tool was associated with the level of understanding, willingness, confidence, motivation and the perceived usefulness of ICT.

Table 4.14: Correlation Matrix of Attitudes Sub-scales

Subscales	1	2	3	4
Attitude (1)	1			
Perceived Usefulness (2)	.51**	1		
Perceived Ease of Use (3)	.42**	.33**	1	
Affective Components (4)	.37**	.38**	.57**	1

**. Correlation was significant at the 0.01 level (2-tailed).

The table-4.14 revealed six relationships that had been found statistically significant. The correlation matrix exposed that the significance level was .00 which was less than the accepted alpha level .01. The significant level between attitude and perceived usefulness showed ($r = 0.51$, $p < .01$), attitude and perceived ease of use reflected ($r = 0.42$, $p < .01$) while attitude and affective components displayed ($r = 0.37$, $p < .01$) regarding ICT-pedagogy integration in BGS. Similarly, there were significant correlations between perceived usefulness with perceived ease of use ($r = 0.33$, $p < .01$) and perceived usefulness with affective components ($r = 0.38$, $p < .01$) while perceived ease of use and affective components were also correlated ($r = 0.57$, $p < .01$) towards incorporating ICT-pedagogy in BGS. The results ensured that there were significant relationships among attitude, perceived usefulness, perceived ease of use and affective components towards ICT-pedagogy integration in the BGS classrooms. Similarly, Raman, Mallick, and Sofian (2015) as well as Crittenden (2009) depicted that the attitudes towards ICT had been found to be positively correlated with perceived self-efficacy towards ICT.

According to the results, it could be assumed if the attitudes towards ICT-pedagogy integration were positive, perceived usefulness was also positive. In contrast, if the attitudes towards ICT-pedagogy integration were lesser, the attitudes would be lesser. The relationships between perceived usefulness, perceived ease of use, and affective components were also true. Therefore, the data disclosed that the sub-scales of the questionnaire could explain the teachers' attitudes towards ICT-pedagogy integration in the BGS classrooms.

The overall findings disclosed that the BGS teachers possessed positive attitudes towards ICT-pedagogy integration irrespective of different types of variances like rural and urban, government against non-government, male teachers compared to female teachers, teachers' age, experience and their professional degree.

4.2.6 Correlations with Attitudes and Skills

The following table-4.15 illustrated ten different relationships which were correlated with attitude and ICT skill. The table also showed the correlation between attitude and the presence of laptop or computer in the classrooms.

Table 4.15: Correlation Matrix with Attitudes and ICT Skills

Correlation scales	1	2	3	4	5
Attitude (1)	1				
Confidence in ICT Skill (2)	.30**	1			
Teachers’ ICT skill (3) (total-11 items)	.37**	.75**	1		
Skill on Application Software (4) (MS Word & PowerPoint)	.31*	.71**	.86**	1	
Number of Laptop/Computer in classroom (5)	.19**	.18**	.23**	.19**	1

**. Correlation was significant at the 0.01 level (2-tailed).

The above table-4.15 revealed moderate to high correlation in each pair where the p value level was .00 which was less than the accepted alpha level .01. However, the demonstrated correlation between attitudes and confidence showed ($r=0.30$, $p < .01$); attitudes and teachers' ICT skill exposed ($r=0.37$, $p < .01$) and attitudes with skill on application software exhibited ($r=0.31$, $p < .01$). On the other hand, the matrix exposed highly correlation between confidence in ICT skill and level of teachers' ICT skills ($r = 0.75$, $p < .01$); confidence in ICT skill and skill on application software ($r = 0.71$, $p < .01$) and skill on application software with teachers' ICT skills ($r = 0.86$, $p < .01$).

Therefore, the above stated associations disclosed significant correlations with attitudes and different types of ICT skills. Similarly, the relationships indicated significant differences persistent towards attitudes of ICT-pedagogy integration between the teachers who had prior knowledge on ICT compared to the teachers without prior knowledge. This finding was associated with the results of Islam (2015), Copriady (2014), Bozdogan and Ozen (2014), Copriady (2014)**,** Lal (2014), Chowdhury (2009), Cavas et al. (2009), and Teo (2008). They found that the teachers who had experience with ICT use, had a significant role in positive attitudes compared to ICT non-user teachers but differed with the findings of Semerci and Aydin (2018). However, Al-zaidiyeen, Mei, and Fook (2010) concluded a significant positive relationship between teachers' level of ICT use and their attitudes towards ICT. Wario (2014) also argued that ICT competence was the most influencing factor affecting ICT use in the classrooms.

The results exposed that the teachers who had more confidence in ICT skill, possessed more positive attitudes. However, the confidence increased based on one's experience and perception which could assure teachers to make habits through everyday use of ICT in personal as well professional life. A confident teacher exhibited better performance than others of ICT use in the classrooms. According to the findings, the teachers' ICT skills and their level of confidence as well as teachers' ICT skills and their application software skill demonstrated high correlations with each other along with teachers' attitudes. These findings argued that attitudes and confidence were positively correlated. Therefore, it was important for the government and institutions to take the initiatives unitedly to improve teachers' skills in the use of ICT-pedagogy in school.

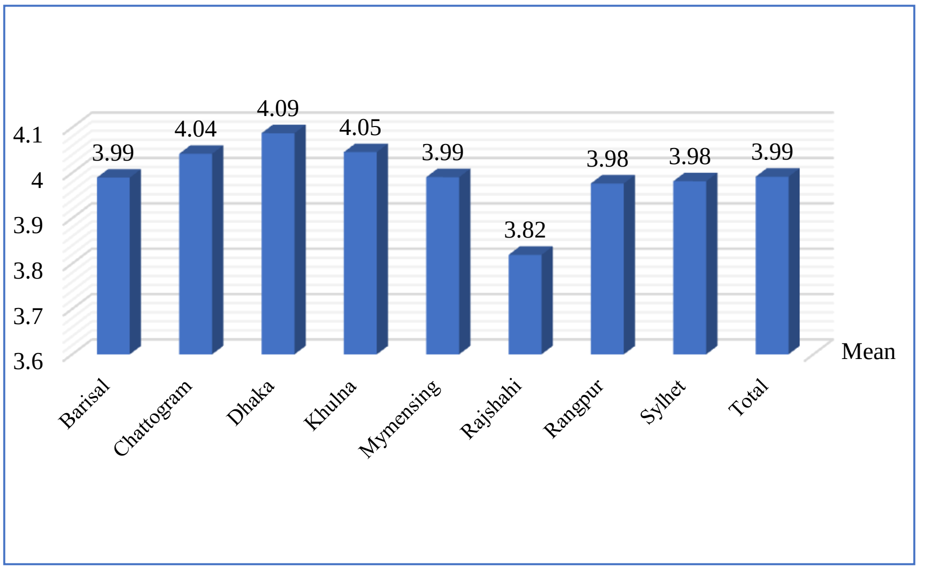
From the above discussion, it could be claimed if the capability of using ICT tools by teachers was positive, the overall attitudes towards ICT-pedagogy integration in BGS would also be positive. In contrast, if the capability of using ICT tools by teachers was lower, then the attitudes towards ICT-pedagogy integration in BGS would be lower. These correlations were also true if it was considered in other stated relations. Therefore, it could be concluded that a strong level of prior knowledge on different types of ICT skills boost up ICT-pedagogy integration in the school curriculum.

On the other hand, the data illustrated that the presence of laptop or computer in the classroom was significantly correlated ($r = 0.19$, $p < .01$) with the attitudes towards ICT-pedagogy integration in the BGS classrooms. The other correlations also found with statistically significant with each other. These were the level of confidence in ICT skill and presence of laptop or computer in classroom ($r = 0.18$, $p < .01$); teachers' ICT skills and presence of laptop or computer in classroom ($r = 0.23$, $p < .01$); skill on application software and presence of laptop or computer in classroom ($r = 0.19$, $p < .01$). The result exposed that the presence of laptop/computer in classroom correlated with attitudes towards ICT-pedagogy integration in teaching BGS.

4.2.7 Attitudes by Divisions

The efforts had been taken to explore whether there were any differences among the teachers' attitudes towards ICT-pedagogy integration by division. The results provided positive insights into the attitudes of the teachers around Bangladesh which were very much important for smooth, balanced and successful integration of ICT-pedagogy in the school curriculum. The following figure-4.30 graphically presented the data regarding teachers' attitudes by division.

Figure 4.30: Attitudes to ICT-pedagogy Integration by Division



The above table denoted that the teachers from each division possessed to some extent positive and closely similar attitudes towards ICT-pedagogy integration in classroom activities, while the teachers from Dhaka division (M=4.09; SD=.39) claimed more positive attitudes compared to others. On the other hand, the teachers from Rajshahi (M=3.82; SD=.36) revealed the lowest but possessed moderate attitudes between the divisions. In other words, the top three scores regarding the average attitudes were above 4:00 whereas the rest of the five demonstrated below 4.00 but was closely related to each other except Rajshahi (Appendix-R).

On the other hand, the statistical analysis (table-4.16) argued that there was statistically significant difference ($p < .05$) among the teachers considering divisions.

Table 4.16: ICT-pedagogy Integration by Divisions

SL	Part-A (ANOVA)						
		Category	Sum of Squares	df	Mean Square	F	*sig.*
1	Division	Between Groups	2.150	7	.307	2.09	.04
		Within Groups	56.217	383	.147		
		Total	58.366	390			

*p < .05 for ANOVA whereas Homogeneity of variance has been found in each categories p > .05.

Despite having positive attitudes of teachers all over Bangladesh, it could be concluded that there were significant differences in teachers' attitudes towards ICT-pedagogy integration. The results indicated that the development of ICT-pedagogy integration among districts was not parallelly progressed all over Bangladesh. Some shortcomings had been found during classroom observation spoken by teachers which were the subject preference, lack of infrastructure development, improper distribution of ICT equipment in schools, inability to organize ICT equipment by schools, lack of cooperation from colleagues or institutional heads or by SMC members, insufficient training on ICT-pedagogy integration, etc. These findings recommended that the disparities should be reduced and might provide similar opportunity for students to flourish their latent intellectual ability. Therefore, NEP-2010 suggested reducing the discriminations among several secondary educational institutions and various socio-economic, ethnic, and socially disadvantaged backgrounds. Furthermore, the NIP (2009, 2015 & 2018) emphasized enhancing social equity in society as well as expected to expand the quality of education to all parts of the country using ICT-pedagogy.

Key Findings of Attitudes towards ICT-pedagogy Integration

The teachers possessed overall positive attitudes towards ICT-pedagogy integration but there were variations in different sub-scales regarding school location, school types, age, ICT knowledge and ICT confidence. Teachers confirmed that the integration of ICT-pedagogy had significant effect to facilitate student-centric approach. The use of ICT-pedagogy in teaching-learning activities also helped to make learners creative, self-directed and motivated. Concurrently, teachers were found confident about using ICT-pedagogy and had positive intention to use in teaching BGS although the gaps were found between teachers' possessed ICT skills and their teaching-learning practices in ICT-pedagogy integrated classrooms. Additionally, the female teachers were found more practitioner than male teachers in spite of lower use of ICT-pedagogy in both groups. On the other hand, ICT was used to a very limited extent in formative assessment rather than the teachers were habituated to the traditional type of formative assessment during teaching-learning activities.

4.3 ICT-pedagogy use in BGS Classrooms

The ICT-pedagogy integration process in the classroom had been observed to explore the degree of amalgamation of pedagogical knowledge with ICT and content knowledge. The primary data was collected through classroom observation in two phases to compare the uniformity of ICT-pedagogy integration process. There was two to three months gap between 1st and 2nd phases in the same academic year and the same teacher. Although it was an informed visit, teachers were requested to conduct their class with ICT equipment as per class routine. However, the data had been presented into eight different sub-sections based on mean average and standard deviation but focused on the comparative analysis between the 1st and 2nd phases. Concurrently, at the end of this sub-section presented the comparative analysis between actual classroom practices (based on RQ 3) compared to their possessed attitudes (based on RQ 2) towards ICT-pedagogy integration which was named Attitudes against Practice: Research Reflection. Initially, the discussion started with lesson preparation.

4.3.1 Lesson Preparation

ICT-pedagogy integrated classrooms required proper homework for successfully completing the lesson. It might come from teachers or institutions. Teachers needed to have apposite plan aligned with ICT-pedagogy integrated classrooms, whereas institutions should provide well-equipped classroom. However, the table-4.17 listed below presented the level of lesson preparation.

Table 4.17: Lesson Preparation

SL	Statements	N	1st Phase		2nd Phase	
			M	SD	M	SD
1	ICT resources were prepared and ready before lesson in schools	16	2.38	2.22	3.06	1.61
2	Teacher set realistic learning outcomes		3.093.81	.91	3.69	.87
	Total			1.27	3.38	1.12

The data indicated that the results of the 2nd phase were better than the 1st phase, but it did not happen concurrently for both times. Schools were found more prepared in the 2nd phase than the 1st phase, whereas teachers were slightly backward in the 2nd phase than the 1st phase in setting lesson objectives. However, the above data depicted that the teachers prepared themselves better in setting learning outcomes (M=3.81; SD=.91) and (M=3.69; SD=.87) for the 1st and 2nd time although the average mean declined in the 2nd phase. Concurrently, most schools had lacked of preparation for setting multimedia projector, either fixed or temporary, in the classroom in 1st (M=2.38; SD=2.38) or 2nd phases (M=3.09; SD=1.27).

Many schools were found which had no fixed multimedia classroom. It was considered a major challenge for ICT-pedagogy integration. Sometimes, teachers (COB-3, 5, 6, 22, 27, & 31) claimed that they had to carry multimedia projector in the classrooms including other ICT equipment if they desired to use in the BGS classrooms. In contrast, most schools had only one multimedia projector, which was hardly possible to fix in certain classroom for other uses. In some cases, the teachers had to inform or request to head of the institution before conducting class with a multimedia projector (COB-5, 8, 12, 13, 15, 21, 24, 29, & 31).

On the other hand, some of the schools had been found with Sheikh Rasel Computer Lab (COB-1, 3, 4, 5, 9, & 12) but it was fixed only for ICT classes. The usage of multimedia projector, laptop or desktop computer and slightly sound system were the technologies which had been used in a lesson. Moreover, setting multimedia was time-consuming, and sometimes teachers felt bored, which affected the total class duration. They needed to restrain class time and finish the discussion in brief. The time-consuming preparation for multimedia class ultimately discouraged teachers from incorporating ICT-pedagogy in classroom practice. On the other hand, there were some schools that had only one fixed multimedia classroom and students used this room periodically. This process made another problem to finish the class in time because there was no extra time allocated in between two class periods for students' movement.

Then again, it had been found that most of the teachers used model content in lesson presentation for 1st phase while many of them used self-prepared content in 2nd phase. The model content were prepared following the TPACK model by expert teachers of Bangladesh and Global Studies (BGS) with continuous supervision of ICT and pedagogy expert teacher educators under auspices of a2i, Prime Minister's Office, Bangladesh. The learning outcomes were set in model content guided by curriculum while the learning outcomes directed the lesson plan to achieve the learning goals. Conversely, according to the textbook, teachers' self-prepared content had some lacking in setting learning outcomes. Although the learning outcomes and its presentation steps of lesson plan were well organized in model content, teachers were unable to go through the steps accordingly. Consecutively, teachers were lacking in preparing multimedia digital content for ICT-pedagogy integration in the BGS classrooms. Moreover, the classrooms were observed around August to November of 2019, whereas teachers taught such topics which might be taught in the first quarter of the academic session. Furthermore, it was identified that most of the teachers selected comfortable lesson for presentation despite having repetition.

4.3.2 Content Knowledge

Content Knowledge made teachers confident for analyzing the particular topic with relevant examples and discussion in class. However, Özden (2008) defined content knowledge that it was the concepts, principles, relationships, processes, and applications that a student should know within a given academic subject, appropriate for his/her and organization of the knowledge. The table-4.18 below represented the moderate content knowledge possessed by teachers during observation for the 1st (M=3.73; SD=.74) and 2nd phases (M=3.75; SD=.72).

Table 4.18: Content Knowledge

SL	Statements	N	1st Phase		2nd Phase	
			M	SD	M	SD
1	Level of content knowledge according to learning outcomes	16	4.25	.68	4.25	.86
2	Discussion had gone through level of students' understanding		3.75	.68	3.63	.87
3	Explanation was enough according to content area		3.50	1.03	3.38	.96
4	Relevant analysis was aimed to learning objectives		3.44	.96	3.75	1.00
	Total		3.73	.74	3.75	.72

The above findings explained that the teachers had better content knowledge following the learning outcomes, set in the lesson plan for the 1st (M=4.25; SD=.68) and 2nd phases (M=4.25; SD=.86). These scores were the highest which teachers possessed in classroom observation either in 1st or 2nd phases. The results exposed that most teachers represented themselves with sound content knowledge to achieve the learning outcomes set in the lesson plan.

Although the teachers possessed sound content knowledge, differences were found in the relevant analysis according to learning outcomes both for 1st (M=3.44; SD=.96) and 2nd (M=3.75; SD=1.00) phases compared to content knowledge. However, the lessons were not expectedly explained, which might help achieving the learning outcomes. Conversely, the teachers performed relatively better in 2nd phase though there was still a lack of content related analysis. The teachers mainly used model content in classroom activities without proper preparation for the lessons. Thus, the teachers' discussion was not always aligned according to learning outcomes, especially for model content. On the contrary, it was found that a few content had been prepared by teachers him/herself, especially in the 1st phase. Overall, teachers demonstrated more expertise in their self-developed multimedia digital content compared to collected digital content due to knowing the plan in advance what they needed to cover by the lesson. They could prepare themselves according to the lesson plan which made teachers more confident in lesson and they were able to explain properly than model content. Otherwise, teachers needed to follow the given guidelines to demonstrate model content for useful teaching-learning activities in classroom practice. However, proper preparation helped to keep control of the lesson with relevant discussion, explanation, and analysis that transformed students into creative learners.

Moreover, the teachers exposed themselves moderately capable of discussing and explaining the lesson addressing the level of students' understanding. The results indicated that the teachers' discussion on the lesson was comparatively better in 1st phase (M=3.75; SD=.68) compared to 2nd phase (M=3.63; SD=.87). The level of content explanation was also better in 1st phase (M=3.50; SD=1.03) than 2nd phase (M=3.38; SD=.96). The results revealed that the performance of teachers was shaky and varied in different conditions. In most cases, teachers were not sure what they would do in the following steps. As a result, teachers could not but finished incomplete lesson without discussion or insufficient discussion. They demonstrated one slide after another without knowing the goals of the lesson. Teachers could not fully deliver the lesson due to little content knowledge. Sometimes they were seemed nervous about the ongoing lesson and could not manage students properly. It had also been noticed that students were taught for examination instead of focusing on learning. However, little content knowledge of teachers hampered students' achievement of the learning outcomes properly. Therefore, the findings suggested that teachers needed to develop their subject understanding in BGS.

4.3.3 Pedagogical Knowledge

The data from the following table-4.19 disclosed that teachers had a little pedagogical knowledge either in 1st (M=2.91; SD=.97) or in 2nd phases (M=3.09; SD=.61). It was noted that the mean scores were increased while standard deviation decreased in 2nd phase. The standard deviations of second phase indicated that the variation was minimized compared to the first phase except for one item. These findings revealed that teachers gradually reduced their teaching gap and comparatively performed better in the second phase. However, the average mean score of pedagogical knowledge (3) was lower than the other three sub-sections of the observation checklist i.e., Lesson Preparation (1), Content Knowledge (2) and Integration of ICT-Pedagogy and Content Knowledge (4) but slightly higher than the use of ICT in Assessment (5).

Table 4.19: Pedagogical Knowledge

SL	Statements	N	1st Phase		2nd Phase	
			M	SD	M	SD
1	Teacher was flexible enough to allow for individual differences in learning	16	3.19	1.38	3.69	.79
2	Students took participate in different activities following teachers' instruction		2.94	.93	2.94	.85
3	Learners remain fully engaged throughout the lesson		2.63	.89	2.81	.98
4	Interactive learning environment between teacher and students		2.88	1.20	2.94	1.06
	Total	16	2.91	.97	3.09	.61

According to the scores of items, the teacher was flexible enough to allow individual differences in learning for the 1st (M=3.19; SD=1.38) and 2nd phases (M=3.69; SD=.79). The results revealed that the teachers were moderately conscious about the differences of individuals regarding gender, language, social, cultural, and economic backgrounds. Teachers in this study demonstrated alike skills in both phases on students' participation (M=2.94; SD=.93) and (M=2.94; SD=.85). They engaged learners a little in different activities at lesson (M=2.63; SD=.89) against (M=2.81; SD=.98) and also facilitated a small-scale interactive learning environment (M=2.88; SD=1.20) than (M=2.94; SD=1.06) during 1st and 2nd phases classroom observation. However, it had been noted that teachers performed better in all items in the 2nd phase compared to the 1st phase.

In consideration of the pedagogic view, teachers overlooked the plan of model content replacing his/her own view. However, modification of model content and their teaching-learning activities were not pedagogically sound. Teachers presented the lesson standing at one point while they had limited movement in classroom environment. Moreover, it had been noticed that the teachers were busy with laptop and projector. Thus, they failed to pay full attention to students who sat in the back. Teachers demonstrated slides one after another on multimedia screens without involving students in the lesson because teachers were busier finishing the lesson. In addition, teachers employed individual, group work or peer learning without any discussion or instruction. Most of the teachers hardly managed the multimedia class properly. They also had a lack of content knowledge, pedagogy knowledge, as well as had inadequate preparation for the lesson. On the other hand, the same content had been used in different ways by different teachers as well as different schools. Thus, there were variations found in the teaching-learning activities due to teacher differences, which might significantly impact on achieving the learning outcomes. It could be concluded from the above discussion that teachers had relaxation about adequate preparation for the lessons.

On the other hand, a few teachers acquainted with the steps of teaching methods and techniques very well. A very few of them conducted classes with sound pedagogical knowledge. Some of them started the lesson according to the plan, but they could not finish at the same pace in practice due to a lack of proper preparation. Conversely, many teachers rarely used chalk/white board in multimedia class. Sometimes it had been found that many teachers were directed by multimedia digital content rather than it had been used as a learning tool. On the other hand, it was needed to use real-life examples and proper learning material to make the abstract concept easier in BGS subject. On the other hand, sometimes it was found that the used image or video in the lesson was not gendered friendly or not expected to demonstrate during classroom activities and sometimes it was irrelevant for lesson.

The above analysis revealed that the teachers required more attention on teaching strategies to disseminate the lesson purposefully. Their proper preparation could minimize the ambiguity of the lesson. Otherwise, students might face difficulties to comprehend the lesson. Teachers were expected engaging the student in the lessons through different activities to make the classroom interactive by which teachers could develop themselves as a scholar in the teaching arena. Equally, the schools should take proper steps to relief teachers from their class load because teachers needed more time to take preparation for multimedia classes. The concerned authority should frequently visit the multimedia classroom to monitor, supervise, and provide guideline for making teachers confident about using ICT material for the betterment of students.

4.3.4 Integration level of ICT-Pedagogy and Content Knowledge

The following table-4.20 explained the integration level of ICT-pedagogy and content knowledge in teaching BGS. The average mean scores for the 1st (M=3.26; SD=.65) and 2nd (M=3.31; SD=.57) phases reflected a positive insight about the level of integration skills. Concurrently, it was required to develop the teachers' expertise for effective integration of ICT-pedagogy and content knowledge for the betterment of students' learning. The ICT-pedagogy integration in classroom dramatically changed to student-centric learning process replacing the traditional methods of teaching where teachers could play a significant role and students had freedom to learn their lesson. Therefore, teachers were required to have more skills and experience on ICT together with pedagogy and content knowledge to blend it for effective use in the classrooms.

Table 4.20: Integration Level of ICT-pedagogy and Content Knowledge

SL	Statements	N	1st Phase		2nd Phase	
			M	SD	M	SD
1	Teachers could manage technology well by ability of the pupils	16	4.06	.77	4.12	.62
2	Use of ICT helped students to clear the lesson		3.81	.75	3.69	.70
3	Technology had been designed creative and innovative learning opportunities for students		3.75	.58	3.75	.93
4	Teacher's role during session was confident and spontaneous		3.75	1.18	4.00	.73
5	Use of ICT encouraged students to learn the lesson		3.56	1.03	3.44	1.03
6	Employed instructional strategies, media and material fostered critical thinking and problem-solving ability of learners		3.25	1.00	3.25	.68
7	Technology made opportunity to express opinion and engaged in discussion		2.88	.86	3.31	.70
8	Teacher used the technology pedagogically sound with purposefully and meaningfully		2.88	1.20	3.25	1.07
9	Teacher effectively managed time to provide maximum access/use to ICT resources.		2.56	1.15	2.81	1.05
10	Teacher extended the boundaries of the use of ICT in the wider world (wider context/ perspective)		2.19	1.17	1.50	1.03
11	Level of ICT-Pedagogy integration in content as a whole		3.19	1.05	3.25	.86
	Total		3.26	.65	3.31	.57

The data indicated that the teachers could manage ICT equipment well in the classrooms according to individual differences as well as age and ability of the pupils in 1st (M=4.06; SD=.77) and 2nd (M=4.12; SD=.62) phases. The results of comparative analysis between the 1st and 2nd phases demonstrated that there were six items found with the higher score in the 2nd phase compared to the 1st phase, while the teachers were better in three items in the 1st phase. There were two scores found equal in both 1st and 2nd phases regarding average mean scores. Despite having some variations, the overall scores indicated that the performances of teachers were coherent between the two phases. Regarding the average mean for 1st and 2nd phases, teachers made little opportunities for students to express their opinion as well as little engagement in discussion in ICT integrated classroom for 2nd (M=3.31; SD=.70) and 1st (M=2.88; SD=1.15) phase. They also demonstrated poor pedagogical knowledge to present the lesson purposefully and meaningfully for the 1st (M=2.88; SD=1.20) and 2nd (M=3.25; SD=1.07) phases. Although the teachers were observed more confident and spontaneous to play their role during 2nd phase, the results recommended that teachers needed to know how to best use ICT for students' involvement and engagement in the discussion session.

Equally, the teachers were found with downward to extend the boundaries of BGS textbook regarding the content they taught in 1st phase (M=2.19; SD=1.17) compared to 2nd phase (M=1.50; SD=1.03). They usually provided textbook information instead of acquiring up-to-date knowledge about BGS content by using ICT. The data recommended that the teachers to be required to think beyond the boundaries with proper examples as well as useful teaching aids in instruction to enrich the concept of students about the textbook. They also needed to develop their skills in ICT because the teachers were found in partial use of ICT for delivering only textbook information. They could extend the boundaries of the textbooks through relevant analysis by using

ICT-pedagogy in teaching BGS. Moreover, the data of the 1st (M=2.56; SD=1.15) and 2nd (M=2.81; SD=1.05) phases suggested that teachers urgently to be required to develop ICT skills for timely or maximum use of ICT equipment in the lesson.

There were two statements found with equal scores in the 1st and 2nd phases. The teachers possessed moderate skill (M=3.25; SD=1.00) and (M=3.25; SD=.68) but were required to improve the capacity for fostering students' critical thinking and problem-solving ability. These abilities might help to integrate collaborative learning opportunities which also could promote content knowledge. The results also illustrated that many teachers could design ICT-pedagogy integrated classroom that might direct towards creative and innovative learning opportunities for students (M=3.75; SD=.58) and (M=3.75; SD=.93).

In contrast, it had been found that the use of ICT in lessons made learning fairly clear, including understandable conception for 1st (M=3.81; SD=.75) and 2nd (M=3.69; SD=.70) phases. Additionally, students were moderately stimulated to learn their lesson in an ICT-oriented classroom (M=3.56; SD=1.03) against (M=3.44; SD=1.03) in the 1st and 2nd phases although the engagement of students in lesson decreased in 2nd phase. However, it was acknowledged that ICT offered a better learning friendly environment where students could engage themselves in a creative and innovative way of the learning process that made learning more interesting. On the other hand, the level of ICT-pedagogy integration (M=3.19; SD=1.05) and (M=3.25; SD=.86) in classroom instruction as a whole made hopeful. However, the overall integration (M=3.26; SD=.65) and (M=3.31; SD=.57) concluded that there was a lot of works to be done for enlarging its use up to the standard level.

However, the overall data provided mixed results about ICT-pedagogy integration and teachers' content knowledge. Some teachers were capable enough to manage the classroom well while most of the teachers were required to develop their knowledge and experience towards integration of ICT in teaching BGS. There were few teachers who had well preparation on both content knowledge and ICT knowledge together with pedagogy knowledge. They taught well following the TPACK model with discussion, explanation and made the opportunity for student's participation in classroom activities. Some content were prepared following the TPACK framework, but it was not presented according to plan due to a lack of ICT skills and content knowledge of teachers. It was found that there was no harmony with ICT, pedagogy and content knowledge, although there were some teachers having sound knowledge in each segment. As a result, the lesson failed to generate appeal to the students and they were not as attentive in the lesson as it was expected. On the other hand, most of the teachers had either lack of ICT knowledge, pedagogy knowledge or content knowledge and somehow, they could not harmonize among the stated knowledge. Many teachers desired to make the classroom more interesting and constructive by using image and video in the lesson but, in many cases, it had not been properly presented during a lesson or designing content.

Although there had scope to use several types of ICT equipment in BGS lessons, it was not employed due to lack of either internet facility or proper planning of the lesson. Moreover, despite having internet availability in some schools, many teachers could not utilize the opportunity in classroom activities. They needed to take preparation differently for ICT-pedagogy integrated classes. However, it could be expected that teachers would become accustomed if they regularly conducted classes with ICT. At this stage, teachers might need the help of ICT known resourced teachers. Above all, ICT-pedagogy integration mainly depended on teachers' expertise on how they successfully integrated ICT knowledge, pedagogy knowledge and content knowledge unitedly in classroom practice. Therefore, it could be claimed that teachers needed to develop their ICT knowledge, pedagogy knowledge and their content knowledge for successful integration of ICT-pedagogy in the lesson. On the other hand, institutions and government should create opportunities for teachers to make frequent access in ICT equipment without any trouble. Moreover, teachers required to be properly trained on the ICT-pedagogy integration process.

4.3.5.a Assessment Process

The data described the used assessment techniques in ICT-pedagogy integrated BGS classroom. In the table below, one item had been excluded and presented differently for its nature (section-4.5.5.b). However, the average mean from listed below table demonstrated the lowest scores (M=2.50; SD=.83) and (M=2.84; SD=.51) for 1st and 2nd phases than the other four sub-sections in observation checklist. Although the scores of the 2nd phase were higher than the 1st phase in all four items of the table, yet it had not been up to the level, especially the use of ICT for assessing students' progress. This result was similar to other statements in this study which was reflected the lower use of ICT in assessing students' progress.

Table 4.21: Formative Assessment in Classroom

SL	Statements	N	1st Phase		2nd Phase	
			M	SD	M	SD
1	Teacher assessed student's progress during the lesson traditionally	16	3.56	1.32	4.25	.86
2	A good pace maintained throughout the lesson		2.94	1.06	3.19	.75
3	Teacher assessed student's progress during lesson by ICT		.25	.68	.44	.51
4	Achieved today's learning outcomes		3.19	1.11	3.50	.73
	Total		2.50	.83	2.84	.51

The above data stated that the teachers were used to practice traditional assessment system to assess the progress of students during the lesson (M=3.56; SD=1.32) and (M=4.25; SD=.86) for 1st and 2nd phases. The data regarding traditional assessment technique exposed surprisingly higher in the 2nd phase than the 1st phase. However, the teachers were habituated to assess the progress of students orally. Conversely, they were not at all accustomed to assessing students' progress by using ICT either 1st (M=0.25; SD=.68) or 2nd (M=0.44; SD=.51) phase. According to the results, it could be explained that there were many steps to be taken to reach the standard level of using ICT in the formative assessment strategies.

Moreover, the teachers faced difficulties to follow the time limit properly that they set in their lesson in ICT-pedagogy integrated classes for 1st (M=2.94; SD=1.06) and 2nd (M=3.19; SD=.75) phases. However, the time frame of a lesson had great importance to accomplish the session optimizing the learning opportunities for students. It not only helped teachers to prioritize their work but also encouraged students to become more organized, more self-confident and learn more successfully whereas teachers prepared themselves to meet needs of diverse learners (CERI, n.d.). On the other hand, the data argued that the learning outcomes of the lesson were achieved a little for the 1st (M=3.19; SD=1.11) and 2nd (M=3.50; SD=.73) phases. The used assessment strategies in classroom required to develop teachers' ICT skills so that they could assess student's progress by ICT tools. It was also required that teachers needed to go through the steps of lesson plan and might follow the time schedule, they planned for different parts of the lesson to run the teaching-learning activities smoothly.

4.3.5.b Interruption of ICT Resources

This item was included in the observation checklist to explore the interruption of ICT during class time and the instant technical support service available in the schools.

Table 4.22: Interruption of ICT Resources

SL	Statements	N	1st Phase		2nd Phase	
			M	SD	M	SD
1	Interruption of ICT resources during class time	16	2.87	1.63	2.75	1.48

The statistics revealed that there were several difficulties observed addressing interruption of ICT resources in-class time for 1st (M=2.87; SD=1.63) and 2nd (M=2.75; SD=1.48) phases. However, the identified problems were as multimedia setting, lack of required resolution of multimedia, shortage of technical support, lack of sound system, interrupted power supply, lack of electric equipment, and also lack of space for multimedia projection. Shortage of space for students' sitting arrangement and teachers' classroom management were the other challenges of ICT-pedagogy integration in classroom activities. Similarly, Albugami and Ahmed (2015) found lack of space as a challenge for proper implementation of ICT resources in their study in secondary schools in Saudi Arabia.

It was also noticed that the teachers needed technical support for smooth integration of ICT-pedagogy in classrooms but there was no technical hand in schools. ICT teachers could provide technical support whereas they were busy with lots of class load in daily class routine. Therefore, the schools should have a technician to support teachers for ICT-pedagogy integration process. Similarly Oni, Haruna, and Amugo (2017) recommended to provide technical facilities for full implementation of ICT in secondary schools (Mannan, Rahman, & Khan, 2014). On the other hand, this study found that maximum schools had no alternative power supply. If electricity dropped the classes were rigorously disrupted while electricity voltage was another challenge for ICT-pedagogy integration, especially in rural schools.

4.3.6 Uses of ICT-Pedagogy

It had been analyzed whether there were any significant differences among school categories, types, and locations, including gender diversities regarding ICT-pedagogy integration in teaching BGS. The findings were presented successively.

4.3.6.1 School Categories

The table-4.23 presented data regarding ICT-pedagogy integration by boys, girls and co-education school categories for the 1st phase (M=3.11; SD=.70) and 2nd phase (M=3.27; SD=.54).

Table 4.23: ICT-Pedagogy Practice by School Categories

Types	n	1st Phase		2nd Phase	
		M	SD	M	SD
Boys	2	3.21	1.05	3.38	.32
Girls	6	3.48	.47	3.61	.36
Co-education	8	2.81	.71	2.99	.58
Total	16	3.11	.70	3.27	.54

The findings disclosed that the teachers from girls schools practiced ICT-pedagogy comparatively more in both phases (M=3.48; SD=.47) and (M=3.61; SD=.36) for in teaching BGS than boys schools (M=3.21; SD=1.05) and (M=3.38; SD=.32) as well as co-education schools (M=2.81; SD=.71) and (M=2.99; SD=.58). However, all three categories of schools were looked behind in the ICT-pedagogy integration process in teaching-BGS.

On the other hand, the results of table below indicated that the selected classroom were homogeneous (P > .05) for collecting data. Thus, the homogeneity test results were consistent with the assumption that variations should not be significant. The one-way ANOVA was then conducted for the 1st and 2nd phases to identify the statistically significant relationship between boys, girls, and co-education schools.

Table 4.24: Variances of ICT-Pedagogy Practice by School Categories

SL	Category		Sum of Squares	df	Mean Square	F	Sig.
1	1st Phase	Between Groups	1.612	2	.806	1.793	.21
		Within Groups	5.843	13	.449		
		Total	7.454	15			
2	2nd Phase	Between Groups	1.317	2	.658	2.806	.10
		Within Groups	3.050	13	.235		
		Total	4.367	15			

*p > .05

The results stated that the p value was .21 and .10 which was higher than the accepted alpha level of .05. According to the findings, there were no significant relationships ($p > .05$) found among schools regarding practices of ICT-pedagogy in teaching BGS [$F(2, 13) = 1.79$, $p > .05$] and [$F(2, 13) = 2.81$, $p > .05$] for 1st and 2nd phases. The results indicated that there were no variances regarding ICT-pedagogy practices in teaching BGS in spite of having different conditions and types of teachers.

4.3.6.2 School Location, Type and Gender Difference

The table-4.25 below reflected the integration process of ICT-pedagogy in classroom practice by school location, school types and gender diversities for the 1st and 2nd phases.

Table 4.25: Practice by School Location, Types and Gender Diversities

Categories	Location				Types				Gender			
	1st Phase		**2nd Phase**		**1st Phase**		**2nd Phase**		**1st Phase**		**2nd Phase**	
	Urban (5)	Rural (11)	Urban (5)	Rural (11)	Govt. (3)	Non-govt. (13)	Govt. (3)	Non-govt. (13)	Male (10)	Female (6)	Male (10)	Female (6)
Mean	3.67	2.86	3.63	3.10	3.71	2.98	3.73	3.16	2.96	3.37	3.17	3.44
SD	.44	.66	.33	.54	.58	.67	.38	.52	.79	.49	.64	.27
***sig.* (t-test)**	**.02**		**.04**		**.10**		**.10**		**.27**		**.39**	

The comparative analysis of data illustrated that there were significant differences found between urban and rural schools in both phases while urban schools were practiced more compared to rural schools during teaching BGS. The scores of urban schools were for the 1st ($M=3.67$; $SD=.44$) compared to 2nd ($M=3.63$; $SD=.33$) phase while in rural schools were for 1st ($M=2.86$; $SD=.66$) against 2nd ($M=3.10$; $SD=.54$) time. The both mean scores indicated that rural schools practiced ICT-pedagogy more in the 2nd phase than the 1st phase while urban slightly declined their practice in the 2nd phase compared to the 1st phase. Conversely, the data indicated that there were significant differences between urban and rural in both phases ($p < .05$).

Based on mean and standard deviations, the data from 1st and 2nd phases illustrated that there were big differences found in teaching BGS between government and non-government schools for 1st time (M=3.71; SD=.58) and (M=2.98; SD=.67) as well as for 2nd phase (M=3.73; SD=.38) and (M=3.16; SD=.52).

Concurrently, it was notable that the performance of female teachers for 1st (M=3.37; SD=.49) and 2nd (M=3.34; SD=.27) time were onward in ICT oriented classrooms than their male counterpart for 1st (M=2.96; SD=.79) or 2nd (M=3.17; SD=.64) phases separately. Although the mean and standard deviation displayed differences, the t-test for school types and gender diversities in the 1st and 2nd phases revealed that there were no significant differences in the above relations regarding the ICT-pedagogy integration process in teaching BGS.

The above results indicated that a significant difference had been identified between rural and urban schools regarding ICT-pedagogy integration in the BGS classrooms practices. Although there was no significant difference between the pairs, there were some gaps between government and non-government as well as male compared to female teachers. The classroom observation results recommended that the concerned authorities should take care to meet the gap between rural and urban, as well as government against non-government teachers for the successful integration. It should make sure the equal opportunities for all students regardless their diversities.

4.3.7 Correlations of Observation Checklist Sub-scales

The following two tables- 4.26 & 4.27 exposed the correlations among sub-scales of classroom observation checklist based on the 1st and 2nd phase classroom observation report. The correlation matrix revealed in both tables that the significance level was .00 and somewhere more than .00 but less than .05. It also discovered the significance level which was less than the accepted alpha level .01 and .05. The results among the sub-scales of the observation checklist were statistically highly significant correlated without one or two exception/s in each table.

Table 4.26: Correlations of Observation Checklist (1st Phase)

Subscales	1	2	3	4	5
Lesson Preparation-LP (1)	1				
Content Knowledge-CK (2)	.58*	1			
Pedagogy Knowledge-PK (3)	.59*	.85**	1		
ICT-Pedagogy and Content Knowledge-ICT_PCK (4)	.28	.85**	.77**	1	
Assessment of Lesson-AL (5)	.49	.91**	.85**	.84**	1

*. Correlation was significant at the 0.05 level (2-tailed).
**. Correlation was significant at the 0.01 level (2-tailed).

The first table stated that ICT_PCK was not significantly correlated with LP, while second table revealed that CK and AL were not correlated with LP.

Table 4.27: Correlations of Observation Checklist (2nd Phase)

Subscales	1	2	3	4	5
Lesson Preparation-LP (1)	1				
Content Knowledge-CK (2)	.32	1			
Pedagogy Knowledge-PK (3)	.63**	.67**	1		
ICT-Pedagogy and Content Knowledge-ICT_PCK (4)	.63**	.77**	66**	1	
Assessment of Lesson-AL (5)	.63**	.69**	.63*	.74**	1

**. Correlation was significant at the 0.01 level (2-tailed).

The significant level between 1st and 2nd phases in schools were found significantly correlated those were presented sequentially for 1st and 2nd time in each pair: LP and CK (r = 0.58, p < .05) and (no significance); LP and PK (r = 0.59, p < .05) and (r =

0.63, $p < .01$); LP against ICT_PCK (no significance) and ($r = 0.63$, $p<.01$); LP and AL (no significance) and ($r = 0.63$, $p<.01$). The relations also were highly significant between CK and PK ($r = 0.85$, $p < .01$) and ($r = 0.67$, $p < .01$); CK and ICT_PCK ($r = 0.85$, $p < .01$) and ($r = 0.77$, $p < .01$); CK and AL ($r = 0.91$, $p < .01$) and ($r = 0.69$, $p < .01$). Similarly, the other relations were found significantly correlated between PK and ICT_PCK ($r = 0.77$, $p < .01$) and ($r = 0.66$, $p < .01$); PK and AL ($r = 0.85$, $p < .01$) and ($r = 0.63$, $p < .01$); and lastly ICT_PCK and AL ($r = 0.84$, $p < .01$) and ($r = 0.74$, $p < .01$). The results made sure that the relationships within the items for classroom observations were significantly correlated.

4.3.8 Attitudes against Practice: Research Reflection

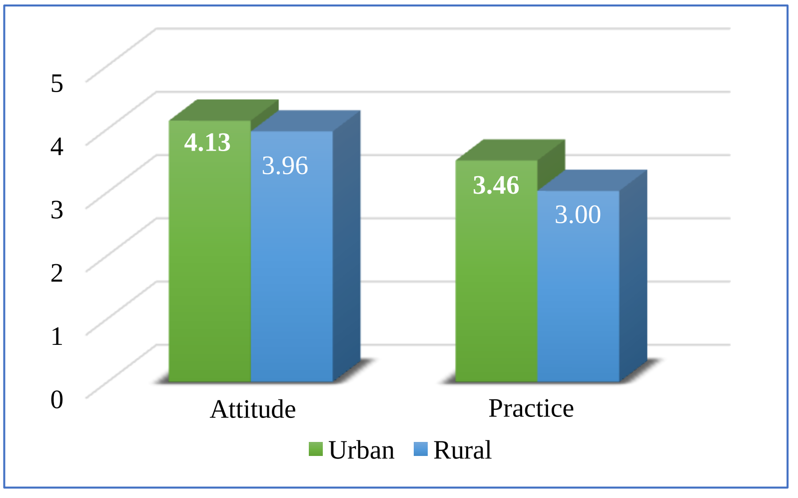
The teachers' attitudes and their level of practice in respective schools were observed to compare whether the ICT-pedagogy integration was being practiced against attitudes in BGS classroom instruction. It had been examined on the basis of school location, school types and categories, gender diversities, teachers' age and participated whether or not in-service training courses. There were some other areas that had been analyzed in terms of attitudes, such as teaching experience, educational qualification, social media use in education and confidence against attitudes. However, the variances had been noticed based on the total average attitudes and classroom practice of ICT-pedagogy integration. The following comparison provided significant insights about the differences between attitudes and their actual practice of ICT-pedagogy integration in teaching BGS.

4.3.8.1 School Location

The environmental circumstance of school was considered as a location such as rural and urban. It might have important role towards ICT-pedagogy integration in teaching BGS because of having some advantage and disadvantage by school location.

Therefore, it had been intended to identify whether there was any impact by school location in the integration process. The data from figure-4.31 and table-4.28 illustrated that the teachers irrespective of rural and urban schools exposed positive attitudes while urban teachers possessed comparatively higher (M=4.13; SD=.34) than rural (M=3.96; SD=.39) teachers. The results regarding attitudes demonstrated that the rural teachers were behind than urban teachers regarding their possessed attitudes towards ICT-pedagogy integration in the classrooms.

Figure 4.31: Attitudes against Practice by School Location



On the other hand, the level of ICT-pedagogy practiced in teaching BGS was also higher by urban (M=3.46; SD=.65) than rural teachers (M=3.00; SD=.60) although the level of practice was slighter than possessed attitudes in both items. The decreasing ratio of practice from possessed attitudes had been demonstrated more by rural teachers compared to urban.

Table 4.28: Attitudes against Practice by School Location

Location	Level of Attitude (a)			Level of Practice (b)			t-test for Attitude (a1)			t-test for Practice (b1)		
	N	M	SD	n	M	SD	t	df	*sig.*	t	df	*sig.*
Urban	76	4.13	.34	14	3.46	.65	3.53	389	.00*	2.09	30	.04*
Rural	315	3.96	.39	20	3.02	.60						

*p < .05 & **p > .05

The data also disclosed that there had fairly significant difference [t (389) = 3.53, $p < .05$] between urban and rural teachers' attitudes towards ICT-pedagogy integration in BGS classrooms because of being derived significance level (.00) was lower than the accepted alpha level of .05. This result was matched with the findings of Guoyuan et al. (2009) who found significant differences considering geographical context focusing on China. Moreover, Shameem (2016) argued that cultural perceptions towards ICT were the important factors influencing their attitudes despite having vast differences in teachers by different types of schools.

On the other hand, the practice of ICT-pedagogy integration in teaching BGS had been found significant differences in attitudes [t (30) = 2.09, $p < .05$] during teaching-learning observation. The urban schools practiced more compared to rural schools. These results were coefficient with the teachers' attitudes whereby the urban teachers possessed significantly overall high-tech practice compared to rural teachers.

Moreover, the classroom observation reports indicated that the rural teachers faced more challenges than urban teachers in the ICT-pedagogy integration process. Therefore, their declined ratio was more than urban teachers in terms of ICT-pedagogy practices in the BGS classrooms. The reasons behind differences in attitudes and practices might be the facilities they availed in schools. It was found that urban schools enjoyed more opportunities compared to rural schools. Their infrastructure facilities i.e., space in the classroom, better-sitting arrangements, availability of ICT material, internet facility, uninterrupted power supply, and developed communication systems were comparatively better than rural schools.

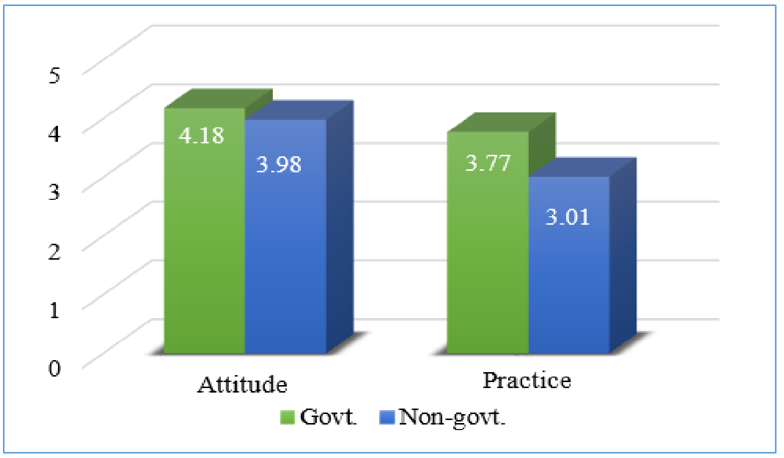
While, the rural schools had insufficient ICT equipment, including computer, laptop, or multimedia projector, insufficient space in classroom, improper sitting arrangement and lack of a plan for multimedia setting. Moreover, lower physical infrastructure, i.e., poor building or tin-shed school compound without having any boundary wall, insufficient power supply, and security issues pushed away from the proper utilization of ICT-pedagogy in the BGS classrooms especially for rural schools, which might be impeded successful ICT-pedagogy integration in secondary school BGS classrooms. However, many urban schools faced similar challenges with rural schools for practicing it in teaching BGS.

Irrespective of geographical context, the urban and the rural schools were meeting different types of constraints for effective integration of ICT-pedagogy in teaching BGS; especially it happened more in rural schools. These findings disclosed that there was remaining inequality on the attitudinal level of teachers between the rural and the urban in terms of ICT-pedagogy integration, including some other relevant issues. The identified challenges might be reflected as barriers in consideration of ICT-pedagogy integration in BGS subject.

4.3.8.2 School Types

There was another criterion to analyze whether there was any difference between teachers of government and non-government schools regarding attitudes towards ICT-pedagogy integration. In consideration of opportunities, government schools enjoyed more advantages such as incentives, infrastructure facilities, up-to-date ICT equipment compared to non-government schools. On the other hand, the position of non-government schools mostly was in rural compared to government schools and the teachers of non-government schools availed comparatively lower financial benefits compared to the teachers of government school which might consider as influential motivator regarding ICT-pedagogy integration in education. Therefore, the overall attitudes mean were calculated between government and non-government teachers.

Figure 4.32: Attitudes against Practice by School Types



Teachers from government and non-government schools possessed positive attitudes (figure-4.32 & table-4.29) while government teachers depicted more attitudes (M=4.18; SD=.32) than non-government (M=3.97; SD=.39) teachers. Similarly, the teachers from government schools practiced more (M=3.77; SD=.33) than non-govt. schools (M=3.01; SD=.63).

The results revealed differences between the level of attitudes and practice of ICT-pedagogy integration in government and non-government schools. In both cases, teachers of government schools demonstrated higher attitudes and they practiced more in classroom use than non-government schools. Likewise, for rural teachers (table-4.28), the level of practice was declined more in non-government teachers compared to government teachers in terms of possessed attitudes towards ICT-pedagogy integration. These differences might become out from teachers' educational and professional qualification, their training experience, ICT experience, availability of ICT tools and accessibility, they availed either in govt. or non-govt. schools.

The data indicated that the teachers of government schools were more confident about ICT-pedagogy integration. In other words, government schools might enjoy more advantages like incentives, infrastructure facilities and up-to-date ICT equipment compared to non-government schools. The identified inequalities were alarming for incorporating ICT-pedagogy in teaching BGS, especially for non-government schools.

The negative effect of inequality was not only limited in teachers' attitudes but also could create disparity for the majority of students who enrolled in non-government schools. Moreover, they might be deprived from the benefits of ICT-pedagogy integration in teaching BGS. If the inconsistencies continued, the students' learning process will be delayed, which could make a big difference in a future knowledge-based society although the NIP-2018 set a vision to be a knowledge-based country by 2041.

Table 4.29: Attitudes against Practice by School Types

School Types	Level of Attitude (a)			Level of Practice (b)			t-test for Attitude (a1)			t-test for Practice (b1)		
	n	M	SD	n	M	SD	t	df	*sig.*	t	df	*sig.*
Govt.	30	4.18	.32	8	3.77	.33	2.78	389	.00*	3.25	30	.00*
Non-Govt.	361	3.98	.39	24	3.01	.63						

*p < .05 & **p > .05

According to the results, there was a significant [t (389) = 2.78, $p < .05$] difference between government and non-government teachers addressing overall attitudes towards ICT-pedagogy integration because the significance level was (p=.01) lower than the accepted alpha level of .05.

However, the classroom observations report argued that the level of actual practice of ICT-pedagogy in teaching BGS was found a significant difference [t (30) = 3.25, $p < .05$] between government and non-government schools. It was similar to attitudinal differences. The differences might become out from teachers' educational or professional qualifications, the presence of laptop or computer, and better physical infrastructure facilities which could help government teachers more to integrate ICT-pedagogy in the BGS classrooms than non-government teachers. Even though the government schools had comparatively better physical infrastructure, many of the teachers had to carry multimedia if they desired to employ in teaching BGS. Therefore, the necessary steps to be taken equally irrespective of different categories of secondary schools in Bangladesh to improve the scenario of ICT-pedagogy integration in the BGS classrooms.

4.3.8.3 School Categories

The homogeneity test revealed that there was no statistically significant difference found ($p > .05$) among the teachers of boys, girls and co-education schools. Thus, the result showed the homogeneity of variances which was an important criterion for a survey research design.

Table 4.30: Attitudes against Practice by School Categories

Categories		Level of Attitude (a)					Practice (b)
		Sum of Squares	Df	Mean Square	F	*sig.*	*sig.*
School Categories	Between Groups	.389	2	.19			
	Within Groups	57.98	388	.15	1.30	.27	.00
	Total	58.37	390				

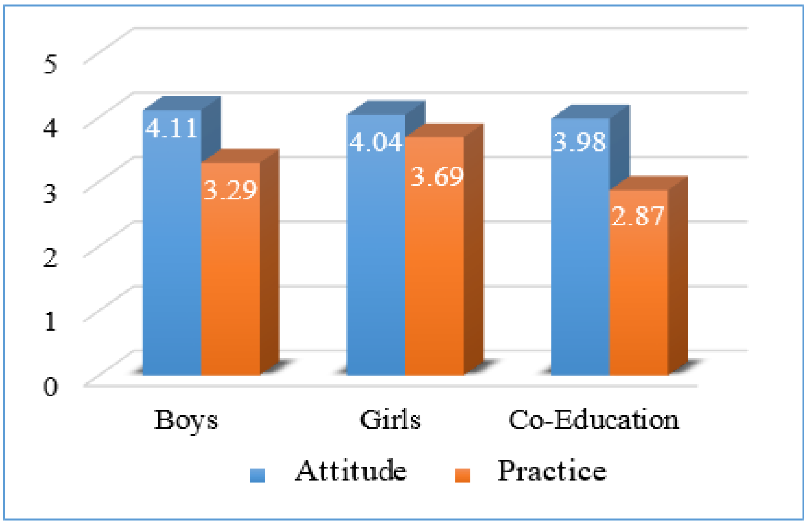
*p < .05 for ANOVA whereas Homogeneity of variance was found in each categories p > .05

Then the statistical analysis was conducted (table-4.30) to know the relationship of teachers' attitudes towards ICT-pedagogy integration regarding boys, girls and co-education schools. The following table also explained the practice of ICT-pedagogy integration in the BGS classrooms. The attitudinal views illustrated that there was no significant difference found among teachers because the significance level was .27, which was more than the accepted alpha level ($p > .05$). The result indicated [$F(2, 388) = 1.30$, $p > .05$] that there was no significant difference among boys, girls and co-education schools regarding attitudes towards ICT-pedagogy integration in BGS.

According to statistical outputs [$F(2, 29) = 6.70$, $p < .05$], there were significant differences found during real time practice of ICT-pedagogy in the BGS classrooms (Appendix-S). It could be concluded that the school need to increase their level of

ICT-pedagogy practices in teaching BGS, as well as supply ICT equipment such as computer, laptop, and multimedia projector. They also needed to arrange in-service training for pedagogical use of ICT and built up awareness for protecting teachers from criticism, etc.

Figure 4.33: Attitudes against Practice by School Categories



On the other hand, the results (figure-4.33) regarding school categories revealed that the teachers from different schools exposed closely positive attitudes while the teachers (2.8%) from boys schools demonstrated comparatively higher attitudes (M=4.11; SD=.46; n=11). Conversely, the teachers from girls schools (18.4%) possessed more attitudes (M=4.04; SD=.38; n=72) compared to the co-education school teachers (M=3.97; SD=.39; n=308) those were the majority (78.8%) of the sample representing in this study but lower than the teachers from boys schools (Appendix-T).

The overall findings of attitudes and practice represented mixed results about ICT-pedagogy integration. However, the overall attitudes and the level of ICT-pedagogy practice displayed a bit difference (figure-4.33) in teaching BGS among the participants of boys, girls and co-education schools. The practice was not found compared to their possessed attitudes for all three groups. It was down for all but unexpectedly co-education was down more than girls and boys schools. Concurrently, the teachers from boys schools possessed the highest attitudes while teachers from girls schools followed them.

However, the level of ICT-pedagogy practice in teaching BGS indicated reverse view and teachers from girls schools practiced more (M=3.69; SD=.41) than the boys' schools (M=3.28; SD=.53). The teachers from co-education schools demonstrated the lowest performance (M=2.87; SD=.64) among stated groups (Appendix-U). The number of co-education schools in this study might have effect on their possessed attitudes and level of practice. Finally, it could be concluded that the girls schools practiced more ICT-pedagogy in teaching BGS compared to the other two groups, although it was not up to the standard level in teaching BGS.

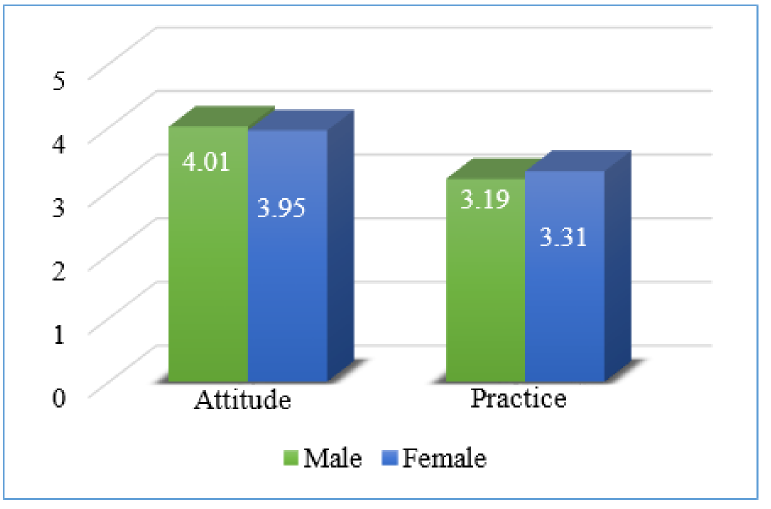
4.3.8.4 Gender Diversities

Researchers were divided into two groups regarding male and female teachers' attitudes towards ICT-pedagogy integration on the basis of research outputs. Many researchers found that there were no significant differences between male and female teachers' attitudinal approaches regarding ICT-pedagogy integration, while many of them found differently. Similarly, some of the researchers disclosed that the male teachers possessed more positive attitudes while some of the others revealed that female teachers demonstrated more attitudes. Therefore, the overall attitudes scores and the independent sample t-test had been done to identify whether there was any significant difference between male and female teachers' attitudes towards ICT-pedagogy integration in teaching BGS.

This study found no significant differences between male and female teachers' attitudes. However, the observations report argued that the teachers' attitudes and level of practice did not go parallel in teaching BGS.

The findings based on figure-4.34 & table-4.31 revealed that both male (M=4.01; SD=.34; f=265) and female (M=3.95 SD=.46; f=126) teachers exposed positive attitudes towards ICT-pedagogy integration in teaching BGS.

Figure 4.34: Attitudes against Practice by Gender Diversities



However, their attitudes and level of practice were not parallelly advanced. Surprisingly, it had been found that female teachers practiced more than their male counterparts while male counterparts possessed more attitudes than female teachers. However, the level of practice declined compared to the possessed attitudes of male and female teachers.

Table 4.31: Attitudes against Practice by Gender Diversities

Gender	Level of Attitude (a)			Level of Practice (b)			t-test for Attitude (a1)			t-test for Practice (b1)		
	n	M	SD	n	M	SD	t	df	*sig.*	T	df	*sig.*
Male	265	4.01	.34	28	3.19	.66	1.44	389	.15**	-.36	30	.71**
Female	126	3.95	.46	4	3.31	.68						

*p < .05 & **p > .05

According to attitudes mean, the male teachers possessed slightly higher positive attitudes than their female counterparts. Conversely, the t-test disclosed that there was no significant [t (389) = 1.44, p > .05] difference between male and female teachers' attitudes towards ICT-pedagogy integration in BGS classrooms because of being derived significance level (.18) was higher than the accepted alpha level of .05. This finding was in compliance with the results of Semerci and Aydin (2018), Birwal (2017), and Mustafina (2016). On the contrary, Elsaadani (2013) and Chowdhury (2009) claimed that gender was a significant factor considering attitudes towards ICT despite having positive attitudes of male and female teachers.

On the other hand, there were no significant differences found between male and female teachers in terms of different ICT skills, their level of confidence, practices of ICT-pedagogy in teaching BGS [$t\ (30) = -.36$, $p > .05$]. Although the females were backward in different social indicators in local perspective such as several familial, social, urban, and rural differences, they demonstrated competitive attitudes as their male colleagues. These results provided a momentous positive insight about deploying ICT-pedagogy integration in BGS classrooms regarding the societal context of Bangladesh.

The data revealed that one-third of the working teachers for all subjects were female, while 42% were BGS teachers who put a significant contribution to teaching-learning activities. Despite having several types of problem, female teachers practiced equally with their male colleagues. This finding was coherent with the results of Semerci and Aydin (2018), Birwal (2017)**,** Mustafina (2016), Yusuf and Balogun (2011), Cavas et al. (2009), Teo (2008), including Wong and Hanafi (2007). On the contrary, there were different views also illustrated by Gámez and Fernández (2020), Elsaadani (2013), and Chowdhury (2009).

However, gender disparities had appeared as a significant factor considering attitudes towards ICT in spite of having positive attitudes by male and female teachers. In contrast, Alrasheedi (2009) found that male teachers' attitudes towards ICT was slightly positive and practiced more than the female teachers. However, this study claimed that ICT-pedagogy was more practiced by female teachers against their male counterparts despite having comparatively lower positive attitudes. Eventually, the female teachers were more involved in household activities and family affairs in Bangladesh (BBS, 2022). They could overcome their limitations of using ICT resources and attitudes by their teaching style, classroom experience, and efforts towards the involvement of students in classroom activities.

Moreover, their confidence level of ICT and professional or educational background might have a significant effect on the practice of ICT-pedagogy in teaching BGS. Therefore, the teachers' positive attitudes had an important role in the smooth integration process of ICT-pedagogy in BGS classroom practice.

4.3.8.5 Age

The overall attitudes and the level of practice demonstrated the differences among the teachers by their age groups (table-4.32 & figure-4.35) but it had been done to determine whether there was any relation between respondents' age and overall attitudes towards ICT-pedagogy integration. Therefore, the test of homogeneity and one-way ANOVA had been conducted to identify the significance level.

Table 4.32: Attitudes against Practice by Age

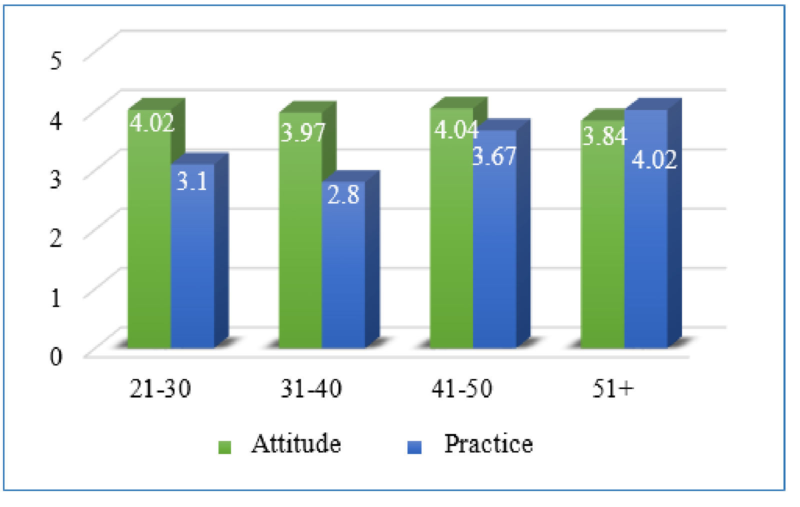
Categories		Attitude (a)					Practice (b)
		Sum of Squares	df	Mean Square	F	*sig.*	*sig.*
Teachers' Age	Between Groups	.883	3	.29			
	Within Groups	57.48	387	.15	1.98	.12	.00*
	Total	58.35	390				

*p < .05 for ANOVA whereas Homogeneity of variance was found in each categories p > .05

The data in table-4.32 exposed that the significance level was .12, which was higher than the accepted alpha level ($p > .05$). According to statistical analysis, there was no relationship among teachers based on their age differences [$F(3, 387) = 1.98$, $p > .05$].

On the other hand, the level of ICT-pedagogy practice in teaching BGS was significantly differentiated by age differences of teachers [F (3, 28) =7.60, p < .05]. Moreover, the mean scores demonstrated variances between teachers' attitudes and their level of practice. However, the above data showed heterogeneous results which indicated that their attitudes and level of practice was not correlated. However, teachers' attitudes and their practice required to be parallelly advanced for effective integration of ICT-pedagogy in teaching BGS (Appendix-V & W). The following figure-4.35 revealed the average mean attitudes and level of practice by different age groups of teachers.

Figure 4.35: Attitudes against Practice by Age



The possessed attitudes and level of practice were similarly ups and downs except for one age group. Surprisingly, the aged group-4 dramatically practiced more (M=4.02; SD=.10) than others, although they possessed lesser attitudes (M=3.84; SD=.33) among the groups. It could be explained that the aged teachers might have advantaged of pedagogical knowledge in ICT-pedagogy integration process. From the other relations, it was found that the age group-3 showed the highest attitudes (M=4.04; SD=.32) among the groups while they practiced comparatively lower from aged group-4 but higher than others.

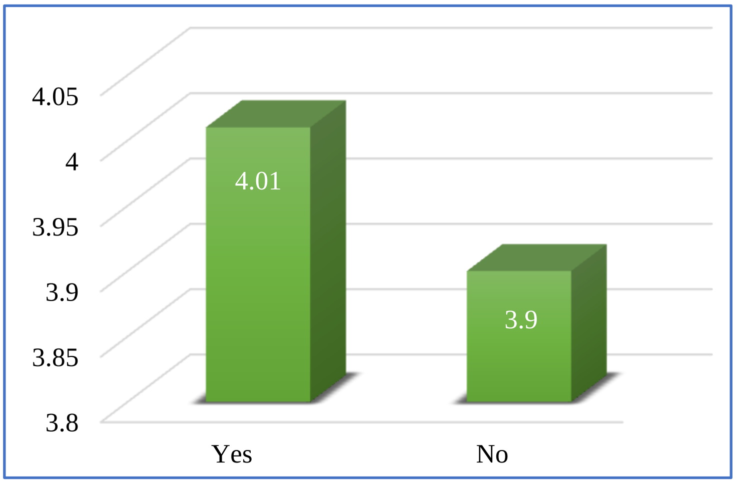
Moreover, the teachers were asked to put their opinion on whether they use technology regularly in their classes, feelings about using the internet for instructional purposes and the level of using technology for students' assessment. The teachers of the 51^{+} age group demonstrated the lowest attitudes in all three cases (M=2.89, SD=1.13; M=3.78, SD=1.10; M=3.50, SD=1.10) than others, whereas overall attitudes was M=3.99 in this study.

This finding exposed that the level of acceptance in terms of ICT-pedagogy was comparatively lower in aged teachers while younger were more positive about ICT integration in teaching BGS. This result was compliance with several studies Semerci and Aydin (2018), Mustafina (2016), Chow (2015), Teo (2008), but differed with the studies of Mwila (2018), Elsaadani (2013), Cavas et al. (2009), who claimed that the age was an influential factor considering attitudes towards ICT. However, the aged teachers conducted teaching-learning activities with pedagogically sound, made the opportunities of involving students in different tasks as well as using their experience more in teaching. In a nutshell, there were differences in attitudes and level of practice by teachers' age regarding ICT-pedagogy integration in teaching BGS.

4.3.8.6 In-service Training

The following figure-4.36 & table-4.33 illustrated whether there was any significant difference in attitudes towards ICT-pedagogy integration by in-service training on ICT. The overall attitudes revealed who participated in ICT-related in-service training courses, lightened more attitudes (M=4.01; SD=.39) compared to the teachers who (M=3.90; SD=.36) did not attend in-service training though all of them had positive attitudes.

Figure 4.36: Having In-service Training in ICT



Several earlier studies also revealed that in-service training was an influential factor that helped to improve the teachers' performance and guides towards positive attitudes about ICT-pedagogy integration. In-service training facilitated teachers to accept new innovations (Wario, 2014) and it made easy use of technology. In-service training also made teachers skilled as well as helped to adopt new approaches of teaching methods in classroom activities by hands-on technology experience. It also helped to overcome anxiety and assists in building positive attitudes about ICT-pedagogy integration in teaching BGS.

Table 4.33: Attitudes by In-service Training

Participation	Level of Attitude (a)			t-test for Attitude (b)		
	n	M	SD	t	df	*sig.*
Yes	305	4.01	.39	2.42	389	.02**
No	86	3.90	.36			

*p < .05 & **p > .05

Similarly, t-test [t (389) = 2.42, p < .05] indicated that there was a significant difference between the teachers whether participated or not in in-service training courses. This result differed from Semerci and Aydin (2018) who exposed that there was no significant difference found between teachers' ICT willingness with ICT training. In contrast, Alrasheedi (2009) stated that ICT training had an influential factor on teachers' attitudes towards ICT though there were differences between male and female teachers.

On the other hand, the teachers were asked about the urgency of training on ICT skills before incorporating them into classroom practice. They put their highest priority on the necessity of ICT training (M=4.73; SD=.49; N=391) for ICT-pedagogy integration in BGS classrooms (section-4.2.6). Teachers were also requested to provide data on whether they participated in ICT embedded training courses or did not. The data revealed that the majority of teachers (78%) attended ICT-related in-service training courses and they possessed more attitudes. However, it could be concluded that the in-service training accelerated the positive attitudes of teachers towards ICT-pedagogy integration in BGS classroom activities.

Similarly, teacher training had been found to be a strong factor for building the confidence of teachers regarding ICT self-efficacy and comfortable using ICT equipment (Sultana & Haque, 2018; Bozdogan & Ozen, 2014). Therefore, teachers required training (Mierzejewski, 2009) on ICT pedagogy integration in teaching BGS which made teachers pedagogically sound and helped to create a collaborative teaching-learning environment. Moreover, ICT training was found as a significant factor in teachers' ICT attitudes (Alrasheedi, 2009) while in-service teachers' training on ICT was found a significant mediator in this study. The result was in compliance with Afshari et al. (2012) who also revealed that there were positive relations between computer training and the principal's computer competence.

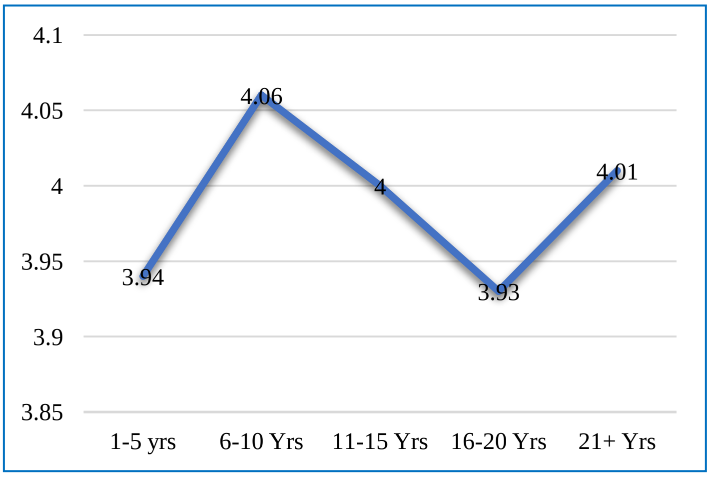
On the contrary, the teachers with prior experiences of ICT use possessed highly positive attitudes (Lal, 2014; Cavas et al., 2009). Furthermore, Crittenden (2009) disclosed that the advanced degree helped teachers to make more positive attitudes and a greater level of perceived self-efficacy towards ICT. Moreover, Hosman and

Cvetanoska (2010) as well as Wanjala, Khaemba, and Chris (2011) claimed that ICT training should not be once-off; instead, it should be an ongoing process so that teachers could be kept up-to-date with ever-changing technologies (Cited in Wario, 2014). Conversely, Wario (2014) did not find any significant relationship between attitudes and ICT training. Therefore, this study suggested that in-service training was needed (Banu, 2012) to offer a better experience of new innovation which made teachers confident about using ICT-pedagogy in teaching BGS.

4.3.8.7 Teaching Experience

The following figure-4.37 explained whether the teaching experiences had any effect on ICT-pedagogy integration. On the basis of mean scores, teachers' teaching experience revealed mixed results regarding ICT-pedagogy integration in teaching BGS. The data explained that the teachers who had 6-10, 11-15 and 21+ years of experience demonstrated more attitudes compared to 1-5 and 16-20 years of experience.

Figure 4.37: Attitudes by Teaching Experience



On the other hand, the test of variance based on teaching experience (table-4.34) indicated that the respondents were homogeneous ($p > .05$) while the results of ANOVA did not show any significant relationship between teachers' attitudes and their teaching experiences.

Table 4.34: Attitudes by Teaching Experience

Categories		Sum of Squares	df	Mean Square	F	*sig.*
Teaching Experience	Between Groups	1.14	4	.29	1.90	.11
	Within Groups	57.69	386	.15		
	Total	58.82	390			

*p < .05 for ANOVA whereas Homogeneity of variance was found in each categories p > .05

The results (table-4.34) stated that the significance level was .11 which was higher than the accepted alpha level of .05. According to the result, there was no significant relationship (p > .05) found regarding teaching experience and overall attitudes towards ICT-pedagogy integration [F (4, 386) =1.90, p > .05]. This result was similar to Semerci and Aydin (2018) as well as Chowdhury (2009), who indicated that there was no significant difference disclosed between teachers' ICT willingness and their teaching experience. Conversely, Chan and Mohammad (2019) found in the case of STEM teachers that teaching experience was significantly affected the confidence in using technology while years of teaching experience were negatively correlated with teachers' attitudes (Alaugab, 2007).

Therefore, it could be determined, although the teachers' classroom experiences were positively correlated with the achievement of students learning, it had not been significantly related with teachers' teaching experience and attitudes towards ICT-pedagogy integration in teaching BGS.

4.3.8.8 Educational Qualifications

The data illustrated that there was no significant difference (p > .05) found among the teachers regarding their academic qualifications harmonized with school categories, respondents' age and their teaching experience because the significance level was .15, which was more than the accepted alpha level .05.

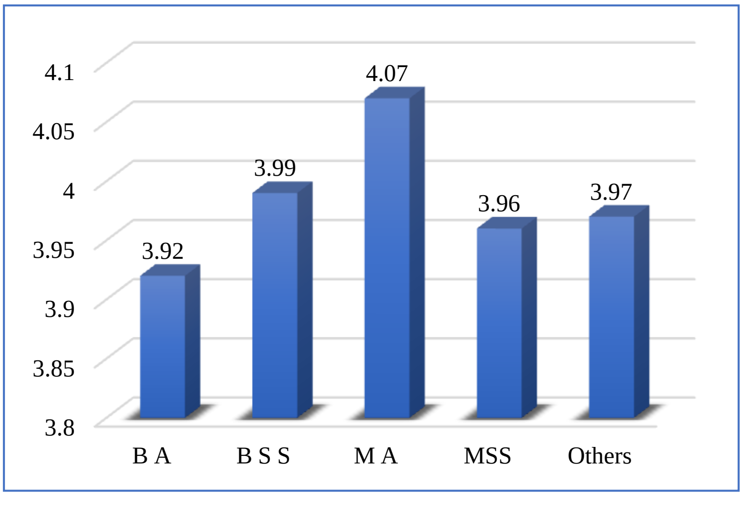
Table 4.35: Attitudes by Educational Qualifications

Categories		Sum of Squares	df	Mean Square	F	*sig.*
Educational Qualifications	Between Groups	1.03	4	.26		
	Within Groups	57.79	386	.15	1.72	.15
	Total	58.82	390			

*p < .05 for ANOVA whereas Homogeneity of variance was found in each categories p > .05

However, there was a bit difference by average mean scores among teachers about their educational qualifications. The mean scores revealed that teachers possessed highly positive attitudes towards ICT-pedagogy integration irrespective of their Bachelor or Master's Degree subject. However, the teachers who completed MA degree possessed more attitudes (M=4.07; SD=.39; f=89) than others while the teachers with B A degree (M=3.92; SD=.42; f=47) holder possessed comparatively lower attitudes.

Figure 4.38: Attitudes by Educational Qualifications



Although educational qualification was not found significantly differentiated in attitudes towards ICT-pedagogy integration in this study, the academic qualification was important evidence behind positive attitudes towards ICT-pedagogy integration. It enhanced the teachers' professional career, especially in teaching to make confidence in content knowledge. Similarly, Crittenden (2009) showed that the educators who had an advanced degree exhibited more positive attitudes and a greater level of perceived self-efficacy towards ICT.

4.3.8.9 Professional Qualification

The result of the homogeneity test suggested that the teachers were equal (p > .05) for collecting data in terms of their professional qualification. The one-way ANOVA was then conducted to explore whether there was any statistical relationship remaining between attitudes towards ICT-pedagogy integration in teaching BGS and the teachers' professional qualification.

Table 4.36: Attitudes by Professional Qualification

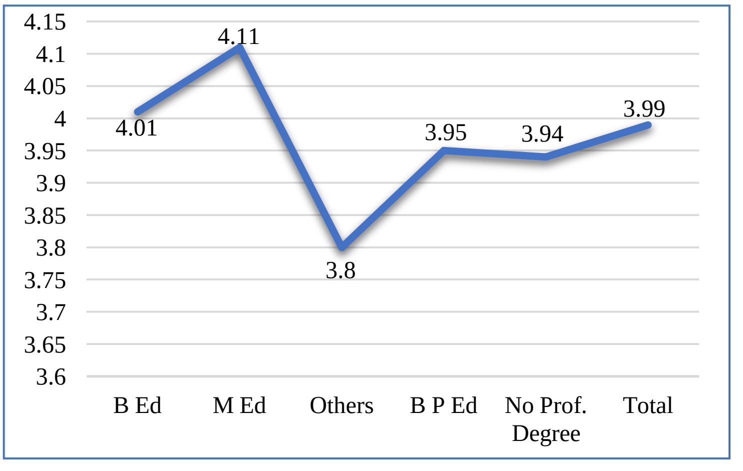
Categories		Sum of Squares	df	Mean Square	F	*sig.*
Professional Qualifications	Between Groups	1.24	4	.309	2.09	.04*
	Within Groups	57.13	386	.148		
	Total	58.37	390			

*p < .05 for ANOVA whereas Homogeneity of variance has been found in each categories p > .05

The table-4.36 illustrated that the significance level was .04 which was lower than the accepted alpha level of .05. The findings [$F(4, 386) = 2.09$, $p < .05$] explained that there were statistically significant differences considering the teachers' attitudes towards ICT-pedagogy integration and their professional degree. Therefore, there was a significant difference identified among teachers' professional qualification and their overall attitudes towards ICT-pedagogy integration in the BGS classrooms.

From the above discussion, it could be concluded that the professional degree had a significant effect on teachers' attitudes towards ICT-pedagogy integration in teaching BGS. The professional degree/s made teachers more efficient by the acquisition of knowledge and skills which might help to meaningful ICT-pedagogy integration in BGS classrooms. Moreover, the professional degree/s offered better ways of teaching-learning strategies which might help teachers to make a constructive learning environment by engaging students in learning. Trained teachers could manage students well to share their ideas through brainstorming in the learning process. The professional degree had significant positive attitudes towards ICT-pedagogy integration. However, a large number of teachers (32%) participated in this study who had no professional degree although the teachers with professional degree/s possessed highly positive attitudes than the teachers who had no degree.

Figure 4.39: Attitudes by Professional Qualification



The figure-4.39 illustrated that all the participants of this study exposed positive attitudes towards ICT-pedagogy integration in BGS classrooms. The teachers having professional degree/s possessed comparatively better positive attitudes towards ICT-pedagogy integration while the teachers. Additionally, the teachers who had accomplished MEd degree possessed more (M=4.11; SD=.37; f=43) attitudes than the teachers who had attained BEd (M=4.01; SD=.39; f=216) degree/s. However, both of the groups showed significantly more attitudes than the teachers who did not have a professional degree (M=3.94; SD=.39; f=124) (Appendix-X). Therefore, the teachers obliged to have professional degree/s to make collaborative teaching-learning activities through ICT-pedagogy integration in teaching BGS. Conversely, the government should take necessary steps so that the teachers could make passionate themselves to enroll right now in a professional degree course.

4.3.8.10 Social Media Use in Education

The finding (table-4.37) illustrated that there were statistically significant variations found among the teachers regarding their social media use in education by age because the significance level was .01 which was less than the accepted alpha level ($p < .05$). On the other hand, the mean scores of using social media in education demonstrated some differences between urban and rural, government against non-government and male compared to female teachers. While the independent sample t-test revealed no significant differences in using social media for teaching purpose regarding school location, school types, and gender distribution.

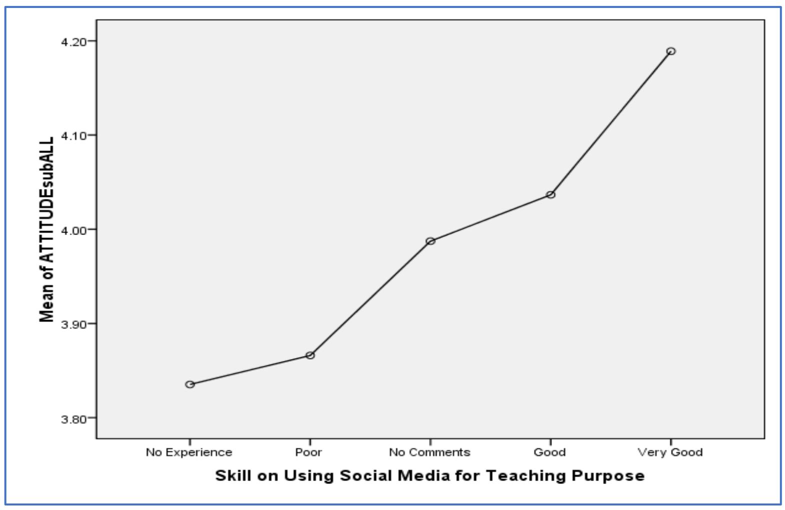
Table 4.37: Attitudes by Social Media Use in Education by Age

Categories		Sum of Squares	df	Mean Square	F	*sig.*
Social Media use by Age	Between Groups	6.09	4	1.523	11.25	.00
	Within Groups	52.27	386	.135		
	Total	58.37	390			

*$p < .05$ for ANOVA whereas Homogeneity of variance was found in each categories $p > .05$

The use of social media in education made differences among the teachers to integrate ICT-pedagogy in BGS classrooms. The data indicated who had more skills on social media possessed more attitudes than others. The use of social media helped to build confidence in the ICT-pedagogy integration process (Mahmuda, 2016). However, a lot of teachers (40%) revealed that they had either no experience or poor experience with social media use in education. Most of them were aged and rural teachers who also had less experience in ICT tools. However, the use of social media in education might help teachers by giving useful information about their teaching subjects, might connect with their students and teachers' community which had significant positive effects on teachers' professional development. The use of social media made optimistic of its educational use because the teachers who used social media, possessed positive attitudes but comparatively young teachers possessed more attitudes towards ICT integration in teaching BGS.

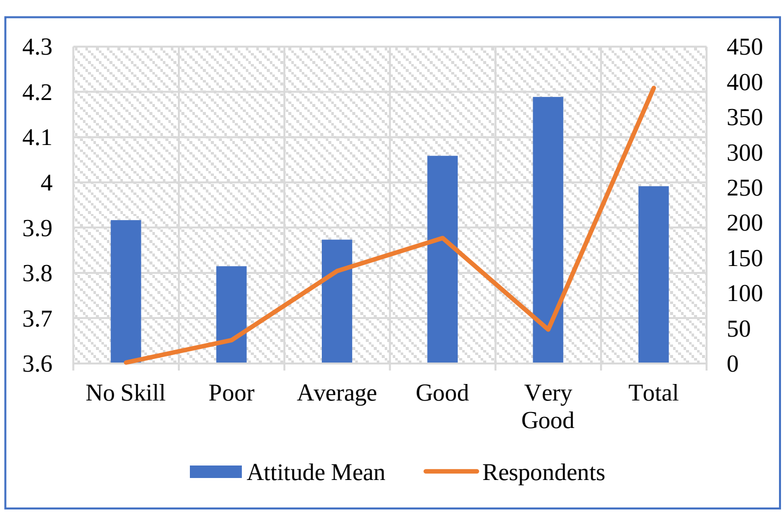
Figure 4.40: Social Media Use in Education



4.3.8.11 Confidence against Attitudes

The figure-4.41 demonstrated that the teachers who assessed themselves as competent ICT users possessed more attitudes regarding ICT-pedagogy integration in teaching BGS.

Figure 4.41: Confidence and Possessed Attitudes



The results explained that the teachers who (12%) showed strong confidence in ICT skill possessed more attitudes (M=4.19; SD=.42; n=48) compared to others regarding

ICT-pedagogy integration. At the same time, the teachers who (46%) disclosed themselves as good at confidence in ICT skill demonstrated positive attitudes comparatively lower (M=4.06; SD=.36; n=178) than strongly confident group of teachers but better than the teachers (34%) having a moderate level of confidence in ICT skill (M=3.87; SD=.39; n=131) as well as the lowest (M=3.81; SD=.28; n=33) group of teachers (8%). However, all teachers demonstrated positive (M=3.99; SD=.39; N=391) attitudes towards ICT-pedagogy integration in BGS classroom activities (Appendix-Y).

The overall attitudes demonstrated a bit difference among the participants of this study according to their prior ICT skills. This result was correlated with the level of ICT skills and overall attitudes towards ICT-pedagogy integration in teaching BGS. The statistical data also indicated that more than half (58%) of the teachers had more confidence in ICT skill (good and very good), while a many of teachers (42%) had lower confidence. Although the confidence in ICT skill helped teachers to integrate new innovation in education, especially for ICT innovation and it had significant positive effects on achieving the success. Moreover, the prior skill on ICT was a key indicator to overcome the fear and anxiety which reinforced to cope easily the integration of ICT in classrooms. Similarly, computer self-efficacy was negatively associated with computer anxiety and raised confidence to use ICT tools (Chen, 2012). Similarly, Islam (2015) revealed that the teachers who had ICT skill possessed more attitudes. The findings of this study also illustrated that the confidence creates differences in pursuing positive attitudes to ICT-pedagogy integration in teaching BGS. Therefore, the initiative should be taken for creating interest in ICT skill among teachers for transforming ICT-friendly behavior that might help ICT-pedagogy integration in BGS the classrooms.

Table 4.38: Attitudes against Confidence in ICT Skill

Categories		Sum of Squares	Df	Mean Square	F	*sig.*
Level of confidence in ICT Skill	Between Groups	5.52	4	1.38		
	Within Groups	52.85	386	.138	10.08	.00*
	Total	58.37	390			

*p < .05 for ANOVA whereas Homogeneity of variance was found in each categories p > .05

On the other hand, the homogeneity test revealed that there was no significant difference recognized (p > .05) among the respondents regarding their level of confidence in ICT skill. The significance level was .00, which was less than the accepted alpha level of .05. The results [F (4, 386) = 10.08, p < .05] exposed that there was significant difference among teachers by their level of confidence in ICT skill regarding attitudes towards ICT-pedagogy practice in the BGS classrooms.

According to the results, teachers were needed to build up their confidence in ICT skill, and it might be possible through increasing technology experience. Mustafina (2016) illustrated that self-confidence influences teachers' positive attitudes towards ICT while ICT engagement helped to build self-confidence (Varol, 2013). In contrast, perceived self-efficacy was a strong predictor of ICT use in the lessons (Drossel, Eickelmann, & Gerick, 2017). In addition, Afshari et al. (2012) revealed a positive correlation between computer competency and level of computer use. Similarly, this study claimed that computer competence had been found as the most influencing factor towards ICT-pedagogy practices in the classrooms (Wario, 2014).

4.3.8.12 ICT Skills, Attitudes and Practice

This sub-section explained the relation between teachers' ICT skills and their level of practice in teaching BGS classrooms. The analysis had been done based on demographic data (q-14; section-A of questionnaire survey; table-4.4) and some selected items from the Classroom Observation Checklist (Appendix-C). According to the results, teachers presented themselves (N=391) to some extent skill on ICT regarding their degree of choice (good and very good on 5-points Likert's scale). Moreover, they exposed themselves comparatively more expert on working with PowerPoint (76%) and browsing internet material for content preparation (72%) than other skills. In the same way, they showed moderate skill on mailing ability for communication (67%), browsing YouTube material for teaching purpose (63%) and using an online platform for content preparation, especially on the Teachers Portal (52%). On the other hand, the level of ICT-pedagogy practice in teaching BGS (N=32) was a little extent to moderate level. The teachers could not extend their thinking boundaries other than books (9%) during ICT-pedagogy integration in BGS classroom activities. They made little opportunity to let express their students' opinion and engage (38%) in lesson-related activities. Moreover, the employed instructional strategies, media and material in their lesson (44%) were not able to foster the critical thinking and problem-solving ability of students up to the mark. The lack of appropriate preparation for the presented lesson was the major reason.

Moreover, it was found that model content had been designed with a scope of creative and innovative learning opportunities (78%) for students, but the administered lesson did not go through the same pace in teaching-learning activities. On the other hand, the teachers' self-prepared content was poor in quality but taught better than model content because of having a good concept about lesson plan. There were some items those were observed under relation between teachers' attitudes towards usefulness of ICT and the practice of ICT material in classroom activities regarding the degree of choice about agree and strongly agree against good and very good perception. The analysis demonstrated a big gap between possessed attitudes against their level of ICT-pedagogy practice in BGS classroom activities.

All most all the teachers demonstrated strongly (98%) positive attitudes which might increase the level of students' motivation and it helped to transform student-centric classroom activities (92%). Conversely, the participation of students in classroom activities was very poor (28%). At the same time, the learning opportunity of students (65%) did not fully quantify with motivation. Although the motivation and engagement in the lessons were correlated, the results did not go through in a similar way. On the other hand, the teachers revealed that students with learning difficulties could be strongly benefitted from ICT integrated classroom (80%) while the practice level of ICT in the classrooms did not follow as per possessed attitudes. Equally, teachers claimed that ICT-pedagogy could be properly used to make learners creative with proper learning opportunities (96%) whereas the ICT-pedagogy was being practiced by teachers (78%) according to the teachers' opinion. Therefore, there were dissimilarities established about possessed attitudes and their level of practice ICT-pedagogy integration in teaching BGS.

Key Findings of ICT-pedagogy use in BGS Classroom Practice

The ICT-pedagogy integration in BGS classroom was fairly practiced as well as it was found unorganized use in classrooms. Conversely, the use of ICT-pedagogy in classroom activities was limited within laptop and multimedia projector and a little use of internet in limited schools. However, there were shortages of different ICT tools in ICT-pedagogy mediated classrooms regarding the concept of multimedia classroom. Teachers displayed comparatively better Knowledge in subject matter (Content Knowledge) rather than ICT-pedagogy & Content Knowledge as well as Pedagogical Knowledge. Teachers performed better in second phase than first although the performance was not equally progressed in both phases. Moreover, dissimilarity had been found between survey results and the results of classroom observation regarding ICT-pedagogy integration in classroom practices.

Concurrently, there were some differences found regarding attitudes and practice of ICT-pedagogy in schools concerning urban and rural, government and non-government in spite of having positive attitudes of teachers. The ICT-pedagogy practice level was lower than their possessed attitudes, while the level of practice in rural and non-government schools dropped suddenly more than in urban and government schools. The teachers' age and professional qualification were appeared as significant mediator of integrating ICT-pedagogy in classroom whereas gender difference was not considered as significant factor. Surprisingly, the female teachers practiced more ICT-pedagogy in their lesson presentation than male teachers whereas male teachers possessed slightly more positive attitudes than female. However, the professional qualification, confidence in ICT skill, and social media use in education influenced ICT-pedagogy integration in classroom activities. At the same time, it was true that they faced different types of limitations during the integration process.

4.4 Challenges to ICT-pedagogy Integration in BGS Classrooms

Innovation in education always brought new challenges (Khan, 2014) and stresses associated with integrating technology in education. However, this study focused on exploring the challenges in integrating ICT-pedagogy in BGS classrooms and identified several types of challenges regarding teaching BGS. The major challenges were: lack of infrastructure, shortage of up-to-date ICT facilities, lack of training and experience, shortage of time to prepare content, teaching load, lack of motivation and reward, including anxiety about new technology. These challenges were similar to other contemporary research findings. The following data, based on the survey questionnaire (sections- c & a) focused on the challenges of ICT-pedagogy integration in teaching BGS which started with Challenges of ICT infrastructure in the classrooms. Concurrently, at the end of this sub-section teachers' classroom experience was analyzed relating to ICT-pedagogy integration process.

4.4.1 Challenges of ICT Infrastructure

The table-4.39 below disclosed the challenges faced by teachers regarding ICT infrastructure in BGS classrooms.

Table 4.39 Challenges of ICT Infrastructure

SL	Statements	n	M	SD
1	Computers or laptop for learners in classroom	391	4.39	.88
2	Access of computers or laptops for teachers (i.e., smart board, electricity, multimedia projector, lab facilities, internet cost/speed)		4.30	.93
3	Power supply		4.23	.93
4	Internet facilities		4.14	1.03
5	Support for instant ICT problem		4.09	.96
	Average	391	4.23	.70

The above data claimed that the teachers faced most challenges on ICT infrastructure (M=4.23; SD=.70; N=391) for integrating ICT-pedagogy in BGS classrooms overlooking the disparity between rural and urban, male and female, govt. and non-govt. etc. This result concurred with Mahdum, Hadriana, and Safriyanti (2019); Al Mofarreh (2016); Albugami and Ahmed (2015); Yusuf and Balogun (2011) who found in their study that the teachers met various types of challenges to utilize ICT in BGS teaching-learning activities, especially the lack of ICT infrastructure and its limited facilities.

The data also revealed that schools had a shortage of ICT equipment (Mannan, Rahman, & Khan, 2014) such as computer, laptop, multimedia projector, smart board, and internet access both for teachers and students. These were the major challenges for the smooth integration of ICT-pedagogy in BGS classrooms. Moreover, there were a shortage of physical infrastructure facilities i.e., inadequate space and well-decorated classroom, lack of adequate space for multimedia setting, and insufficient ventilation system in the classrooms. Furthermore, the teachers had to compromise with interrupted power supply and instant technical help during ICT-pedagogy integration in teaching BGS. The above stated challenges made ICT-pedagogy integration either slow or stop. Similarly, Sultana and Haque (2018), Talukder and Saba (2016), Parvin (2013) examined ICT status on education in Bangladesh and identified many challenges of implementing ICT in the classrooms. They also found a lack of ICT resources, insufficient power supply, low internet connectivity, lack of computer or laptop, and multimedia projector. Additionally, Salam (2016), and Karim (2014) claimed that the educational infrastructure were not designed consistent with ICT facilities of higher education in Bangladesh. In the same way, Rahman, Paul, and Hasan (2012) including Khan, Hasan, and Clement (2012) identified the lack of ICT-supported infrastructure and resources as barriers to effective use of ICT in the classrooms.

4.4.2 Challenges to Integration of ICT-Pedagogy

The following table-4.40 demonstrated the challenges regarding ICT-pedagogy integration which were faced by teachers usually in teaching BGS. However, the results stated that Challenges of ICT-pedagogy Integration (M=3.36; SD=.48; N=391) was considered lower than Challenges of ICT Infrastructure (table-4.39) but higher challenges compared to the other three sub-sections (table-4.41, 4.42 and 4.43) under section-4.7.

Table 4.40: Challenges of ICT-Pedagogy Integration

SL	Statements	N	M	SD
1	Knowledge on TPACK integration		4.22	.77
2	Relevant ICT skill		4.18	.96
3	Experience of using ICT in classroom		4.18	.79
4	Lack of training on ICT integration	391	4.09	.86
5	Dependence on ICT during teaching		2.77	1.17
6	Assess students by using ICT		2.38	1.09
7	Utilizing time in class by using ICT		1.67	.72
	Average	391	3.36	.48

According to data, most teachers assessed themselves that they (90%) were suffering on integrating Technology Pedagogy and Content Knowledge (TPACK) in teaching BGS (M=4.22; SD=.77). Similarly, Ndibalema (2014) acknowledged that the teachers were unable to integrate ICT efficiently as a pedagogical tool in teaching BGS due to shortage of skills on ICT despite having positive attitudes. At the same time, Ertmer, Tondeur, and Leftwich (2016) explicated a link between teachers' pedagogical beliefs and their uses of digital technologies. They also revealed that the technology integration was not an isolated goal to be achieved separately from pedagogical goals but simply the means by which students were engaged in relevant and meaningful work.

Once again, the majority of teachers were found (89%; n=348) with shortened experience (M=4.18; SD=.79) on using ICT-pedagogy in teaching BGS. At the same time, most of the teachers (86%; n=337) assessed themselves with a lack of relevant ICT skills (M=4.18; SD=.96). These results coincided with Mahdum, Hadriana, and Safriyanti (2019), Albugami and Ahmed (2015), Cavucci (2009) who found that the teachers had lack of capacity and skills on ICT use in the classrooms. Moreover, Nsolly and Charlotte (2016) recognized that inadequacy of qualified teachers with technology-based pedagogy was treated as barriers to integrating ICT in teaching BGS.

However, MoE (2013) aimed at developing professional ICT skill because teachers who gained skill on ICT possessed more attitudes than others (Islam, 2015; Wario, 2014; Al-zaidiyeen, Mei, & Fook, 2010). On the other hand, the teachers (86%; n=334) identified that the Lack of Training on ICT-pedagogy integration (M=4.09; SD=.86) was another issue that delayed the integration process in BGS classrooms. Similarly, Mahmuda (2016), Andoh (2012) reported that lack of teacher training on pedagogy was considered a barrier to technology integration. Above all, Alrasheedi (2009) claimed that training on ICT had a significant factor on teachers' attitudes towards ICT-pedagogy integration. Therefore, it could be concluded that ICT-pedagogy embedded training enhanced the ability of teachers to integrate it in teaching BGS.

Additionally, Dependence on ICT (M=2.77; SD=1.27) was found as a new challenge although the level was comparatively lower (31%; n=116) than early stated challenges but higher than the difficulties of students' assessment with ICT (M=2.38; SD=1.09) and time management (M=1.67; SD=.72) in ICT-pedagogy integrated classroom. According to data, teachers could properly utilize time management in ICT-pedagogy integrated BGS classroom whereas it was hardly observed that teachers could properly complete the lesson in time. Concurrently, teachers represented themselves that they used ICT in formative assessment (67%; n=262) process, although teachers possessed a somewhat moderate attitudes towards ICT use in the assessment procedure (section-4.4.4). Furthermore, they followed traditional types of formative assessment in teaching BGS.

The above discussion indicated that insufficient knowledge on TPACK had been considered a major challenge in ICT-pedagogy integration in teaching BGS. The other major challenges were the lack of proper ICT skill and experience of using ICT as well as lack of training on ICT-pedagogy integration in the BGS classrooms. Many teachers used ICT material as a driving force rather than assistive tools in classroom teaching. However, the teachers' positive attitudes could be employed by appropriate support for creating new technology-enhanced pedagogies (Young, 2016) because the teachers had higher positive attitudes towards ICT-pedagogy integration. On the other hand, the use of ICT in students' assessment started to a limited extent by some young teachers. This effort could make formative assessment quick, easy and exciting for students. It also helped with the successful integration of ICT-pedagogy in teaching BGS.

Therefore, it could be suggested that the teachers required knowing how to better practice ICT Knowledge, Pedagogy Knowledge and Content Knowledge in the BGS classrooms. They were also required to develop a high level of relevant ICT skills and experience through training to meet the challenges successfully. Thus, training could be a solution to accelerate the use of ICT-pedagogy as a whole in teaching BGS. It also helped quicken to employ ICT as a formative assessment tool to assess students' progress. Therefore, ICT should be introduced immediately to offer professional development on ICT-pedagogy integration either by proper authority or schools (section-4.4.1). Moreover, Chan and Mohammad (2019) disclosed the importance of professional development and training to upgrade technological skills. Malcom-Bell (2009) also suggested resolving the barriers of inadequate professional development for integration of technology in education. However, teachers who positively exposed themselves to the integration process could properly utilize the teacher-student contact hour compared with the challenges they faced in this section. Moreover, these results recommended that there were enormous opportunities to work for integrating ICT-pedagogy in teaching BGS. Consequently, for perfect use of ICT as a cognitive tool in knowledge construction teachers would accept the computer as a learning tool and were able to integrate it into teaching-learning activities (Mueller, 2009).

4.4.3 Challenges about Pedagogical Knowledge

The table-4.41 below presented the challenges that teachers faced in classroom practice related to Pedagogical Knowledge. The challenges were considered based on average mean and standard deviation, while the more average mean scores were considered as higher challenges compared to lower mean scores.

Table 4.41: Challenges of Teachers' Pedagogical Knowledge

SL	Statements	N	M	SD
1	Creating interactive learning environment by using appropriate teaching methods in lesson	391	3.87	.98
2	Learners remain fully engage throughout the lesson		3.82	1.01
3	Ability for evaluating students' activities by using ICT		3.76	1.03
4	Work sheet for creative thinking skill and problem-solving skill of learners		3.64	1.05
5	Ability in disciplined classroom activities		3.48	1.19
6	Subject knowledge of teachers in context of learners' class, age and ability		3.32	1.18
7	Enhancing attention by real life example while requires by using ICT		2.68	1.33
8	Analysis about lessons by using ICT		2.39	1.16
9	Participation of learners in ICT oriented classroom activities		2.14	1.05
10	Involvement of learners in group work in ICT oriented classroom		2.07	1.02
11	Opportunity of traditional question-answering in ICT oriented classroom		1.91	.85
	Average	391	3.26	.55

The data illustrated that the teachers faced different challenges with incorporating pedagogical knowledge (M=3.26; SD=.55; N=391) in ICT-pedagogy integrated classrooms, which might stop benefiting from integrating ICT in teaching BGS. However, the teachers in this study faced the lowest challenge in the question-answering (M=1.91; SD=.85) session because they were used to question-answering in traditional classroom activities. In the same way, teachers could engage learners effectively (M=2.14; SD=1.05) in ICT-pedagogy integrated classroom. ICT-pedagogy integrated classroom might be more interactive through group work, discussion and active participation (M=2.07; SD=1.02) despite having some challenges.

On the other hand, the data disclosed that teachers poorly faced more challenges in creating a welcoming learning environment and using teaching methods in ICT oriented classrooms (M=3.87; SD=.98). In addition, they could not fully engage learner throughout the lesson in ICT embedded classrooms (M=3.82; SD=1.01). According to the data, the teachers neither brought out the students' creativity through worksheets nor to make skilled on problem solving ability by using ICT material (M=3.64; SD=1.05). Moreover, teachers were not fully capable (M=3.76; SD=1.03) of assessing students' activities in ICT mediated classrooms. Unexpectedly, they possessed insufficient subject knowledge (M=3.32; SD=1.18) about learners' class, age and ability. Sometimes, teachers were not trained adequately on ICT-pedagogy to deliver lesson effectively in schools (A2I, 2011). Additionally, the lesson had been completed without sufficient analysis on content (M=2.39; SD=1.16). Conversely, the utilized of content related real-life examples (M=2.68; SD=1.33) and limitations of the disciplined classrooms (M=3.48; SD=1.19) were the other challenges towards ICT-pedagogy integration in teaching BGS.

However, the proper pedagogical knowledge of teachers facilitated the easy integration of ICT in education. It was closely related to the higher-order thinking and metacognition skill by effective interactions performed in the teaching-learning activities. Pedagogical Knowledge of teachers also had a momentous role in making the classroom constructive and collaborative where students could learn the content knowledge with better understanding by using their prior knowledge. This learning process was useful for BGS content because it was focused more on the abstract theme. Moreover, the use of ICT-pedagogy in the learning activities fostered the deepen learning. It also provided the opportunity to acquire concrete ideas on learning BGS which offered to understand better history, culture, heritage, and about the people of Bangladesh. Therefore, the proper integration of pedagogy in ICT mediated classrooms could significantly contribute to teaching BGS like other subjects.

Above all, teachers were found with positive attitudes. They believed that they could play a vital role as facilitators in the ICT-pedagogy integration process where students could have more opportunities to learn the lesson in the collaborative, creative and joyful learning environment. Therefore, teachers should develop their pedagogical knowledge for successful ICT-pedagogy integration in teaching BGS. In contrast, concerned authorities could make arrange in-service or in-house training for sharing teachers' knowledge. Furthermore, teachers could participate in online training courses to build their capacity.

4.4.4 Challenges about Motivation and Reward

The table-4.42 presented the average mean, standard deviation and percentage (%) of frequency addressing the level of challenges regarding Motivation and Reward. The bigger mean scores were considered as more challenges and gradually it decreased.

Table 4.42: Challenges of Motivation and Reward

SL	Statements	N	M	SD	Agreed (%)	No Comments (%)	Disagreed (%)
1	Administrative support for using ICT	391	4.11	.97	82	8	10
2	Reward for encouraging ICT usage in teaching		3.99	1.07	78	9	13
3	Self-interest of teachers in ICT usage in teaching		3.49	1.08	64	10	26
4	Increases teaching load for teachers		2.78	1.23	32	16	52
5	Using ICT is not my school's priority		2.72	1.22	30	18	52
6	Using ICT is not my priority		2.30	1.05	14	20	66
	Total	391	3.21	.65	--	--	--

[Note: the degree of choice agreed and strongly agreed had been calculated as agreed while disagreed and strongly disagreed were considered in disagreed.]

The NIP-2018 and A2I (2011) suggested offering incentives for teachers based on their performance and innovation. However, lack of motivation and reward were considered as a moderate level of challenges (M=3.21; SD=.65; N=391) for using ICT in classroom activities. Unexpectedly the administrative support (M=4.11; SD=.97; 82%) was one of the biggest challenges in the ICT-pedagogy integration process. While the initial stage of ICT-pedagogy integration process required more support from their administration and colleagues. Especially, the integration process wanted a supportive team-building environment.

In contrast, Nsolly and Charlotte (2016) claimed that school administrators' ignorance made ICT integration into the curriculum ineffective. On the other hand, Baharuldin, Jamaluddin, and Nizam (2019) disclosed a statistically significant relationship between school administrative support and teachers' ICT competence. Unlikely the teachers were rarely rewarded by the school authorities for their effort to incorporate ICT-pedagogy in their classroom activities (M=3.99; SD=1.07; 78%) though many of them were encouraged for practicing ICT-pedagogy (section-4.4.3). While, Copriady (2014) illustrated that motivation was a significant variable as a mediator between the variables of readiness with ICT application in teaching-learning science and social science. Conversely, the other challenges were teachers' self-interest (M=3.49; SD=1.08; 64%) and their priority of using ICT in teaching (M=2.30; SD=1.05; 66%). The priority towards ICT-pedagogy integration was comparatively lower than other challenges despite having much teaching load in daily routine (M=2.78; SD=1.23; 52%). Meanwhile, teachers (30%) thought that ICT-pedagogy integration was not school's priority (M=2.72; SD=1.22) whereas 52% of teachers differed with the statement. According to the teachers' opinion, the majority of the schools provided priority for using ICT-pedagogy in teaching BGS though it was differed of researchers' experience during classroom observation.

The reward and motivation for the ICT-pedagogy integration process in education helped teachers performing desired behavior. It also boosted students' learning by making sense of meaningfulness and accomplishment to be a master in certain subject, skills, or activity (Saeed & Zyngier, 2012). Similarly, Mahdum, Hadriana, and Safriyanti (2019) revealed that teachers' level of perception and motivation towards ICT integration was positively correlated with their attitudes. Additionally, Afshari et al. (2010) stated that principals' expertise in computer operation might positively affect their attitudes towards ICT integration.

The administrative body could play a motivating role towards extensive use of ICT-pedagogy in teaching BGS. Unfortunately, the major challenges were come from the body whereas the positive support might help teachers accumulate and motivate towards ICT-pedagogy in teaching BGS. On the other hand, there were some dedicated teachers who might pay best effort for incorporating ICT-pedagogy in the BGS classrooms were criticized for their positive behavior (T-17, 85, 134, 171, 211, & 363). However, concerned authorities could enhance the integration process by providing a supportive environment in schools and might reward the teachers who involved in the process. In contrast, the teachers were required to build positive attitudes towards ICT-pedagogy integration and made them capable of conducting class with ICT material.

4.4.5 Other Challenges

The data regarding other challenges were presented in two sections: unstructured and strategic challenges. The unstructured challenge came from section-C, while the strategic challenge was from the part of section-A (demographic part) of the survey questionnaire.

4.4.5.1 Unstructured Challenges

The Unstructured Challenges explored some common issues, i.e., lack of time (Alkahtani, 2017; Al Mofarreh, 2016; Parvin, 2013; Khan, Hasan, & Clement, 2012; Cavucci, 2009; and Zuniga, 2009), insufficient learning material, lack of language proficiency (Talukder & Saba, 2016; Rahman, Paul, & Hasan, 2012) which required attention for successful integration of ICT in teaching BGS. According to the findings, the higher mean scores indicated comparatively higher challenges which were elaborated in the following table-4.43.

Table 4.43: Unstructured Challenges of ICT-pedagogy Integration

SL	Statements	N	M	SD	Agreed statement (%)	No Answer (%)	Disagreed statement (%)
1	Effective learning material	391	3.61	1.19	65	12	23
2	Time Limitation		3.37	1.25	56	13	31
3	knowledge of English language		3.16	1.17	48	17	35
4	Appropriateness of BGS curriculum to integrate ICT		2.14	1.01	10	17	73
	Total	391	3.07	.75	--	--	--

[Note: the degree of choice agreed and strongly agreed were considered as agreed while disagreed and strongly disagreed were transformed in disagreed.]

As stated by data, most teachers (73%) believed that the secondary school BGS curriculum was good enough for incorporating ICT-pedagogy, especially for BGS (M=2.14; SD=1.01; 73%). However, the data (M=3.61; SD=1.19; 65%) recommended that teachers need support for sufficient prepared learning material, which might help teachers' easy integration of ICT-pedagogy in teaching BGS because teachers had time limitations to prepare learning material (M=3.37; SD=1.25; 56%) due to class load. In addition, teachers faced many challenges on insufficient knowledge, skills and experience to prepare learning material focusing on ICT-pedagogy and Content Knowledge (table-4.20) while MoE (2013) focused on improving standards of teaching-learning material. On the other hand, they had quite a bit of difficulty in language skill (M=3.16; SD=1.17; 35%), which might be considered as barriers for collecting resources that might have ultimately negative impact on ICT-pedagogy integration process. These results concurred with Rahman, Paul, and Hasan (2012) who demonstrated that the limitation on English skill was considered a challenge to integrate ICT in the Bangladesh education system.

Teachers were asked to provide their opinion on whether the BGS curriculum was appropriate to integrate ICT-pedagogy. The teachers opined positively that the BGS curriculum was appropriate for ICT integration. Therefore, it could be concluded that the curriculum should deliver a guideline for ICT-pedagogy integration process to run the education system on the right track. In Bangladesh, to make the BGS curriculum feasible in ICT integrated classrooms desired quality teaching material, adequate ICT equipment, needed to minimize the class load of teachers and made proficiency on language skill both Bangla and English. Thus, concerned authority would take steps to supply proper learning material or make teachers skill and reduce class load to develop learning material for successful integration of ICT in BGS curriculum.

4.4.5.2 Strategic Challenges

The following table-4.44 presented the challenges into three major perspectives, i.e., teachers, institutions and government policies. The teachers were asked to mark the statements either Agree or Disagree. Responses were calculated by frequency (f) and percentage (%) differently for each item.

Table 4.44: Strategic Challenges of Integration Process

SL	Perspective	Items	N	Agree (f)	%	Disagree (f)	%
1	Teachers	Teachers' lack of ICT skill	391	352	90	39	10
2		Teachers unwillingness		304	78	87	22
3		Anxiety about using new technology		285	73	106	27
4		Language problem for searching online resources		243	62	148	38
5	Institution	Inadequacy of laptop or computer in classroom teaching		347	89	44	11
6		More class load		334	85	57	15
7		Low internet speed or no internet		329	84	62	16
8		Spoiled laptop or computer		310	79	81	21
9		Spoiled multimedia		287	73	104	27
10		Lack of reward		272	70	119	30
11		Obstacle from institutional head for ICT use		233	60	158	40
12	Govt. Policy	Lack of training on ICT use		334	84	57	16
13		Lack of technical help		315	81	76	19
14		Electricity failure		310	79	81	21
15		Inadequate content		270	69	121	31
16	Others			16	--	--	--

From teachers' perspective, the data disclosed that the lack of ICT skills (n=352; 90%), their unwillingness to incorporate ICT in teaching (n=304; 78%), anxiety about using new technology (N=391; n=285; 73%) and language problem to comprehend the online content (N=391; n=243; 62%) were reflected as major challenges to incorporate ICT-pedagogy in teaching-learning BGS. In the same way, Ha and Lee

(2019) found that the awareness of teachers was affected by the degree of their knowledge of ICT. Moreover, Semerci and Aydin (2018) claimed that the teachers had significantly different negative attitudes regarding ICT anxiety towards ICT use in teaching by their ICT experience, ICT skills and ICT training (Albugami & Ahmed, 2015; Andoh, 2012). Likewise, Chen (2012) stated that computer confidence was negatively associated with computer anxiety.

Chen (2012), along with Oni, Haruna, and Amugo (2017) also illustrated that teachers' anxiety about technology was a major factor against their readiness and the effective use in classrooms. Similarly, Zuniga (2009) revealed that fear of computer technology was a significant factor impeding in the integration process. Wario (2014) also claimed that computer competence was the most influencing factor affecting ICT use in the classrooms. In contrast, Tasir et al. (2012) demonstrated that teachers' ICT competency and their confidence level were highly correlated. Therefore, it could be concluded that ICT experience, skills, and training helped to eliminate ICT anxiety and changed negative attitudes that would foster confidence to incorporate ICT-pedagogy in teaching BGS.

On the other hand, the data from institutional perspective exposed that the inadequacy of laptop or computer for classroom teaching (n=347; 89%), class load (n=334; 85%), low internet facilities (n=329; 84%), spoiled laptop or computer (n=310; 79%), spoiled multimedia (n=287; 73%), lack of reward (n=272; 70%) and obstacle from institutional head for technology use (n=233; 60%) were found as major challenges against incorporating ICT-pedagogy in teaching BGS. Bandyopadhyay (2013) disclosed that the faulty and malfunctioning equipment were the barriers to accomplishing the teacher's ability. Similarly, Albugami and Ahmed (2015) illustrated that lack of proper maintenance of ICT equipment was considered a challenge in ICT integration. Contrariwise, A2I (2011) stated the effectiveness of multimedia material in imparting content knowledge.

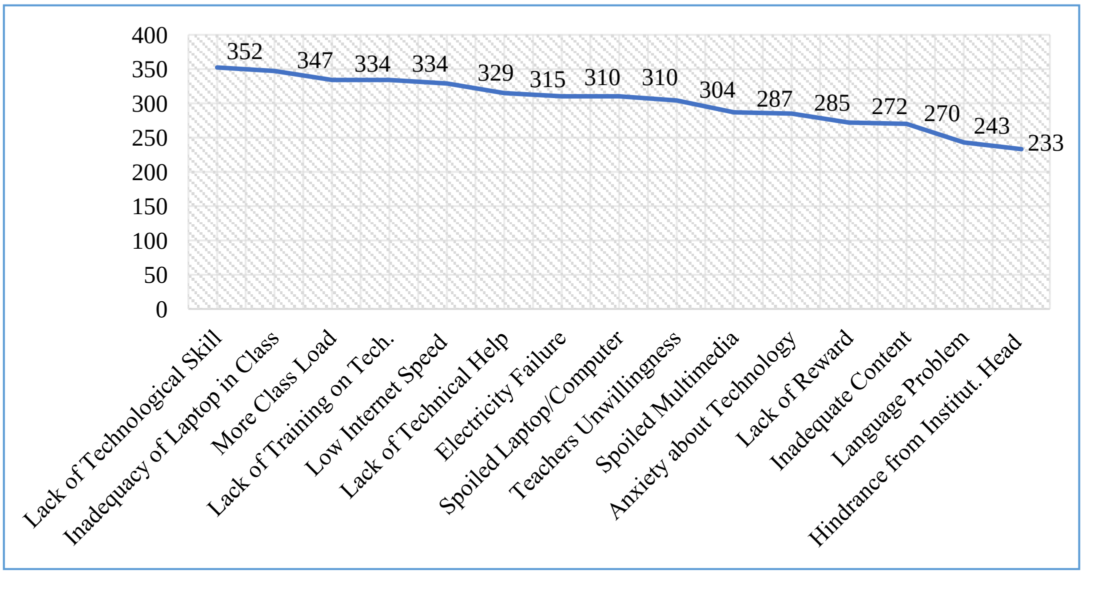
On the other hand, Bandyopadhyay (2013) disclosed that the existing policy, personal characteristics of teachers, lack of technical support, the school context and the offered innovation acted as a catalyzer of ICT integration. However, the govt. policy-related challenges were found in this study those were: the lack of training for technology use (n=334; 84%), lack of technical help (n=315; 81%), electricity failure (n=310; 79%) and inadequate content for lesson design (n=270; 69%). Similarly, Al Mofarreh (2016) disclosed some barriers in implementation stages, i.e., bureaucracy, scarcity of ICT policy planning and development processes, poor training and support, lack of leadership, etc. Additionally, Nsolly and Charlotte (2016) argued that the absence of permanent technical support staff was a barrier to effective ICT integration into the curriculum. Furthermore, Mirzajani et al. (2016) illustrated that insufficient technical support was a barrier that disheartened teachers from using ICT in teaching. Oni, Haruna, and Amugo (2017) also disclosed that lack of technical support was one of the challenges for ICT integration while the presence of technical staff might reduce the anxiety and encourage teachers to use the resources properly.

On the other hand, Onwuagboke et al. (2014), Cavucci (2009), Zuniga (2009) focused that the lack of adequate training of teacher educators and epileptic power supply were the barriers in the technology integration process in the curriculum. While Yusuf and Balogun (2011) revealed that lack of appropriate teacher development programs might prevent the integration process of ICT in education. Similarly, Bozdogan and Ozen (2014) reported that teachers training had been found to be a strong factor for building teachers' confidence regarding ICT self-efficacy. On the other hand, Andoh (2012) showed that the rigid structure of traditional education systems and restrictive curricula worked as a barrier.

The teachers (T-27, 32, 55, 179, 190, 285, & 328) addressed some challenges which were not enlisted in the survey questionnaire but identified as barriers during the ICT-pedagogy integration process in the BGS classrooms. They also remarked that schools had wifi connection though it was not used for teaching-learning purposes rather but was officially used. Moreover, head teachers unwanted to provide wifi password to the classroom teachers. Therefore, teachers needed to buy an internet package if they desired to use ICT resources in their classes which might take away from the integration process. Some of the teachers opined that the head of institutions did not interest in ICT-pedagogy integration due to lack of knowledge or training on ICT (T-34, 89, 127, & 310). Some of them pointed out the weakness of management as the reason for the low use or no use of ICT in BGS classrooms. Moreover, the length of the class period, especially for double shifted schools and engagement of extra duties unlikely teaching by teachers were other challenges towards ICT-pedagogy integration in the BGS classrooms.

In contrast, figure-4.42 below demonstrated the challenges pictorially according to order of choice by respondents of this study.

Figure 4.42: Strategic Challenges



The above figure illustrated that the top three challenges were teachers' lack of ICT skills (n=352; 90%), the inadequacy of laptop or computer in classroom teaching (n=347; 89%) and more class load (n=334; 85%). On the contrary, relatively the least three challenges were as stoppage from the institutional head for ICT use (n=233; 60%), language problem for surfing online resources (n=243; 62%) and inadequacy of relevant content (n=270; 69%).

Unfortunately, the findings disclosed that many teachers (n=272; 70%) usually did not receive any reward from the school authorities for their contribution to incorporating ICT-pedagogy in teaching BGS. On the other hand, the data against teachers' language proficiency presented comparatively a good insight because many of them (n=148; 38%) disagreed about whether they were asked to know to what extent they faced problems with the English language, especially for browsing the internet content relating BGS. Although most teachers (n=243; 62%) felt challenges with language proficiency, many of them suggested that teachers needed to develop their language proficiency for better use of internet resources in teaching BGS.

On the other hand, Sultana and Haque (2018) examined the ICT status in Bangladesh and identified many challenges regarding ICT integration in the classrooms. Those were the lack of ICT infrastructure and resource, insufficient fund, vision and plan, government vision and plan, college vision and plan, social and cultural factors, lack of knowledge and skills, and scarcity of time. In contrast, Talukder and Saba (2016) claimed that the ICT revolution in Bangladesh brought many positive changes in education systems, but they had to face several challenges. Those were the lack of ICT skills of teachers, lack of computer, interactive multimedia, audio devices, internet, television, mobile gadget, interactive whiteboard, etc. Moreover, Parvin (2013); Khan, Hasan, and Clement (2012); Rahman, Paul, and Hasan (2012) found the lack of ICT supported infrastructure, funding problem, proper vision and planning problem, social including cultural and political problem, lack of knowledge and skills, scarcity of time, and lack of convergence of technology and education as challenges in their studies.

On the other hand, table-4.45 elaborated the challenges according to the order of priority by teachers while priority-1 represented the most challenge and priority-15 was least in serial as regarded of ICT-pedagogy integration in the BGS classrooms. However, only the prioritized items were considered for analysis in this table. It was notable that many respondents selected items as challenges by putting tick marks but did not prioritized. The table-4.45 below presented priority 1 to 4 separately but 5-15 unitedly.

Table 4.45: Strategic Challenges by Priority

Item No	Alternatives	N (391)	Priorities									
			1st		2nd		3rd		4th		5-15th	
			n	%	n	%	n	%	n	%	n	%
1	Teachers' Lack of ICT Skill	289	83	29	63	22	34	12	26	9	83	28
2	Inadequate Computer in Classroom	289	84	29	45	16	43	15	27	9	90	31
3	Unwillingness to use ICT	252	44	17	28	11	29	12	19	8	133	52
4	More Class Load	274	34	12	34	12	43	16	36	13	127	47
5	Electricity Failure	256	22	9	25	10	22	9	16	6	171	66
6	Lack of Training	271	14	5	31	12	33	12	30	11	163	60
7	Spoiled Multimedia	235	9	4	12	5	11	5	17	7	186	79
8	Low Internet Speed	272	7	3	32	12	25	9	32	12	176	64
9	Spoiled Computer	253	7	3	10	4	22	9	31	12	183	72
10	Lack of Technical Help	256	7	3	8	3	21	8	18	7	202	79
11	Anxiety about New Technology	236	5	2	12	5	14	6	22	9	183	78
12	Hindrance from Institutional Head	190	4	2	10	5	5	3	7	4	164	86
13	Lack of Reward	225	1	1	4	2	11	5	7	3	202	89
14	Inadequate Content	222	1	1	5	2	1	1	6	3	209	93
15	Language Problem	197	--	--	--	--	--	--	7	4	190	96

According to the priority, the data disclosed that all the items were more or less selected as topmost challenges except language problems for incorporating ICT-pedagogy in the BGS classrooms. The highest challenges items were: the teachers' lack of ICT skills (N=290; n=83; 29%), insufficient laptop or computer for classroom teaching (N=289; n=84; 29%), their unwillingness to integrate ICT as tools in teaching-learning (N=253; n=44; 17%), while more class load was in 4th position (N=274; n=34; 12%).

According to priority, comparatively teachers faced lesser problems (priority-15) on language skill for browsing google or other educational sites in view of subject-based educational resources. Similarly, scarcity of quality content and lack of reward received from school authority were also considered as the lowest challenges. On the other hand, 60% of teachers reported (table-4.44) that they faced obstacles for ICT use from their institutional head (n=190; N=391; 49%).

On the other hand, many teachers (65%; n=256; N=391) claimed that interrupted electricity supply was a major challenge for ICT-pedagogy integration. Similarly, low internet speed or no internet was another identified challenge (69%; n=272; N=391) behind ICT-pedagogy integration in teaching BGS.

4.4.6 Challenges by Societal Issues

Some other social issues had been studied to explore the diversities of challenges during the integration process of ICT-pedagogy in BGS classroom activities. Those were as followed under this sub-section.

4.4.6.1 Challenges by School Location

The data (table-4.46.a) demonstrated the level of challenges by school location. The rural teachers (M=3.45; SD=.46) faced more challenges compared to the urban teachers (M=3.33; SD=.43) while the t-test signified [t (389) = -2.12, p < .05] significant difference between urban and rural teachers (table-4.46.b). It was notable that Levene's tests for all categories under sub-section 4.5.6 indicated that the selected samples (participants along with schools) were homogeneous (p > .05) for data collection to explore the challenges in ICT-pedagogy integration in the BGS classrooms.

Table 4.46: Challenges by School Location

Clusters	Part-A (M and SD)			Part-B (t-test)		
	n (N=391)	M	SD	t	df	*sig.*
Urban	76	3.33	.46	-2.12	389	.04*
Rural	315	3.45	.43			

The data indicated that rural teachers faced more challenges than urban teachers in integrating ICT-pedagogy in their BGS classrooms. If it could compare with practice and attitudes, the rural teachers were backward in the integration process because they faced more challenges than urban teachers.

The urban teachers availed more opportunities, i.e., more computer or laptop in school, and multimedia or smart board connected classrooms. The urban schools also had more ICT skills and experienced teachers (table- 4.5-4.7; 4.9-4.13) and their teachers were professionally more qualified and got more opportunities to participate in-service training courses. On the other hand, rural teachers had to manage a comparatively large class size following students and teacher ratio together with more class load but they exposed more confidence in using ICT-pedagogy in the BGS classrooms than urban teachers. However, equal opportunity could reduce the disparity between urban and rural students all over Bangladesh. Moreover, MoE (2013) emphasized reducing the remaining discrimination of rural and urban schooling systems.

4.4.6.2 Challenges by School Types

Likewise the rural teachers, the non-government teachers (M=3.44; SD=.43; n=361) faced more challenges than government (M=3.22; SD=.49; n=30) school teachers (table-4.47.a). The t-test also indicated significant differences [t (389) = -2.64, p < .05] between the two types of teachers regarding challenges (table-4.47.b).

Table 4.47: Challenges by School Types

Clusters	Part-A (M and SD)			Part-B (t-test)		
	n (N=391)	M	SD	t	df	*sig.*
Govt.	30	3.22	.49	-2.64	389	.01*
Non-Govt.	361	3.44	.43			

The mean average illustrated that the govt. teachers faced lesser challenges than non-government teachers. These differences were statistically significant though the number of non-govt. schools were very high than govt. schools. The govt. schools mostly in urban while non-govt. schools both participated from urban and rural areas. Therefore, the non-govt. schools faced challenges similar to rural problems.

Conversely, it had been found that govt. schools had more professionally qualified teachers. They also had teachers with more teaching experience, ICT skills, and proficiency in application software and mailing capability than rural schools. Moreover, the government teachers availed more opportunities of ICT material, i.e., computer, laptop, multimedia projector facilities, smart board or interactive whiteboard connected classroom and faster internet speed. Contrariwise, non-government schools had to compromise with a shortage of technical help, interrupted power supply, teachers' reluctance to use ICT material.

4.4.6.3 Challenges by Gender Diversities

The challenges were nearly similar according to the mean average while the level of challenges was met by male (M=3.44; SD=.45; n=265) and female teachers (M=3.41; SD=.43; n=126). Equally, results illustrated that there was no significant difference [t (389) = 0.56, p > .05] by gender difference.

Table 4.48: Challenges by Gender Diversities

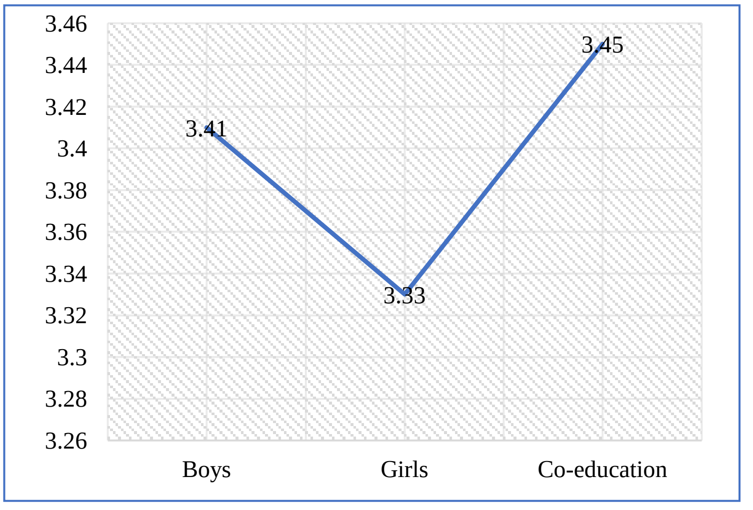
Clusters	Part-A (M and SD)			Part-B (t-test)		
	n (N=391)	M	SD	t	df	*sig.*
Male	265	3.44	.45	0.56	389	.57
Female	126	3.41	.43			

The data indicated comparatively better results regarding challenges faced by males and females compared to school location and school types. Although there were a few differences in attitudes and practices (table-4.31), the challenges were similar for all teachers irrespective of school location or type. However, the female teachers had more professional qualifications and confidence more than male teachers while they got more opportunities to use ICT material, multimedia class, speedy internet facility and lower class load than male teachers.

4.4.6.4 Challenges by School Categories

The challenges were a few differences in boys, girls and co-education schools about ICT-pedagogy integration in schools according to average mean scores, although there were no variances on school categories by ANOVA. In contrast, the teachers from girls schools faced lower challenges than the other two clusters (figure-4.43). The average mean of co-education school was much higher than girls school despite having more sample size in this study. The co-education schools faced more challenges on ICT-pedagogy integration in the BGS classrooms.

Figure 4.43: Challenges by School Categories

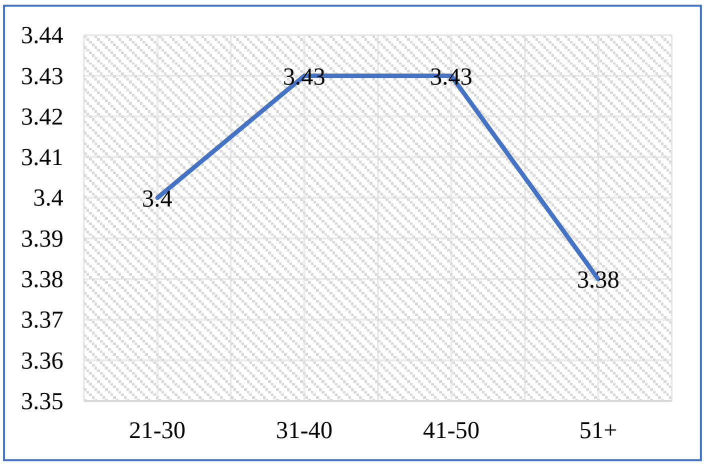


The overall variances ensured that the challenges were more or less equal which they faced in schools during implementation in the BGS classrooms. However, the displayed mean average and standard deviation of co-education schools were more reliable than girls and boys schools.

4.4.6.5 Challenges by Teachers' Age

The average mean scores indicated that there were no differences by teachers' age about challenges which exposed that teachers' age was not a considerable matter. Either older or younger, all BGS teachers faced similar types of challenges about the ICT-pedagogy integration process in their classrooms. The following figure-4.44 based on average mean scores, illustrated the differences regarding ICT-pedagogy integration by age group of teachers.

Figure 4.44: Challenges by Teachers' Age

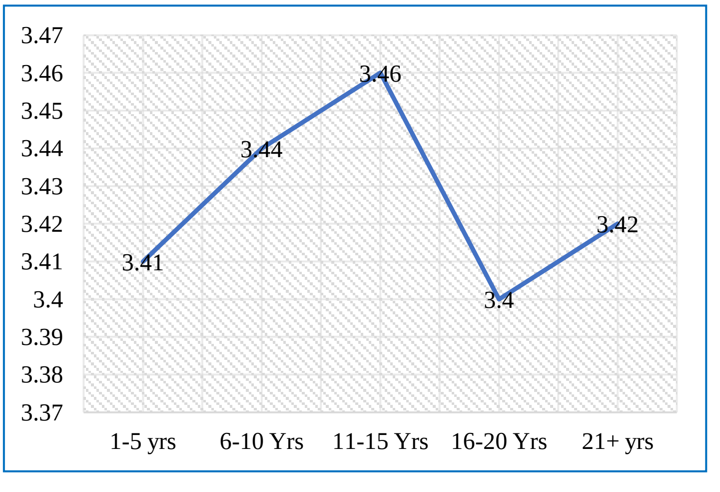


The above figure indicated that there was no significant differences found by age differences, but the challenges were similar to all teachers addressing teachers' age and their prior ICT experience. Despite having slightly difference among individual age group, the school location, school types and gender difference, the challenges were the same in terms of ICT-pedagogy integration in the BGS classrooms (Appendix-Z).

4.4.6.6 Challenges by Teachers' Teaching Experience

Although the figure-4.45 indicated insignificant differences in challenges faced by teachers regarding their teaching experiences, the ANOVA indicated those were relatively equal.

Figure 4.45: Challenges by Teaching Experience

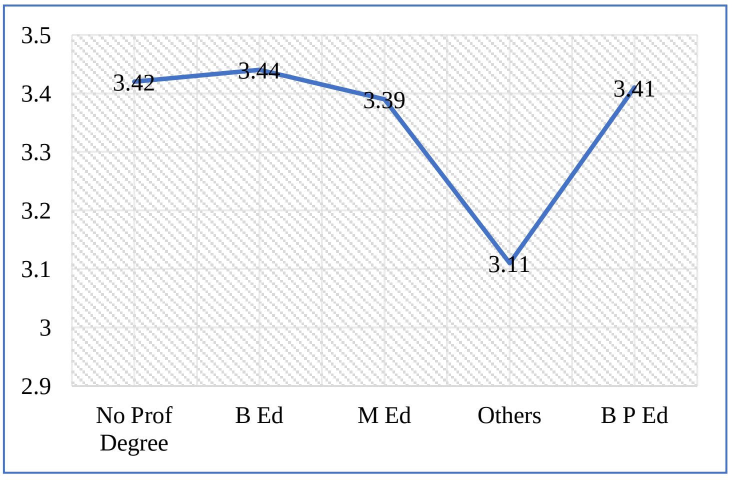


There were no significant differences found, but the challenges were equal to all teachers addressing teachers' age and prior ICT experience. Despite having a little bit difference among the individual age group based on teachers' teaching experience, the challenges were the same in terms of ICT-pedagogy integration in the BGS classrooms.

4.4.6.7 Challenges from Teachers without Professional Qualification

The results indicated that there was no significant difference found between teachers with professional and non-professional degree holders regarding the challenges of ICT-pedagogy integration in BGS classrooms. Likewise, other criteria, the challenges were similar either having professional degree/s or did not have (Appendix-AA). There were no significant differences found [$F(4, 386) = 3.74$, $p > .05$] regarding challenges by teachers' professional degree which proved that the challenges were equal to all.

Figure 4.46: Challenges by Professional Qualification

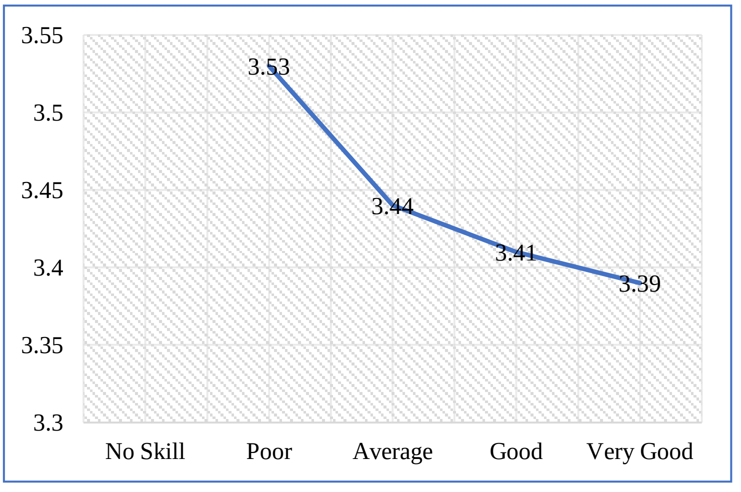


On the other hand, the average mean regarding teachers' professional qualification was very closer except only 2 teachers out of 391 (figure-4.46). Either professional degree or did not have, the teachers faced almost the same challenges to integrating ICT-pedagogy in classrooms.

4.4.6.8 Challenges differed by Teachers' Confidence in ICT Skill

Although there were significant differences found in teachers' attitudes towards ICT-pedagogy integration based on level of confidence, there was no significant difference [F (4, 386) = 0.78, p > .05] in challenges they faced in BGS classrooms (Appendix-BB). Therefore, there was no significant difference between the level of confidence in ICT skill and non-skilled teachers regarding challenges of ICT-pedagogy integration in BGS classrooms.

Figure 4.47: Challenges by Confidence in ICT Skill



The figure-4.47 stated that the challenges were almost equal but who had poor confidence in ICT skill faced more challenges in ICT-pedagogy integration. On the contrary, the teachers who exposed themselves expert in ICT skill, felt comparatively lower challenges than others.

4.4.7 Challenges at a Glance

There were some key challenges identified in this study that might be hindered the ICT-pedagogy integration process. Despite having some dissimilarity, the social science teachers from around Bangladesh met similar challenges during ICT-pedagogy integration in teaching BGS. However, the rural and non-government teachers had to face more challenges than urban and government teachers, which were not expected for the smooth integration process of ICT-pedagogy in BGS classrooms. Conversely, gender gaps had not been appeared as significant differences in the ICT integration process. Teachers' teaching experience, prior technology skills, their level of confidence, and professional qualification were observed as significant indicators towards ICT-pedagogy integration in teaching BGS. Guggemos and Seufert (2021) also revealed that teachers' professional knowledge might be an important predictor for teaching-learning activities. In contrast, the lack of pedagogical knowledge, shortage of technology pedagogy and content knowledge, and their integration process in the BGS curriculum were major concerns. Additionally, the lack of motivation and reward, shortage of infrastructure, and scarcity of ICT material were associated issues in a smoother and faster integration of ICT-pedagogy which this study had acknowledged. Moreover, insufficient ICT equipment such as laptop, computer and multimedia projector; more class load; lack of training on ICT-pedagogy integration; low or no internet speed; lack of electricity or insufficient backup of power supply; anxiety or fear about new technology; lack of instant technical support; lack of support from the institutional head; language problem; shortage of adequate quality content were the other major challenges towards ICT-pedagogy integration, recognized in this study.

Consequently, the above-stated issues should be minimized for a fruitful integration process of ICT-pedagogy in BGS classrooms. Similarly, more concentration should be given to improve the rural and non-government types of schools which control the major part of students in secondary education in Bangladesh. Above all, the concerned authority should take necessary steps for developing teachers' pedagogical knowledge and integration process of ICT Knowledge, Pedagogy Knowledge and Content Knowledge for the betterment of BGS teaching-learning activities in schools.

4.4.8 Correlations of Challenges Sub-scales

The table-4.49 represented the correlations among five sub-sections of the questionnaire under section iii. The relationships were compared among ICT infrastructure; Integration of ICT-Pedagogy; Pedagogical Knowledge; Motivation and Reward; and Unstructured Challenges addressing the challenges about ICT-pedagogy integration in BGS classrooms.

Table 4.49: Correlations of Challenges Sub-scales

Subscales	1	2	3	4	5
ICT Infrastructure (1)	1				
Integration of ICT-Pedagogy (2)	.45**	1			
Pedagogical Knowledge (3)	.33**	.56**	1		
Motivation and Reward (4)	.26**	.40**	.49**	1	
Unstructured Challenges (5)	.21**	.27**	.39**	.43**	1

**. Correlation was significant at the 0.01 level (2-tailed).

According to correlation matrix, the sub-scales were statistically significant while p value level was .00 which was less than the accepted alpha level .01. The above table-4.49 explained the moderate level of relationship in different dimensions and it had been found significantly related with each other. However, the relationships between ICT infrastructure and integration of ICT-pedagogy was ($r = 0.45$, $p < .01$); ICT infrastructure and pedagogical knowledge was ($r = 0.33$, $p < .01$); ICT infrastructure against motivation and reward was ($r = 0.26$, $p < .01$); ICT infrastructure and unstructured challenges was ($r = 0.21$, $p < .01$) while integration of technology-pedagogy and pedagogical knowledge was ($r = 0.56$, $p < .01$); integration of ICT-pedagogy and motivation and reward was ($r = 0.40$, $p < .01$); integration of ICT-pedagogy and unstructured challenges was ($r = 0.27$, $p < .01$). On the other hand, pedagogical knowledge as well as motivation and reward showed correlation (r

= 0.49, p < .01) and pedagogical knowledge against unstructured challenges showed relationship between the items (r = 0.39, p < .01). The table lastly explained the correlation between motivation and reward as well as unstructured challenges which was moderately related (r = 0.43, p < .01).

However, the highest level of significant relationship found between integration of ICT-pedagogy with pedagogical knowledge (r = 0.56, p < .01) and pedagogical knowledge against motivation and reward demonstrated (r = 0.49, p < .01). Whereas integration of ICT-pedagogy with ICT infrastructure exposed correlated with each other (r = 0.45, p < .01).

The above relations explained that the identified challenges in this study were correlated. Therefore, the results could explain the challenges of ICT-pedagogy integration in teaching-learning activities of BGS classrooms. The outcomes recommended that the sooner the challenges could be minimized, the integration of ICT-pedagogy would be smooth and faster in secondary schools.

4.4.8 Teachers' Classroom Experience Themselves

Teachers were asked for their judgment on observed ICT-facilitated classes which had been observed to explore the possibilities, limitations and suggestions for integrating ICT-pedagogy in BGS classrooms. Teachers were asked about how teachers plan a lesson to integrate ICT; what advantages and disadvantages they received from ICT integration; what sorts of challenges they faced and the promising suggestions they recommended to integrate ICT in the classrooms; how the lesson affected while ICT failed and the possessed role of school administration for integrating ICT in the classrooms. Teachers were also asked to provide answer of what extent they used ICT in education and how they assessed students' progress along with the material usually they used in lessons unless they used ICT as a mediator. The findings were presented below with percentages based on the frequency.

4.4.8.1 Planning about ICT Integrated Classroom

The following table-4.50 reflected that all the teachers usually used multimedia presentations but it depended on teachers' willingness and the availability of ICT equipment in schools. The most teachers, who wished to integrate ICT in teaching, used model content or downloaded the content from Teachers Portal. A few teachers used self-developed content and most of them browsed google (69%) to collect educational resource for developing content following the textbook. The resource like relevant images and videos, including YouTube material, were equally (56%) planned during content development. Some teachers planned to encourage students to play the educational game (44%), i.e., kahoot, hot potato (13%), they were also interested in using google classroom (38%) for additional support of ICT integrated classrooms.

Table 4.50: Planning about ICT Integrated Classroom

SL	Statement	%
1	Use multimedia presentation	100
2	Use youtube material	56
3	Use google resources	69
4	Use google classroom	38
5	Use interactive whiteboard	00
6	Insert relevant image and video in lesson	56
7	Use assessment tool like kahoot, hot potato	13
8	Encourage students to play educational games	44
9	Others	00

According to table-4.50, no teachers were found using the interactive whiteboard in classroom teaching-learning activities, although some schools had the facilities.

4.4.8.2 Advantages of Integrating ICT in Classroom

Although a few teachers had been found interested in using ICT in BGS lesson, all teachers were acquainted with the benefits of using ICT in classroom. In addition, they possessed positive attitudes towards ICT-pedagogy integration. On the contrary, Islam (2015), Al-zaidiyeen, Mei, and Fook (2010) found that the teachers had a low level of ICT use for educational purpose, but they possessed positive attitudes towards using ICT. Malcolm-Bell (2009) argued that the level of technology integration and computer use in teaching-learning activities was low in schools. In the case of higher education, Gámez and Fernández (2020) revealed although the teachers knew about the importance of ICT in education, they did not frequently use ICT tools in their classrooms. However, the use of ICT helped creating a constructivist learning environment focusing on a learner-friendly classroom atmosphere where students could acquire knowledge using their experience with complete confidence. The table-4.51 below demonstrated the advantages of ICT integration in classroom instruction possessed by teachers.

Table 4.51: Advantages of Integrating ICT in Classroom

SL	Statement	%
1	Improve engagement	81
2	Improve knowledge retention	69
3	Encourage individual learning	63
4	Encourage collaboration effectively	63
5	Improve teaching	88
6	Clear the lesson	94
7	Improve creative and innovative learning opportunities	75
8	Differentiate for needs of students	44
9	Provide an equal voice for students	69
10	Can identify students' progress	63
11	Extend the boundaries from classroom environment to wider world	63
12	Others	00

According to the above data, a majority of teachers (94%) thought that the ICT helped to make the lesson clear. In addition, students became benefitted from ICT use by improving their engagement in lessons (81%), enlightening creative and innovative learning opportunities (75%), having the chance of knowledge retention (69%), encouraging individual learning (63%) and increasing collaboration effectively (63%) in classroom activities. Similarly, ICT offered an equal voice for students (69%) to reduce the disparity in learning opportunities. On the other hand, teachers could improve their teaching by using ICT (88%), easily identified the learning progress of students (63%), were able to extend the boundaries from the classroom environment to the wider world (63%) and definitely could differentiate the needs of students in classroom activities (44%). Therefore, the statistical data indicated that ICT had enormous effectiveness for making a learner-friendly environment in the classrooms where both students and teachers participate in the teaching-learning process in more engaging ways. Moreover, ICT decreased the disparity, improved engagement and individual learning, helped in the knowledge retention process, improved creative and innovative learning opportunities and extended the boundaries of knowledge to the wider world.

4.4.8.3 Disadvantages of Integrating ICT in Classroom

ICT integration in schools not only had advantages but there were some disadvantages also. The disadvantages identified in this study were listed below:

Table 4.52: Disadvantages of Integrating ICT in Classroom

SL	Statement	%
1	Expensive	19
2	Time consuming	25
3	Access to inappropriate content	19
4	Incomplete lesson in due time	25
5	May be misguided by the wrong information	00
6	Make learners disconnected from the real world	00
7	May be affected by cyberbullying trap	19
8	Creating enough room for cheating	19
9	Transforming learners into inefficient learners	00
10	Opportunity of copying assignments/ presentation	06
11	Others	00

According to data, no remarkable disadvantage was found compared to the advantages of ICT integration in education. However, teachers identified some challenges during ICT integrations to a certain extent. Those were: unable to complete lesson in due time (25%), time-consuming especially for multimedia setting (25%), and expensive ICT equipment (19%); (Mahmuda, 2016). Although the issues were not directly related to students' learning, they could make distress their smooth learning process. A number of teachers thought that students could access inappropriate content (19%) and they could be trapped in cyberbullying (19%). In contrast, some of them thought that there was little opportunity for cheating (19%), i.e., copying assignments or presentations (06%). However, there were no teachers being found who believed that ICT made learners either disconnected from the real world or changed into inefficient learners or might be misguided by wrong information in classroom activities. Therefore, despite having some limitations, ICT-pedagogy was an integral part of the education system, especially in teaching BGS.

4.4.8.4 The Highest Challenges Teachers Face in ICT Integration Process

There was a question set in the questionnaire to explore the biggest challenges which the teachers faced during class or in the developing stage of content. The responses were presented table-4.53 below:

Table 4.53: The Biggest Challenges to Integrate ICT in Classroom

SL	Statement	%
1	Electricity interruption	44
2	Language barriers	13
3	Poor internet bandwidth	44
4	Personal knowledge and expertise on ICT	19
5	Multimedia projector does not properly work	25
6	Laptop/computer does not work properly	19
7	Lack of technical help	31
8	Others	00

The above data explained that the interruption of power (44%) and poor internet bandwidth (44%) were equally identified as the topmost challenges, while language barriers had been found as the lesser challenge (13%) towards ICT-pedagogy integration. On the other hand, the lack of technical help (31%), disturbance of multimedia projector (25%) and problems of laptop or computer (19%) were considered as challenges that could make the integration process delayed in BGS classrooms. However, teachers (19%) also assessed themselves with a lack of personal knowledge and experience which had an inverse relationship with ICT integration. The negative influence was not only limited to a specific subject but across all subjects. Therefore, the most challenges appeared as interrupted electricity supply, poor internet bandwidth, and lack of technical help with adequate teachers' knowledge and experience for effective ICT integration in BGS teaching-learning activities.

4.4.8.5 Lesson Affected by ICT Drops

The following table reflected how lessons were affected while ICT equipment fails during class. Most of the teachers (63%) revealed that students lost their attention whenever ICT failed during class. They also claimed that the teachers not only needed to cut off (50%) their teaching time but also left the classroom leaving the session incomplete (56%). Otherwise, they had to face noisy classroom (38%) while many of the teachers might disappoint to use ICT (25%) in classroom teaching due to repeated ICT failure.

Table 4.54: Level of Lesson Affected while ICT Fails

SL	Statement	%
1	Cutting off learning time	50
2	Incomplete lesson	56
3	Students lose their attention	63
4	Unable to manage noisy classroom	38
5	Unsatisfied to use ICT	25
6	Others	00

According to the above data, a big challenge was identified to complete the lesson successfully due to ICT failure in lessons. It made learning slow and challenging to manage class because students lost their attention and made classroom uninterested. Therefore, teachers were required to shorten the class and the lesson plan would be curtailed.

4.4.8.6 Administration Support in ICT Integration

The following table-4.55 indicated that the school administration was supportive of supplying multimedia (88%), provided laptop with an internet connection (69%) and laptop without internet connection (31%). A number of teachers (44%) appreciated the administration, so the authorities inspired them to participate in in-service training courses. They received a complement (38%) from their administration for integrating ICT in teaching. Many teachers thought that they had to allow a lot of criticism for using ICT in teaching-learning activities and the administration took a little initiative to defend them. The data claimed that only 31% of administration protected their teachers from criticism. However, the teachers who did not usually use ICT, they criticized the ICT friendly teachers. In contrast, teachers received rewarded (38%) and complement (69%) from the school administration.

Table 4.55: Administrative Support in ICT Integration

SL	Statement	%
1	Provide multimedia projector	88
2	Provide laptop without internet	31
3	Provide laptop with internet	69
4	Save from criticism	31
5	Inspire for training	44
6	Compliment for contribution	38
7	Offer reward	38
8	Others	00

Despite having limited resources, the school administration could make a positive environment through rewarded the ICT friendly teachers who usually use ICT in their teaching-learning activities.

4.4.8.7 Level of Using ICT in Classroom

The teachers were asked to what extent they used ICT in classroom teaching-learning purpose. This was a single answer question and found that nearly half of the teachers (44%) use ICT in the classroom for 4 days a week on average, while 25% of teachers confessed that they use ICT individually for 2/3 days a week.

Table 4.56: Level of Using ICT in Classroom

SL	Use of ICT	%
1	Never	00
2	1 day in a week	00
3	2 days in a week	25
4	3 days in a week	25
5	4+ days in a week	44
6	Once in a month	00
7	Twice in a month	00

The data from table-4.56 provided insight into the integration of ICT-pedagogy in teaching BGS. The data indicated that the teachers were gradually being habituated to use ICT in their classroom instruction.

4.4.8.8 Used Assessment Techniques

The table-4.57 demonstrated that the use of ICT in assessment was the lowest (table-4.21) but the teachers frequently assessed to measure the progress of students in lessons traditionally. The data below represented teachers' assessment process during a lesson.

Table 4.57: Usually Evaluate Students' Progress in Lesson unless Use ICT Tools

SL	Statement	%
1	Question-answer	100
2	Giving task in pair/group	88
3	Class test	69
4	Assignment/Homework	75
5	Individual Performance Observation	75
6	Others…	0%

The table-4.57 demonstrated the traditional assessment process which was usually employed to assess students' progress unless teachers used ICT material. Question-answer technique was used by all teachers (100%) during classroom teaching while more than two-third of the teachers (69%) practiced class tests for formative assessment. The great majority of teachers (88%) assigned students in pair work or group work to go further in lesson. Many of them (75%) used observation technique to assess individual performance. A similar number of teachers offered assignments. Therefore, it could be claimed that the teachers employ traditional types of formative assessment to evaluate students' understanding rather than using ICT. However, different types of free assessment software were available on the websites, which might reduce the anxiety of tests and improve teachers' teaching practice.

4.4.8.9 Used Teaching Aids unless Use ICT material in Classroom

The following table-4.58 stated that the teaching material which was usually employed in classroom teaching unless ICT material were used in lesson.

Table 4.58: Usually Employed Teaching Material unless Use ICT Tools in Classroom

SL	Statement	%
1	Textbook	100
2	White/Black board	94
3	Printed material except textbook	56
4	Internet resources	44
5	Poster	75
6	Model/chart	69
7	Self-study	81
8	Others…	00

The textbooks were used as teaching material by all teachers while majority of teachers (94%) used white/blackboard during teaching-learning activities. Teachers also use self-directed study in lesson (81%), show poster (75%) to motivate students towards content, show model or chart (69%) for encouraging students' engagement in a lesson. Nearly half of the teachers stated that they used printed material (56%) in teaching-learning activities, while internet resources were used by 44% of teachers though it was hardly found during classroom observation.

4.4.8.10 Avenue of Effective ICT Integration

Teachers were requested to put consent on suggestions that might help integrate ICT easier in teaching BGS. The data revealed that a large number of teachers (94%) suggested arranging in-service teacher training, including the head teachers (Cavucci, 2009), for successful integration of ICT-pedagogy in teaching BGS. However, positive attitudes, reward and necessity of instant technical support services (Cavucci, 2009) were equally (81%) prioritized for integration of ICT. Alrasheedi (2009) claimed that training played an important role in teachers' attitudes building towards ICT, while Karim (2014) and Malcolm-Bell (2009) recommended professional training for teachers to integrate technology in the classrooms. The researcher's experience also supported the findings.

Table 4.59: ICT-pedagogy Integration in Classroom

SL	Statement	%
1	Positive attitude to integrate ICT	81
2	Capable to integrate ICT in teaching with pedagogical knowledge	75
3	In-service teacher training including head teacher	94
4	Friendly working environment	75
5	Introduce technology for assessment	56
6	Reward for motivation	81
7	Technological support including support service	81
8	Infrastructure development	75
9	Need multimedia classroom monitoring	63
10	Need personal ICT integration plan	75
11	Others…	00

On the other hand, three-fourths of the participants (75%) suggested building capacity on integration ICT in teaching with pedagogical knowledge. A similar number of teachers put importance on the necessity of a friendly working environment and developed infrastructure in schools. They also expected to get ICT support (Cavucci, 2009) both for themselves and schools addressing ICT-pedagogy integration in teaching BGS. Many teachers recommended that multimedia classroom needed to monitor regularly (63%) by competent authorities. Teachers also wanted to introduce ICT in assessment (56%) for identifying students' understanding. Most importantly, teachers (75%) demanded that every teacher need a personal ICT-pedagogy plan for fruitful integration of ICT-pedagogy in teaching BGS as well as schools.

4.4.8.11 Future Plan of Teachers regarding ICT Integration

Teachers were asked to answer how they would improve their future ICT-pedagogy integrated BGS classroom performance if they would get all facilities in the future. Almost all teachers expressed their willingness to provide their best effort for students' by developing their ICT skills and they would try to use all the ICT facilities if they would get it from the administration. They also wished to establish a better learning environment where students could learn effectively through collaboration with others and enable lifelong education. They also wanted to share their innovation in education with teacher community in the country and beyond.

Key Findings about Challenges towards ICT-pedagogy Integration

Teachers faced challenges on ICT Knowledge, Pedagogy Knowledge and Content Knowledge individually whereas they had to meet lots of difficulties on blending use of ICT-pedagogy and Content Knowledge in BGS classroom environment. On the other hand, there were some other contemporary challenges addressed in the BGS classrooms those were the lack of infrastructure, absence of up-to-date ICT facilities, insufficient training of teachers, shortage of time to prepare content, teaching load, lack of motivation and reward, and anxiety about new technology. Additionally, the teachers had shortened knowledge on relevant ICT skills and ICT experience in classroom use, unable to create interactive learning environment in BGS the classrooms through ICT-pedagogy integration. Conversely, they rarely received reward for encouraging ICT usage in teaching from their respective authority.

However, the challenges were more in rural schools than urban schools while non-government schools faced more challenges than government schools. The findings also disclosed that the challenges of ICT-pedagogy integration in BGS classrooms were similar in terms of age group, school categories (boys, girls, and co-education), and teaching experience.

4.5 Overview

Chapter four offered the data presentation, findings, and interpretation based on of primary data. It presented the existing school situation and their teachers' status about ICT-pedagogy integration. The research questions were primarily focused in different ways to conclude the results of the study. This chapter disclosed about teachers' existing status and their positive attitudes towards ICT-pedagogy integration in BGS subjects. Additionally, it explored the existing practice of ICT-pedagogy integration in teaching BGS by directly involvement of classroom observation. Furthermore, it detailed the challenges face by BGS teachers in secondary school classroom in Bangladesh.

In a nutshell, the next CHAPTER V was set to present major findings, discussion and recommendations of this study following the research questions of this study.

CHAPTER V

MAJOR FINDINGS, DISCUSSION AND RECOMMENDATIONS

5.0 Introduction

This chapter discussed the major findings of the study in light of existing literature and derived some recommendations for the future implementation of ICT-pedagogy in the BGS classrooms. Overall, the study emphasized on the necessity of transforming the existing classroom environment through ICT-pedagogy integration to improve teaching-learning activities in secondary schools. It also identified that although the teachers faced some challenges while integrating ICT with their pedagogical practices, which were most likely technical and infrastructural, they possessed positive attitudes towards ICT-pedagogy integration. Thus, the challenges should be taken into consideration for effective learning. This chapter included the major findings followed by discussion, recommendations and implications of the study for professional use, suggestions for further research, and a conclusion.

5.1 Major Findings

The major findings were presented in four different sections based on the research questions focused in this study.

5.1.1. The Existing Situation of ICT-Pedagogy Integration in Secondary Schools

The findings under the 1st research question found different aspects of the existing situation of BGS teachers' practice of integrating ICT in the classrooms. The findings were stated below:

There was a shortage of ICT-related infrastructure and modern ICT tools for dedicatedly using multimedia classrooms (laptop, projector, sound system and internet facilities) which were necessary for ICT-pedagogy integration in schools. Most of the schools had only one laptop and projector whereas great majority schools had no sound system and internet facilities in classrooms but the activated number of laptop and projector were comparatively lower than the existing number (table-4.2). It could be said that the school might face challenges when more than one teacher needed to use such facility. During classroom observation, it had been found that five among the 16 schools maintained a routine for using laptop facilities/multimedia classrooms so that all the teachers could get equal opportunities to use the facilities. However, the survey data did not have any information on the regulation of such a routine in the sample school. In contrast, most teachers were positive towards internet use in their classroom teaching-learning activities while the opportunity of internet facilitated classrooms were limited in schools. Moreover, two-thirds of the schools had a large class size where teachers had dealt with overcrowded classrooms with many students in limited ICT supported classrooms (section-4.1).

On the other hand, the teachers' status was explored in terms of their school location, school types gender differences, age, experience, position, academic qualification, professional qualification, in-service training with a level of ICT confidence, and ICT competencies. The teachers either with professional degree or participation in technological training program, felt comfortable with their ICT competencies (figure-4.36). Concurrently, they possessed significantly more attitudes (table-4.36 & figure-4.39) than others. However, they had little knowledge of several ICT tools except MS PowerPoint and MS Word (table-4.4). Many teachers said that they used to employ Teachers Portal for ICT-pedagogy integration in classrooms. However, there were differences in the ICT competencies of teachers regarding school types and gender diversities. The female teachers were found more practitioner of ICT-pedagogy than their counterpart although the male teachers possessed more attitudes towards ICT-pedagogy integration in classrooms (figure-4.34 & table-4.31). Concurrently, the age was a significant factor for BGS teachers in ICT-pedagogy integration. The all teachers believed that they had confidence in ICT knowledge while it was not reflected during classroom observation.

5.1.2 Attitudes towards ICT-Pedagogy Integration

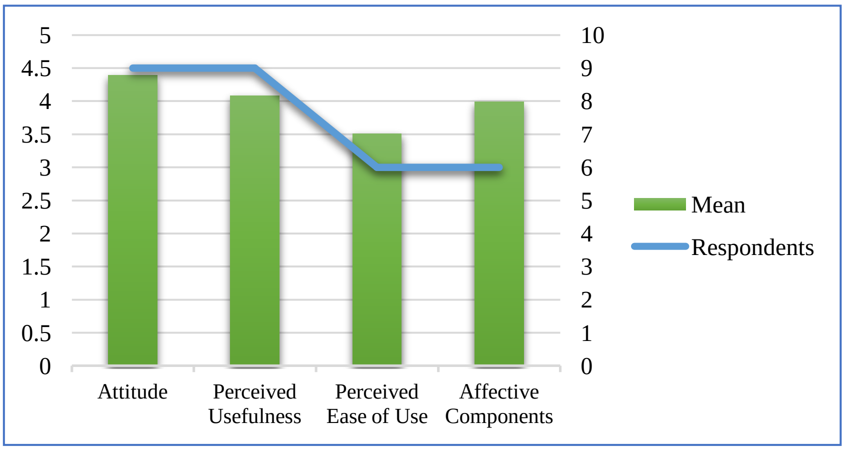
The research question regarding attitudes towards ICT-pedagogy integration in BGS classrooms revealed that the teachers possessed overall positive attitudes (M=3.99; SD=.39) towards the integration process. However, there were four different sub-scales under the attitudes scale, and their comparative pictures were as followed in table-5.1.

Table 5.1: Overall Attitudes towards ICT-pedagogy Integration

Subscale	No of Items	Mean	SD
Attitude	9	4.39	.41
Perceived Usefulness	9	4.08	.43
Perceived Ease of Use	6	3.51	.64
Affective Components	6	3.99	.55
Overall ICT-Pedagogy Attitude	30	3.99	.39

Although the teachers possessed positive attitudes, the sub-scales varied by their different attitudinal levels. However, the attitudes in the sub-scales had been found intensely high, with a mean of 4.39 and a standard deviation of .41. In contrast, the attitudes of perceived usefulness were found highly moderate (M=4.08; SD=.43) towards the ICT-pedagogy integration process which was better than affective components (M=3.99; SD=.55) and perceived ease of use (M=3.51; SD=64). However, the above data were presented graphically in listed below figure-5.1.

Figure 5.1: Overall Attitudes towards ICT-Pedagogy Integration



Teachers' attitudes towards ICT-pedagogy integration varied by school's location, types, teacher's age, professional degree, and ICT skills etc. However, findings from figure 5.1 revealed that the teachers possessed positive attitudes towards ICT-pedagogy integration in the BGS classrooms.

5.1.3 ICT-pedagogy use in BGS Classroom Practices

The third research question was intended to explore the use of ICT-pedagogy integration in BGS classroom activities. The use of ICT-pedagogy at BGS classrooms was at a moderate level for the first (M=3.09; SD=.89) and second (M=3.27; SD=.71) phases. However, the level of using ICT-pedagogy was at a very minimum level which was illustrated below:

Table 5.2: ICT-pedagogy Practice Level

SL	Statements (no. of items)	N	1st Phase		2nd Phase	
			M	SD	M	SD
1	Lesson Preparation (LP-2)	16	3.09	1.27	3.38	1.12
2	Content Knowledge (CK-4)		3.73	.74	3.75	.72
3	Pedagogical Knowledge (PK-4)		2.91	.97	3.09	.61
4	Integration of ICT-Pedagogy & Content Knowledge (ICT_PCK-11)		3.26	.65	3.31	.57
5	Assessment of Lesson and others (AL-4)		2.50	.83	2.84	.51
	Total	16	3.09	.89	3.27	.71

In a nutshell, the level of using ICT-pedagogy in BGS classroom was at minimum in consideration of possessed attitudes but effort of using ICT-pedagogy by teachers within limited ICT tools and inadequate infrastructure made hopeful. However, the practices need to be improved as soon as possible because of their effectiveness in teaching-learning activities (Babu & Nath, 2017; Pandey, 2017). In this study, the using of ICT-pedagogy in classroom activities was at a minimum level (table-5.2) in both phases. Moreover, ICT use in classroom activities was limited to laptop and multimedia projector, with some internet use in limited schools. On the contrary, during ICT-pedagogy integration in classroom activities, it was found that the Content Knowledge of teachers was better than ICT-pedagogy & Content Knowledge. Content Knowledge also was better than their Pedagogical Knowledge. On the other hand, the teachers were not accustomed to assessing students with ICT as they were habituated to the traditional assessment system for formative assessment (table-4.21).

Moreover, it was examined that how much varied between attitudes and their variances in ICT-pedagogy integration. Despite teachers' positivity towards ICT-pedagogy integration in BGS classroom, data showed differences between their attitudes and practice. Overall, teachers' practice level (M=3.09) was lower than their possessed attitudes (M=4.39), though their location and types of school played a vital role in this. As data showed, the level of practice in rural schools dropped significantly than in urban. Similarly, teachers' practices differed between non-government and government schools in urban areas. Shameem (2016) found that even the cultures, education systems, and schools influenced teachers' attitudes towards ICT use in teaching-learning activities. The Ministry of Education of Bangladesh were aware of that differences between attitudes and practices, thus emphasized on right use of ICT in rural and urban schools to minimize the gap (MoE, 2013).

Training played a significant role in developing positive attitude among teachers and instilling ICT skills in them. Data showed that, teachers who received ICT training possessed highly positive attitudes than the untrained teachers (table-4.33). Also, trained teachers showed comparatively higher level of confidence and thus a significant correlation had been found ($r=0.30$, $p < .01$) between teachers' attitudes and their level of confidence in ICT skills (table-4.15). Moreover, the professional degree (B.Ed & M.Ed) had been found as a significant mediator for ICT-pedagogy integration in BGS classroom practices.

There was no significant difference between male and female teachers regarding their attitude to and practices of ICT-pedagogy integration in BGS classrooms (table-4.31). Surprisingly, on the one hand, data showed that the female teachers presented more confidence and competent during their lesson presentation than their male colleagues. On the other hand, the male teachers demonstrated slight more positive attitudes towards ICT-pedagogy integration compared to their female colleagues.

At the same time, data could not find any significant relation of teachers' attitude with their age, experience, educational qualifications, class size, and school categories regarding ICT-pedagogy integration in BGS class, which was also same for school categories (boys, girls, & co-education). However, the practices were significantly different among different category of schools (section-4.3.8.3). It was worth mentioning that the oldest teachers practiced more than young teachers though they shared comparatively less positive attitudes towards ICT-pedagogy integration in classrooms.

According to data analysis and field notes, it could be concluded that the teachers possessed positive attitudes towards ICT-pedagogy integration though they faced different types of limitations during the integration process.

5.1.4 Challenges of ICT-pedagogy Integration

This study identified some significant challenges under research question three which hindered the ICT-pedagogy integration process in BGS classrooms, those were- lack of infrastructure, absence of up-to-date ICT facilities, lack of skilled teachers, teachers lack time to prepare content, teaching load, lack of motivation and reward, and anxiety about new technology. The following table-5.3 presented the level of challenges during the ICT-pedagogy integration process.

Table 5.3: Challenges of ICT-Pedagogy Integration

SL	Subsection (no. of items)	N	M	SD
1	ICT Infrastructure (5)		4.23	.70
2	Integration of ICT-Pedagogy (7)		3.36	.48
3	Pedagogical Knowledge (11)	391	3.26	.55
4	Motivation & Reward (6)		3.21	.65
5	Unstructured Challenges (6)		3.07	.75
	Total	391	3.43	.44

The data claimed that teachers strongly faced enormous challenges for ICT-pedagogy integration in classroom activities. Teachers repeatedly mentioned the challenge of required ICT Infrastructure which in turn made ICT-Pedagogy integration in the classroom difficult for them. Teachers also stated their lack of pedagogical knowledge. Lack of motivation and reward was another persistent challenge for teachers. Some other contemporary challenges were found in BGS classrooms which were the lack of ICT skills, the inadequacy of laptops or computers in classroom teaching, lack of training for technology use, low internet facilities, lack of technical help, electricity failure, inoperable laptop or computer, teachers' unwillingness to incorporate ICT in teaching, spoiled multimedia, anxiety about using new technology, lack of reward, inadequate (section-4.7.5.2).

5.2 Discussion

This section discussed the findings of this study with special reference to other studies done in this field. The discussion included the current school environment, attitudes towards ICT-pedagogy integration, practices of ICT-pedagogy in classroom activities, and the challenges faced in the integration process.

5.2.1 Existing Situation for ICT-pedagogy Integration

Bangladesh made a lot of progress in ICT infrastructure in recent years, yet there were still many challenges addressed in this study. Therefore, the integration process was impeded in teaching BGS. It could be said that suitable ICT infrastructure improved the teaching-learning process and could create opportunities to open the door to broader educational resources. Chun, Tsai, & Wu (2015) revealed that available ICT infrastructure had different influences on their application for schools either in urban or rural areas as well as affected the degree of learning for students (Apostolou, 2020). Habibi et al. (2020) claimed that the limitation of infrastructure (interrupted electricity, lack of internet connectivity) might be the strongest barrier to ICT integration in education. On the other hand, Sarker et al. (2019) opined that modern educational technology could help educators and learners adopting modern teaching-learning approaches in classroom whereas the education sector in Bangladesh still struggled during the ICT-pedagogy integration in classroom teaching (Sultana & Haque, 2018). However, the government of Bangladesh put priority and provided at least one laptop, multimedia projector, sound system, and internet modem in each school that was electrified. The aims were to expand ICT access, especially for teachers all over the country, to make learning sustainable for learners. Apostolou (2020) anticipated that the presence of computers for each student in classroom activities would make the lessons more interesting and enjoyable and would increase student participation in the lessons. Still, ICT-pedagogy integrated classroom in secondary schools required blending use of different ICT tools (Babu & Nath, 2017) to accomplish the class successfully. This study found limited internet facilities in secondary schools for classroom teaching-learning practices. The available ICT tools along with internet facilities and their uses in the classrooms could make lessons effective enough through an interactive and collaborative learning environment (Sultana & Haque, 2018). It stretched the scope to think beyond the schools, both for students and teachers.

On the contrary, the teachers had to manage a large number of students in classroom activities. It was found difficult to conduct large classes in ICT-pedagogy integrated classroom for one teacher at a time which was observed during lesson observation. While Murphy (2010); Egbedokun and Adeyanju (2016); Ruffina, Esther, and Anastecia (2018); including Ifinedoa, Rikalab, and Hämäläinena (2020) argued that the small class size was more helpful for an effective teaching-learning environment. Additionally, the small class size would help teachers practicing ICT-pedagogy better in classroom as well as receive the opportunity to know each learner well and could soundly nourish them. Although the teachers had little skill in different ICT tools (table-4.4), they were gradually acquainted with ICT material for classroom use, especially application software (word processing and PowerPoint presentation) and internet use. These were the basic tools for integrating ICT-pedagogy integration into BGS classroom activities.

On the other hand, the teachers were capable enough to use social media in education, and it could be employed professionally in teaching-learning activities, which might have significant effects on students' learning process. Additionally, the social media could connect learners virtually in groups and different educational systems, making education reachable for each learner which was reflected during covid-19. In the case of teachers, they might reach out easily and could transfer useful information by creating learning-friendly opportunities in the BGS classrooms.

Moreover, the teachers' age, teaching experience, ICT skill, and teaching position were important indicators for building confidence of teachers to participate in the ICT-pedagogy integration process. Similarly, Buza and Mula (2017) argued that the position of a teacher was becoming increasingly important as well as challenging for integrating newly innovated ICT equipment in the classrooms. Moreover, the ICT competencies were not equal among teachers as well as differed by school types, age, experience, and gender diversities.

Then again, this study found that most of the teachers had relevant academic backgrounds and professional qualifications. In contrast, more than one-fourth of employed BGS teachers in schools did not have a professional degree whereas it was acknowledged that the professional degree made teachers capable of teaching pedagogically sound with relational understanding and would help them become successful as teachers. Therefore, their academic and professional background indicated that they had capacity to ensure quality teaching-learning activities in the classrooms. Despite having limitations of ICT tools, it would be uplifted the ICT-pedagogy integration process if they availed a congenial working environment with ICT-supported classrooms. On the other hand, Mierzejewski (2009) claimed that professional development training encouraged using technology for lessons and classroom management. However, A2I (2011) reported that more than half of teachers had little to no professional training, although the current status of in-service training on ICT was better than previous (figure-4.4). The results indicated that most of the teachers participated once or more in-service training courses and they made themselves competent in the ICT-pedagogy integration process ever before. However, the classroom observation experience stretched out that the level of ICT knowledge and skill for the majority of teachers was lower. Ahmed, Qasem, and Pawar (2020) also found that the actual uses of ICT tools in classroom teaching were not up to the level nevertheless highly positive attitudes. In a nutshell, the discussion indicated that there was a gap found between the lack of presence of ICT infrastructure, ICT material in schools and the capability of teachers to employ ICT-pedagogy properly in the classrooms. Furthermore, there was some time to go into understanding teaching methods concerning ICT-pedagogy integration for effective practice in classroom activities.

5.2.2 Attitudes towards ICT-pedagogy Integration

The teachers in this study demonstrated positive attitudes towards ICT-pedagogy integration in BGS classroom activities. Among four sub-scales, they were highly positive towards the Attitudes sub-scale but relatively lower on the Perceived Ease of Use sub-scale. In contrast to Perceived Ease of Use, it was found that their institutions had limited access to ICT-pedagogy integrated classrooms (figure-4.28). On the other hand, the results illustrated that the teachers were aware of the effectiveness of ICT integration in teaching BGS (figure-4.27). Moreover, they were conscious enough about their performance and wanted to improve teaching-learning strategies in teaching BGS by using ICT material. Similarly, Augustine, Daud, and Kamaruddin (2018) claimed that teachers' attitudes towards ICT, perceived usefulness, and behavioral intention were highly positive in the case of ICT integration in classrooms.

The findings of this current study regarding attitudes towards ICT-pedagogy integration was harmonized with many other contemporary researchers those were Ahmed, Qasem, & Pawar (2020); Aminullah, Loeneto, & Vianty (2019); Chan and

Mohammad (2019); Mahdum, Hadriana, and Safriyanti (2019); Semerci and Aydin (2018); Mwila (2018); Birwal (2017); Mustafina (2016); Alemu (2015); Lal (2014); Yusuf and Balogun (2011); Crittenden (2009); Cavas et al. (2009); Wang (2007). They found positive attitudes towards ICT use in their classes. In the case of higher education, Gámez and Fernández (2020) together with Hue and Jalil (2013) revealed that the university lecturers had a medium attitudinal level towards ICT integration into the curriculum and ICT use in the classrooms.

On the contrary, Sultana and Haque (2018) found negative attitudes towards computer use in classroom activities. However, the teachers in this study hold positive attitudes towards ICT-pedagogy integration that could be employed to incorporate ICT-pedagogy in teaching-learning activities. Similarly, Yusuf and Balogun (2011) argued that the positive attitudes of teachers were an important factor in integrating technology into the curriculum. Teachers believed that the ICT-pedagogy integration made learning more enjoyable and inspired them to learn many new entities both for students and teachers. Along with the opinion, teachers' positive attitudes could be used to enhance a student-friendly environment and made them confident to employ student-centric teaching-learning methods in classrooms. Similarly, Bozdogan and Ozen (2014), Teo (2008), and Wang (2007) argued that teachers' confidence played a significant role in ICT integration. Above all, teachers were very much positive about ICT-pedagogy integration, which could be employed as a vital mediator towards integrating ICT-pedagogy in education (section-4.2.1).

Concurrently, the teachers were well-known for the Perceived Usefulness of ICT-pedagogy integration in teaching BGS. Equally, Ndihokubwayo, Uwamahoro, and Ndayambaje (2020) and Ali (2018) indicated that most teachers were positive about ICT usability in the teaching-learning process. Moreover, students could be benefitted from the ICT-pedagogy integrated classrooms which turned students into creative learners and made learning more effective, interesting, and motivating, including self-learning opportunities. Additionally, the students with learning difficulties could be benefitted more than the traditional classrooms. Similarly, Mahdum, Hadriana, and Safriyanti (2019) confirmed that ICT made learning activities more useful, increased students' motivation, fostered positive attitudes towards learning as well as made learning more interesting and enjoyable.

In the case of Perceived Ease of Use, teachers exposed to some extent positive attitudes towards ICT-pedagogy integration in teaching BGS at schools. However, the overall average results indicated that the level of access to ICT material was not satisfactory because the schools had limited ICT equipment which was dedicatedly used only for classroom teaching-learning activities (table-4.2). Furthermore, many of the existing material were not in good condition or were unusable again. These results were coherent with Tezci (2011) who found that ICT material were not enough (Alkahtani, 2017) nor in good condition in schools. However, the inadequacy of ICT material negatively impacted on perceived ease of use which ultimately could discourage ICT-pedagogy integration process in teaching BGS. Even though some teachers had easy access to ICT material together with internet resources, practically there were gaps acknowledged between teachers' access level to ICT tools and their ICT skills with their practice in classroom instruction (section-4.3.8.11 & table-4.38).

In contrast, Ghavifekr, and Rosdy (2015) exposed that the ICT implementation process initially required available opportunities and best practices by teachers and students. Otherwise, the teachers and students might be deprived of using ICT in education to explore their prior experience to generate new ideas. In addition Augustine, Daud, and Kamaruddin (2018) asserted that teachers needed easy access to ICT tools for successful integration in education. In contrast, teachers and institutions were reluctant about ICT-pedagogy integration in classroom instruction. Fortunately, some promising teachers were found during classroom observation who confidently used ICT equipment, especially for multimedia classrooms and did not need any support from others, while most teachers were dependent and required support services to functionalize the multimedia class. However, the skilled and experienced teachers who had to ease access to ICT equipment practiced more ICT-pedagogy. However, the presence of ICT equipment in the classroom worked as a driving force for ICT-pedagogy integration. Concurrently, Motivation and Reward from the administration would help contribute ICT-pedagogy integration process which had been identified as one of the top challenges (table-4.42). Thus, the schools as a beginner required more ICT supportive intervention in the classrooms. The concerned authorities also should create opportunities and equip available ICT material for classroom use (section-4.4.1).

Accordingly, in Behavioral Intention, the teachers strongly believed that the integration process had a significant effect on students learning. However, the learning could be enjoyable through practical knowledge with real-world instances and experience which should be integrated into the BGS curriculum as well as teaching-learning activities. Equally, faculties required a stimulating team-teaching environment from administration and school authorities to complete the school curriculum. Additionally, MoE (2013) emphasized developing teaching-learning activities in the classrooms. On the other hand, the teachers were informed about the importance of using ICT in the assessment process. Still, the ICT as an assessment tool was not administered in formative assessment. However, ICT in assessment could measure students' progress effectively, efficiently, and timely. It also helped to keep records without difficulty.

The results suggested that most teachers possessed positive attitudes toward ICT-pedagogy, which could be interpreted as an encouraging example of secondary education in Bangladesh. The findings indicated that the ICT-pedagogy had all chances to be successfully implemented in BGS classrooms because the main facilitators of this process felt the necessity to promote and integrate ICT in education. Furthermore, the possessed attitudes helped to improve the student-centric classroom activities. It might create a congenial working atmosphere whereby teachers could share their experiences with their colleagues and developed their performances with ICT material. In the same way, Andyani et al. (2020) claimed that a positive organizational environment directly helped the teachers' self-efficacy and motivation towards ICT integration in education. On the other hand, usefulness and ease of use were the critical indicators of attitudes towards ICT-pedagogy integration and significantly affect teachers' positive impressions.

5.2.3 ICT-pedagogy use in BGS Classroom Practices

The use of technology in teaching conforms to unlimited possibilities that had positive effects on students' learning (Shittu & Shittu, 2014). Harris, Al-Bataineh, and Al-Bataineh (2016) disclosed that the use of ICT in lessons helped to learn clear, easy, and efficiently, which led to academic success and increased classroom attendance. It also made learning interesting, enjoyable, and motivated towards collaborative learning activities which had a significant effect on teachers' classroom practice (Hero, 2019).

Conversely, the results of classroom observation in this study indicated that the ICT-pedagogy was chaotically practiced in classroom activities. Some teachers were observed who did not maintain the sequence of lessons while conducting BGS lessons with multimedia devices (COB-2, 5, 6, 11, & 14). A few of them also finished their lessons within twenty minutes by presenting the PowerPoint slides only whereas the lesson was scheduled for 35 minutes (COB-2). However, the level of pedagogical practice in ICT mediated teaching-learning activities was found coherent in both phases, while the second phase results demonstrated comparatively better than the first phase. However, the current level of ICT-pedagogy practice was at minimum level but could not differentiate between student-centric and traditional teaching-learning processes. Additionally, the learning gap had not yet been met through ICT-pedagogy integrated classrooms from the traditional method of teaching. On the other hand, the practice was limited only to laptop and multimedia projector with little internet use in most schools, although the concept of ICT-pedagogy integrated classroom required a digital technology-equipped environment. However, there was a scope to make high-quality teaching-learning activities to boost learners' motivation, connect students to a variety of knowledge sources as well as encouraged students to be active in-class and out-of-class learning settings through ICT-pedagogy integrated classroom.

According to the findings, there had been gaps identified between the aim of the lessons and curriculum objectives. Thus, it could be revealed that the teachers had a lack of appropriate preparation for lessons and teaching-learning strategies. The most cases, teachers were found with a shortage of preparation, especially during the ongoing lesson. Moreover, they had a few notions of learning goals of the lesson as well as had little homework on what they had to do in the next steps during the teaching-learning activities. However, ICT embedded classrooms required sound preparation of a lesson which directed teachers to a certain goal of teaching-learning activities. Similarly, Arslan (2018) revealed that the teachers' homework on lessons made them capable more to teach with a real example in classroom instruction and the learner might be found with more involved in lesson.

On the contrary, the Content Knowledge of teachers encouraged them to present lessons with appropriate interpretation, relevant analysis with the proper example in an organized way which helped students to understand the lesson without difficulty. Furthermore, the previous academic knowledge and teaching experience of teachers were important mediators to apply the TPACK model in teaching practically (Cubeles and Riu, 2018). Additionally, Ulferts (2019) claimed that more knowledgeable teachers generally attained a three-month extra progression for students. However, the results in this study disclosed that most of the teachers had better content knowledge but the use of knowledge in teaching-learning activities was slightly aligned with learning outcomes. The teachers' performance was changeable and differed by the change in lesson, preparation, professional degree, technological pedagogical knowledge, teachers' confidence in ICT skills, and environment of schools.

According to the results, teachers could not but finished the lesson without proper discussion, insufficient explanation, or analysis. The students completed their lesson without understanding the meaning which ultimately demotivated them from active classroom participation. However, the teachers' content knowledge and students' success were coherent with each other. Therefore, the teachers were required to upturn their subject-related content knowledge. They needed to be prepared for proper discussion, explanation, and relevant analysis with relevant activities and examples according to student's level of understanding, but it must be followed by learning outcomes set in the lesson. Similarly, Özden (2008) revealed that teachers' content knowledge positively influenced teaching practices. It also had positive reinforcement on pedagogical content knowledge development (Kleickmann et al., 2017).

In contrast, the use of Pedagogical Knowledge in teaching-learning activities inspired constructivism theory, whereby students could construct new knowledge. It could make innovative and creative learning opportunities, although many teachers were unable to utilize their pedagogical knowledge in teaching effectively (Ndibalema, 2014). On the other hand, teachers' Content Knowledge and Pedagogical Knowledge were both important in the teaching-learning process. Similarly, Jones and Moreland (2003) stated that pedagogical content knowledge was blended with pedagogy and content knowledge. It could be explained that pedagogical content knowledge was the way of effective teaching-learning practice for blending the content and pedagogy to structure the specific topics for students. In contrast, general pedagogical knowledge involved broad principles and strategies of classroom management and organization that seemed to exceed subject knowledge (Shulman, 1987).

However, the presence of pedagogical knowledge in teaching BGS was found lower in ICT-pedagogy integrated classroom activities. There was a lack of initiatives to involve students in a lesson while students were engaged a little in different activities. Although the teachers facilitated a small-scale interactive session in classroom activities, they were concerned about differences like gender, lingual, cultural, and social backgrounds of students. Teachers were busy completing the lesson ignoring the priority of students' understanding, whereas students had little participation in classroom activities. Therefore, the gap had been identified between teachers' teaching strategies and learners' learning process. Moreover, vast differences had been noticed in the teaching-learning process due to changes in teacher, school, or location, although they had a similar lesson.

On the other hand, Ulferts (2019) argued that general pedagogical knowledge was a precondition of quality teaching, which had significant effects on learning outcomes for students. Therefore, teachers required more concentration on teaching strategies to disseminate the lesson purposefully, which could remove the ambiguity of the lesson; otherwise, students might face difficulties in learning. They also needed to develop the capability of increasing students' engagement in lessons with different activities to make the classroom interactive. In this way, teachers could develop themselves as a scholar in the teaching arena. Consequently, teachers needed to develop their content knowledge and pedagogical knowledge to minimize the learning gap from its curriculum goals.

Generally, ICT-pedagogy and Content Knowledge had been used as a pedagogic approach that described the teachers' competence to deliver the content knowledge by involving students in the learning process using ICT material. Moreover, Ertmer, Tondeur, and Leftwich (2016) claimed that ICT-pedagogy and content knowledge were closely involved with pedagogical goals, which helped students to engage in relevant and meaningful activities. They also revealed that promoting best practices and effective pedagogy was crucial for technology integration in teaching-learning activities.

However, the results regarding ICT-pedagogy and Content Knowledge in teaching BGS indicated that the teachers were moderately optimistic about the process. Similarly, Rafeedali (2009) argued that the teachers from higher secondary schools were at a minimum level of utilizing the pedagogical benefits of ICT resources rather than following traditional teaching methods in classroom instruction. Mary (2002) revealed that teachers had a small gap in content knowledge considering pedagogical content knowledge, subject-specific aspects of general pedagogical knowledge, and learners' and curriculum knowledge.

On the other hand, the use of ICT in the assessment made the process easy, interesting, time saver, and easy to store and recording the documents that could be widely used by all students, which encouraged learners to participate joyfully in the lesson. Therefore, there was intended to know to what extent the practices of ICT were employed in the assessment process during the classroom environment. The results disclosed the rare use of ICT in assessing the students' progress in the session, whereas teachers were habituated to conducting formative assessment through traditional assessment (paper-pencil test, oral question-answering, or slightly group presentation) system. In contrast, Herro, Quigley and Jacques (2018) found that the technology had been used extensively for formative assessments in teaching. At the same time, the usage of ICT in the assessment was the lowest in this study than other skills (table-4.21).

The following sub-sections 5.2.3.1, 5.2.3.2, & 5.2.3.3 projected to triangulate the data found from survey data, classroom observation data and semi-structured reflective survey data to explore the differences of attitudes and practice as well as the challenges found during classroom observation.

5.2.3.1 Teachers' Attitudes against Practice: Research Reflection

The regular ICT-pedagogy practices in classroom differed by different indicators. The indicators were the teachers' positive perception, ICT experience and training, availability of resources, infrastructural developed classroom, instant ICT support service, and support from the head of the institution including other colleagues. The school location, school types, and class size were another important indicators those had impact on ICT-pedagogy integration in teaching BGS whereas some significant variance/difference was found in BGS teachers' attitudes in terms of schools' location (Guoyuan et al., 2009), school authority type, training exposure (Sultana & Haque, 2018; Alrasheedi, 2009), and teachers’ age (Mwila, 2018; Elsaadani, 2013). However, there was no significant difference either attitudes or practice by male and female teachers.

Although the teachers had positive attitudes towards ICT-pedagogy integration in classroom instruction, some significant variations were found in different conditions. Moreover, there were differences between teachers' attitudes and their regular ICT-pedagogy practices in classroom activities. The differences might have a negative impact and limit the success of the ICT-pedagogy integration process for secondary education in Bangladesh. It also might cause stress and uncertainty to the teachers and students, which could discourage them and delayed the country's ICT-pedagogy integration in education. Similarly, the quality of the ICT-pedagogy mediated teaching-learning process might be impeded due to remaining inequalities in rural along with non-government students compared to urban and government types of students. They might be left out of the benefits of the ICT-pedagogy integration process in education. However, the available ICT facilities and ease of access in the system could minimize the discrimination among institutions as well as students. Additionally, MoE (2013) set a vision to establish a knowledge-based and equitable society and built a digital Bangladesh where all citizens might have equal opportunity to develop their capabilities and would meet the challenges of 21st-century skills. Therefore, the ICT-pedagogy mediated teaching-learning activities were essential for present and future learners. Similarly, the teachers' attitudes and their ease of access to ICT tools were also more critical factors for the effective integration of BGS teaching-learning activities.

The above discussion disclosed that a many programs were taken by the different organizations but the success of the various initiatives would be ensured only when ICT might properly integrate in the BGS classroom for teaching-learning process and it was possible with the constructive and positive attitudes of teachers towards the integration of ICT-pedagogy in teaching BGS.

5.2.3.2 The Classroom Situations: Hands-on Investigation

The following discussion had been done based on the experience of direct classroom observations. The teachers usually started class with welcoming greetings by showing pictures using a slide show which ignored either relevance with content or no connection with the lesson. Some of the teachers displayed video documentaries to announce the lesson, but they did not relate to the content, which might help students to wonder about the topic. A few of them declared the title of the lesson by creating interest in the content. The pedagogical knowledge of teachers was intensively observed and found that many of the teachers went through slide after slide without any explanation but finished the shortened lesson. In contrast, some of the teachers made an effort to involve students by giving different types of activities, but they were unlikely to have been properly done due to unplanned procedures. Teachers provided different types of unplanned tasks without proper or insufficient instruction that might be guided to do the work in an organized way. Somewhat it had been found that there was inconsistency between the volume of the task for group work and number of the team member in groups. It might either the work volume was higher than capacity or very small in amount regarding the number of students in a group.

Moreover, it had been found that many teachers overlooked the lesson plan. Somewhere teachers were found with irrelevant conversation or more discussion ignoring the students' attention (COB-2, 5, 6, 11, 14, 18, & 29). It also had been observed that the teachers could not keep students' attentive in teaching-learning activities because of overlooking the plan embedded in the lesson. In contrast, students played a passive role, especially the students seated at the back. They were left out of teachers' discussion and participation and ultimately lost their attention from classroom activities. However, teachers could easily engage students if they followed the plan perfectly. Therefore, teachers must simultaneously prepare themselves on ICT, pedagogy, and content knowledge before entering into class to accomplish successful teaching-learning activities.

The content knowledge also was observed whereby teachers found that they provided tasks without discussion or input by showing poor pictures. It had been found that the font size and pictures were so small that the students who took a seat in the back could not see and read the instruction exactly. In addition, the teachers sometimes played the video without any explanation, and it continued for a long time (COB-3), but it was not always relevant to the content. In contrast, a few teachers had been identified who retained everything well (COB-1, 7, & 9). They followed the lesson plan, used multimedia correctly, discussed as much as required to the lesson, provided tasks, and assessed students' progress with feedback.

In the case of content, most of the teachers selected such topics, which made them confident and felt comfortable replacing the regular topic following the year plan. Mostly the teachers administered model content in their class, leaving the suggested plan of content and pedagogy given by content developers. It was also found that the same content was taught in different schools and conditions (COB-2 & 9), but a significant gap had been recognized due to the lack of proper design of content knowledge, pedagogy knowledge, and technology knowledge by their professional qualifications and participation in ICT training courses. Consequently, the expected learning outcomes had been varied because of different schools, teachers, and their different teaching-learning activities, although the content and grades were similar. Therefore, it could be concluded based on classroom observation and survey data, recommended by T-37, 94, 122, 277, 352, & 389 that the teachers needed to plan and prepare content before entering class, whether it was self-made or model content, to accomplish the lesson. There was another big gap identified in the lesson delivery process where teachers delivered the content avoiding the aim of the lesson set in the curriculum (COB-2, 5, 11, 19, & 27).

Conversely, it was found in ICT-pedagogy integrated classrooms that relatively better students could quickly go through with the lessons than weaker students. Interestingly, it was exposed that many students were well prepared for a lesson before entering class. Therefore, the students felt more interested as it was known to them. It was also observed that the students got tired and became distracted from the lesson whether there was no innovative or attentive idea included in the content.

It was also observed on the readiness of schools and their teachers whereby found that most schools had no fixed multimedia classrooms, although they had set multimedia classes in their daily routine. The teachers and subjects were rotated for multimedia class routine but hardly followed in schools. On the other hand, whether the teachers desired to conduct class with a multimedia projector, they had to carry it into class (COB-5, 8, 11, 14, 15; & T-230, 242, 304, & 344). Most of the time, they faced setting problems with laptops and multimedia projectors perfectly. As a result, they had to spend a lot of time, which made them delay starting class at the right time. Moreover, a slow start urged to finish the lesson quickly, and teachers needed to squeeze their lesson plan due to a shortage of time.

Conversely, the teachers manually operated multimedia projectors, which prevented them from moving away from the laptop. In addition, it had been found that the teachers were busy with operating multimedia rather than concentrating on students learning, especially for the students who took sit at the back. Therefore, the students made the classrooms noisy, and teachers failed to manage students to control the lesson. Although, it was known that the teachers needed to move around the class to accomplish lessons with students' participation.

On the other hand, some of the teachers started their lessons accordingly, but in practice, they could not go through at the same pace as they started (COB-6, 10, & 16). Teachers made an effort to involve students in different tasks. However, it had not been properly done always due to shortage of time, large class size, lack of expertise in time management, overcrowded classrooms, classroom sitting arrangement, lack of space in class, etc. Time was too short to manage a big class found primarily in two shifted schools. It was challenging to manage a large class for one teacher within a limited time. Therefore, teachers needed to relieve from class load and required more time to prepare for the successful completion of the class. A substitute teacher or small class size was required to complete an ICT-oriented class successfully. In contrast, there was a lack of proper preparation in schools to support interested teachers. Moreover, there was a scarcity of computers or laptops in schools. In some cases, teachers managed class by borrowing others' laptops.

The results of classroom observation unfolded a few teachers who could involve students successfully in the ICT-pedagogy integration process. They were teaching with sufficient preparation, sound content knowledge, competence in pedagogical knowledge, and experience in ICT skills. According to the lesson plan, they taught students well by following the TPACK (COB-1, 7, & 9) model with discussion and explanation and letting students participate in classroom activities, either individually or in groups. They also applied different techniques to assess the learning progress and provide feedback where it was required. On the other hand, many teachers had been recognized who entered the class with minimal preparation (COB-2, 5, 11, & 23). Even they had no idea about the purpose of the lesson they would deliver in an ICT-pedagogy mediated classroom. Oni, Haruna, and Amugo (2017); Nsolly and Charlotte (2016) identified that the lack of qualified teachers made delay the ICT integration process. The data illustrated that the teachers who had no plan faced more problems than prepared teachers in ICT-oriented classes or regular classroom activities. They had little control over classroom management and suffered from content or pedagogy or both technology, pedagogy, and content knowledge. They lacked planning for the lesson, short discussion with relevant examples, lack of students' participation, inadequate instruction, unplanned task or activities, and lack of assessment with ICT whereas technological training and professional degree could be a solution for using ICT-pedagogy in the classrooms (T-11, 42, 111, 283, 306, & 366). Therefore, most teachers were required to develop their knowledge and experience towards integrating ICT-pedagogy in classroom activities with the TPACK model because it stimulated creative and innovative learning opportunities whereby students could learn their lessons in a joyful environment. According to Jha (2017), technology helped develop an understanding with more accuracy, made lively interaction for effective learning, and collaborated between students and teachers cognitively and affectively. Similarly, Chand (2017); Anandan and Gopal (2011) claimed that ICT-enhanced collaborative learning approaches could support learners to encourage their content knowledge, critical thinking, and problem-solving abilities.

Moreover, Pandey (2017) revealed that teachers must know the use of ICT in their subject areas, which was essential for enjoyable learning. Sunday (2010) stated that ICT made the subject more interesting for students. Subsequently, teachers needed to know how to best use ICT to deliver lessons with students' involvement, and lively participation, and engage in discussion during teaching-learning activities in BGS. They also needed to develop their ICT-pedagogy integration skills to develop learners' creative and innovative learning opportunities and critical thinking with problem-solving abilities. However, teachers could extend the boundaries of textbooks by acquiring up-to-date knowledge with relevant resources, examples, and discussions to enrich the concept of the textbook.

Furthermore, the PowerPoint presentation had been considered a powerful pedagogical tool **(**Lari, 2018). Still, there had been observed a lack of amalgamation of ICT materials in BGS lessons, especially on PowerPoint-made multimedia digital content. It was also identified that there were shortages of teachers' initiative to blend the lesson content with relevant audio/video/image/animation or proper preparation for delivering the lesson. Moreover, ICT-pedagogy integration requires teachers' willingness (T-37, 38, 158, 268, & 309) and expertise to integrate ICT skill with pedagogy and content knowledge in student-centric classroom practice. In addition, TPACK was well connected with instructors' student-centric educational ideas and their technology values (Lai and Lin, 2018). Equally, Sarah (2017) disclosed a link between teachers' pedagogical concepts and practice regarding the usage of technologies. At the same time, Ha and Lee (2019) claimed that teachers' beliefs directly influenced teachers' ICT-related knowledge and its usage in the classrooms. Hermans et al. (2008) demonstrated that teachers' traditional educational beliefs negatively influenced the integrated classroom use of computers. Therefore, teachers need to make themselves capable enough for conducting collaborative learning opportunities for students.

On the other hand, Mierzejewski (2009) revealed that many teachers could properly integrate technology into classroom instruction. Additionally, particular institutions and governments should create opportunities for teachers to ease access to ICT tools without any trouble. Moreover, teachers need to be adequately trained with ICT-pedagogy integration because ICT material could be employed successfully if they were properly trained (Mallick & Anam, 2020).

It had also been recognized that computer skill, experience, including teaching strategies, and content knowledge were the primary indicators of the successful inclusion of ICT in classroom instruction. They also needed to prepare well on content knowledge and had strong background and confidence in ICT use. They could use model content or self-made content but should know how to deliver the lesson as stated in the plan. However, the teachers who made content themselves taught better (COB-12) than the teachers who administered model content in lesson presentations.

On the other hand, more significant differences were observed between the rural and the urban schools other than school categories (boys, girls, & co-education) and gender differences. Although the female teachers as well as government teachers practiced ICT-pedagogy a little more in their classroom compared to their counterparts, there were inequalities in teachers' attitudes which had reflected as barriers all over the country. It might be hindered the ICT-pedagogy integration process equally across the country. Moreover, the differences might negatively affect and limit the success of the ICT-pedagogy integration in secondary education BGS classroom. Therefore, the ultimate impact might go on students' learning process.

Overall the performance of the second phase was comparatively better than the first phase. Additionally, the schools had been found more organized than in an earlier phase, but the results were not equally progressed. Somewhere it had fluctuated either in the first phase or in the second phase. Unfortunately, dissimilarity had been witnessed in some cases between survey results and classroom observation results regarding ICT-pedagogy integration in classroom practices. The data reported that more attention was needed in schools for an effective integration process because the use of ICT in teaching-learning activities accelerated the pedagogy knowledge of teachers for fruitfully incorporating ICT pedagogy in lesson presentations.

5.2.3.3 Limitations Observed during Hands-on Investigation

Overall, the limitations of ICT-pedagogy practices in BGS classes were categorized into four sections based on the classroom observation report. On the other hand, the undergoing discussion had been harmonized with challenges towards ICT-pedagogy integration (5.2.4). Those were as follows:

Limitations of ICT Material and Infrastructure

Shortage of well ICT equipped classroom or multimedia classroom; lack of laptops or computers, sound system, internet, uninterrupted power supply; scarcity of well-decorated classroom; and insufficient space and furniture were observed. These limitations also were noticed in existing school situations and in other sub-sections (section-4.1.1, 4.4.5.2, & 4.4.8.4).

Limitations of the School Setting

Lack of welcoming environment for ICT integration, lack of permanent multimedia classroom, large class size, teachers' class load, shortage of class duration, and lack of administrative support were identified as limitations for ICT-pedagogy integration (section- 4.1.1, 4.4.5.2, & 5.2.3.2).

Limitations of Integration ICT-pedagogy and Content Knowledge

Shortage of content knowledge; lack of ICT knowledge, skill, and experiences; lack of content-pedagogy integration; lack of assimilation for ICT-pedagogy and content knowledge; lack of proper preparation; unplanned teaching; lack of using apposite teaching strategies for ICT integration; absence of students engagement in the lesson; lack of interactive learning environment, lack of creativity in designing lesson; absence of creating innovative learning opportunities; anxiety about technology; unskilled use of ICT; lack of time management for maximum usage of ICT in the lesson and use of technology in assessment. These findings had corresponded with sub-section 4.3.2, 4.3.3, & 4.3.4.

Limitations of Policy Level Strategies

The disparity remained between rural and urban schools, government and non-government schools; teachers' appointment without a professional degree; insufficient in-service teachers' training (Mahmuda, 2016), lack of reward, lack of proper policy guidelines, and proper implementation which had been concurred with sub-section 4.4.6.

5.2.4 Challenges towards ICT-Pedagogy Integration

Buza and Mula (2017) added that the teacher needed to play a vital role in making the classroom enjoyable because ICT integration began in their hands. However, this study addressed several challenges in the ICT-pedagogy integration process, including the early stated limitations (sub-section 5.2.3.3). The degree of challenges varied in different ways. Teachers faced more challenges with ICT Infrastructure and the Integration of ICT-pedagogy during teaching-learning activities. In the same way, a shortage of Pedagogical Knowledge appeared as challenge, which was comparatively lower than the earlier two challenges but higher than the lack of Motivation and Reward. On the other hand, some other relevant issues were connected with ICT-pedagogy integration in teaching BGS. These issues were identified as Unstructured Challenges. The above findings disclosed some challenges which were witnessed as barriers to the ICT-pedagogy integration (section-4.4). The data claimed that ICT Infrastructure were the topmost challenge because schools had insufficient laptops or computers, limited access to ICT material, insufficient power supply, inadequate internet facilities, and lack of instant technical support. Concurrently, Salam (2016) asserted that institutions had a lack of proper ICT infrastructure to integrate ICT in higher education in Bangladesh. Furthermore, Onwuagboke et al. (2014); Dinc (2019); Hur, Shannon, and Wolf (2016) identified that the teachers faced numerous challenges of ICT integration due to a shortage of ICT resources. Furthermore, Andoh (2012), Cavucci (2009), and Malcolm-Bell (2009) claimed that the limitation of ICT accessibility in the classroom was another barrier for ICT-pedagogy integration.

Moreover, it was found that the physical infrastructure of schools were not fully useful for ICT-pedagogy integration due to inadequate space, classroom sitting arrangement, shortage of ventilation, and lack of multimedia setting in the classrooms.

Mahdum, Hadriana and Safriyanti (2019), Al Mofarreh (2016), Albugami and Ahmed (2015), Yusuf and Balogun (2011) identified various types of challenges to utilize ICT in learning activities, including the limited facilities of ICT material and lack of infrastructure facilities. In addition, Teixeira, Amoroso, and Gresham (2017) stated that the development of educational infrastructure (buildings, classroom, laboratories, and equipment) were essential elements of learning environments either schools or universities and had a strong relationship between high-quality infrastructure with better instruction, students' learning outcomes and their declining dropout rates with other benefits. Similarly, Guoyuan et al. (2009) revealed significant differences regarding infrastructure facilities considering the school location. Additionally, Lu, Tsai, and Wu (2015) discoursed that ICT infrastructure in schools were comparatively lower in rural areas.

On the other hand, the teachers had been found with inadequate knowledge in integrating ICT-pedagogy and content knowledge, a lack of relevant ICT skills, experience, and training for integrating ICT in teaching, including dependency on ICT tools during teaching BGS. The identified challenges might be hindered the successful integration of ICT-pedagogy in the BGS classrooms. Oni, Haruna, and Amugo(2017) depicted that most teachers in secondary schools had limitations to incorporate ICT as pedagogic use in classroom teaching-learning activities. Additionally, a number of studies had been addressed with a lack of ability to use of ICT as pedagogical tool in the secondary school teaching-learning process (Makhlouf & Bensafi, 2021;

Bingmlas, 2009; Nihuka & Voogt, 2012) cited in Mahdum, Hadriana, and Safriyanti (2019).

In contrast, Mueller (2009) recommended that teachers need to accept the computer as a learning tool and integrate it into teaching-learning activities for fruitful use in knowledge construction. Moreover, the use of ICT in formative assessment was found another challenge in this study. Therefore, it could be suggested that the teachers immediately needed to know the better practice of ICT knowledge, Pedagogy Knowledge, and Content Knowledge unitedly in their classrooms. They should also develop their relevant ICT skills and experience to meet the challenges successfully. The results in this study recommended that policymakers should rethink about the effective integration of ICT-pedagogy in teaching BGS.

Teachers' Pedagogical Knowledge had also been identified as a significant challenge. However, the proper utilization of pedagogical knowledge in lessons transformed the classroom more interactive, participatory, and goal-oriented and allowed students to be creative and active learners. The proper pedagogical knowledge of teachers helped to complete the lesson constructively, whereby students learned with more concentration. Oppositely, the teachers without pedagogical knowledge faced various types of difficulties in the effective delivery of lessons and classroom management (Biku et al., 2018). Among pedagogical knowledge, teachers were found with limited knowledge on the adaptation of teaching methods in ICT-pedagogy mediated lessons, lack of structuring the lessons as well as evaluating students' activities by using ICT, absence of using creative thinking and problem-solving skill of learners, unable to manage disciplined classroom activities and shortage of content knowledge. These results were coherent with other studies and identified that higher secondary schools were incompetent to apply pedagogical knowledge properly in ICT embedded classrooms rather than follow traditional teaching methods (Rafeedali, 2009). Salam (2016) also disclosed that teachers usually used traditional teaching methods due to their lower pedagogical knowledge. On the other hand, Bandyopadhyay (2013) did not find any significant difference in the pedagogical styles of teachers regarding gender. The researcher also added that both teachers displayed very similar pedagogical styles and engaged in as much or as little constructive pedagogy as one another.

In contrast, Motivation and Reward inspired teachers towards practicing ICT in the teaching-learning procedures. It helped the development of teachers' positive attitudes and increased efficiency in using ICT in classroom. However, the insufficient support from the administration for integrating ICT-pedagogy in BGS classroom had been treated as another challenge of the integration process (section-4.2.4 & 4.4.86) as well as survey data also claimed such accusation by T-57, 70, 76, 102, & 303. The school authorities rarely encouraged the teachers to incorporate it into their classroom activities (section 4.4.4; & T-268, 277, 314, 346). Nevertheless, despite having a teaching load, there were positive insights about the integration process in the BGS classrooms (section 4.2.1). According to the findings, most of the schools prioritized using ICT-pedagogy in teaching BGS, although the administration did not facilitate an always welcoming environment. Oni, Haruna, and Amugo (2017) also found that the lack of commitment from government and school management as well as lack of motivation and technical help were the challenges of ICT integration. Conversely, motivated teachers could provide maximum effort to use innovation. Unfortunately, they faced more challenges from the administration rather than receiving rewards for ICT-pedagogy integration. On the other hand, teachers thought that the national curriculum for secondary education, especially BGS was good enough for incorporating ICT-pedagogy in the classroom.

Conversely, many advantages of ICT-pedagogy integration in the BGS classrooms had been acknowledged by this study. The pondered advantages of the integration process in the classroom were: helped learners clear the lesson, increased students' engagement in the lesson, enlightened creative and innovative learning opportunities, offered an opportunity for knowledge retention, encouraged individual learning, and made collaboration effective in the classroom activities. Similarly, ICT offered an equal voice for students to reduce the disparities in learning opportunities. Nevertheless, teachers could develop their teaching-learning activities by using ICT, easily identify students' learning progress, extend the boundaries from the classroom environment to the broader world, and definitely differentiate students' needs in BGS classroom activities.

Although there were many advantages of ICT-pedagogy integration in teaching BGS, there were also some disadvantages. The disadvantages were: immense expenditures, time-consuming, and unable to complete lessons in due time. At the same time, there were few instances where students could access misplaced content and could be trapped in cyber bullying. Moreover, they might have a little bit opportunity of cheating such as copying assignments/project work/presentations, etc.

5.3 Implication

This section highlighted the implications of this study in the following major categories: contribution to the new knowledge, development of BGS teaching strategies, accelerating ICT teaching practice, and regressing existing challenges in ICT implementation. In light of the effectiveness of ICT-pedagogy integration, this study had a number of implications for practice and development.

5.3.1 Contribution to New Knowledge on Integrating ICT-pedagogy in BGS classroom

Previous studies on ICT use in teaching learning activities mostly based on language education (Ahmed, Qasem, & Pawar, 2020; Herrera et al., 2018; Talukder & Saba, 2016; Bozdogan & Ozen, 2014), and some others on science education (Chan & Mohammad, 2019; Herro, Quigley, & Jacques, 2018; Mannan, Rahman, & Khan, 2014; Anandan & Gopal, 2011; Cavas et al., 2009; Sunday, 2010). However, this research studied the present status of BGS teacher's attitudes and practice of ICT-pedagogy integration in the Bangladesh context. Similar studies were found in the context of social science and history (Çetin & Işçi, 2022; Tarman, Kilinc, & Aydin, 2019; Ghanney & Mwinkaar, 2019; Mannan, Rahman, & Khan, 2014) though the findings of those studies resonated with novelty in terms of practice and attitudes of teachers. The findings of this study added a new insight primarily in TAM and then TPACK model which indicated that teachers possessed positive attitudes towards ICT-pedagogy integration in secondary school BGS classroom as well as had fairly and unorganized use of ICT-pedagogy in BGS classrooms. The findings also shed some light on the gender perspective of ICT integration with pedagogy. The female teachers were way ahead of their male colleagues in terms of ICT use although male teachers possessed positive attitudes towards this than the female whereby the findings might be a guide for future researchers to investigate this area of study. In contrast, the aged teachers were benefitted of pedagogical knowledge in ICT-pedagogy integration process than younger teachers. Moreover, high correlations were found among teachers' attitudes with their ICT skills and level of confidence including ICT skills and their application software skills which argued that skills and confidence were positively correlated with teachers' attitudes.

Furthermore, this study explained the relation among existing school situation, limitations and success factors of secondary schools and ICT-pedagogy integration in BGS classrooms, which had not yet been addressed by the existing literatures and shared some recommendations which should be taken into consideration to implement ICT-pedagogy in education successfully. Nonetheless, BGS teachers' willingness to integrate ICT was observed, but the class size and existing facilities were not conducive to ICT integration. Thus, the study highly suggested to develop and maintained ICT facilities in schools to sustain teachers' motivation and practice.

5.3.2 Contribution to TAM and TPACK model in ICT-Pedagogy Integration in BGS Classrooms

Despite having different conditions and subject matter as well as the presence of limited ICT tools, the findings of this study particularly on BGS teachers' attitudes highlighted some new aspects for the advancement of TAM model. The teachers possessed positive attitudes and had a positive perception about perceived usefulness (PU) and perceived ease of use (PEOU) in BGS classrooms. Their behavioral intention was also in favor to ICT-pedagogy integration. Therefore, it might be said that the TAM could be utilized in ICT-pedagogy integration process in teaching BGS at secondary schools in Bangladesh. There were some other variables measured (school location, school types, teachers' professional degree & participation in in-service training, their age, including ICT skills & confidence) which influenced the teachers' overall attitudes towards ICT-pedagogy integration in BGS classroom.

Similarly, the use of ICT-pedagogy in classroom practice was limited to only one laptop and multimedia projector with little use of the internet but there were variances found regarding ICT-pedagogy & Content Knowledge. Significant differences were observed between rural and urban schools as well as government and non-government schools. Teachers' insufficient knowledge about TPACK was a challenge in the ICT-pedagogy integration process, though the teachers with ICT skills and professional degree confirmed their positive attitudes towards ICT-pedagogy integration. In addition, the trained teachers use ICT as a pedagogical tool comparatively better than non-trained teachers who were observed during a classroom observation. Moreover, this study revealed dissimilarity between possessed attitudes and practice based on survey and classroom observation data. However, it was found that the teachers lacked proper skills of blending ICT-pedagogy and Content Knowledge, which hindered the entire integration process. These findings would guide teachers as well as future researchers to study the gap between technology, pedagogy, and content knowledge of teachers and their practices. Moreover, they could investigate the best practice of blending ICT knowledge, pedagogy knowledge, and content knowledge in BGS classroom within limited ICT resources to enrich the TPACK in developing countries, especially in Bangladesh.

A lot of studies worked with language (Khan & Kuddus, 2020; Ahmed, Qasem, & Pawar, 2020), science (Herro, Quigley, & Jacques, 2018; Mannan, Rahman, & Khan, 2014; Chan & Mohammad, 2019) and many other subjects following TPACK whereas this study intended to explore the teaching-learning activities in BGS classroom environment. The findings showed that teachers struggled to integrate the subject knowledge with pedagogy and technology, which was at the heart of TPACK model. The main thesis of TPACK suggested combining three types of knowledge to ensure better integration of ICT in the classrooms (Davis, 1989; Koehler & Mishra, 2009). The present study reaffirmed the concept as the findings showed that insufficient knowledge in one of the three categories (Content, pedagogy, and technology) affected the teachers' practice of ICT integration. The study emphasized on teachers' capacity and infrastructural support to get the best out of TPACK model in secondary schools of Bangladesh.

5.3.3. Accelerating BGS Teaching Practice

The teachers' perceived usefulness (PU) affirmed that the use of ICT-pedagogy in BGS classrooms might improve the teaching-learning activities (T-01, 14, 37, 38 55, 59, 198, 268, 383, & 314). On the other hand, the fairly and unorganized practice of ICT-pedagogy in BGS classrooms could be improved through skill development of teachers (T-11, 14, 34, 125, 248, & 371) and continuous supervision (T-42, 57, 127, 283, & 306). However, the teachers could develop their skill through participation on ICT related training, blended use of content, pedagogy, and ICT knowledge that would accelerate the integration process of ICT-pedagogy in BGS teaching-learning activities. Teachers might use content related videos, images or PDF documents as teaching aids for further explanation to understand the content even better. In this process, students could empower their intellectual abilities and improve their academic performance. However, the further study could suggest specific strategies to overcome the identified limitations for delivering the lesson effectively.

5.3.4 Existing Challenges about ICT-pedagogy Integration in BGS Classrooms

This study provided insights about current practices of ICT-pedagogy for transforming classroom student-centric (Aidoo et al., 2022; Trinidad & Ngo, 2019; Babu & Nath, 2017). However, lack of proper use of ICT-pedagogy in teaching BGS was major challenge whereas the associated challenges were the lack of content knowledge, pedagogy knowledge of the teachers, and shortage of ICT skills and experience. Due to these challenges, teachers could not practice properly to the extent their attitudes were. Thus, the gaps were found between teachers' possessed ICT skill and their teaching-learning practices in ICT-pedagogy integrated classrooms. The future researchers might investigate the reasons behind attitudes and practice of ICT-pedagogy integration process. The use of ICT tools in formative assessment was found in very limited extent whereas the future researchers could explain the motive and might suggest the ways of using ICT tools in assessment.

The study addressed some other inequalities in infrastructure, ICT tools, and internet connectivity particularly in rural and non-government schools, reflecting the prevalence of organizational and geographic aligned digital divide. Thus, the infrastructure facilities, ICT material, and internet connectivity in rural and non-government schools needed to be given special attention for developing the lingering conditions and it would be investigated areas for betterment of ICT-pedagogy integration process in BGS classrooms. The identified challenges made room for teachers, school administrators and concerned authorities to take the subsequent initiatives for utilizing ICT into practice reforming student-centered pedagogical aspect. The findings might quicken to set innovative plan to overcome the acknowledged challenges for employing teachers' positive attitudes towards ICT-pedagogy integration.

5.4 Recommendations

This study identified some challenges which were to be minimized for effective ICT-pedagogy integration in teaching BGS. Therefore, the current study suggested some recommendations for better ICT-pedagogy integration and further improvement of teaching-learning activities in the BGS classrooms. The recommendations had been presented in two different heads, i.e., institutions and teachers.

5.4.1 Recommendations for Institutions

The challenges might be either organizational, infrastructural and/or teaching-learning material connected with ICT-pedagogy integration in teaching BGS addressed herewith. The recommendations associated with institution needed significant policy attention to solve which were as follows:

5.4.1.1 Constructive Support from Concerned Authority

The study recommended that support from the educational and institutional administration were urgently required for effective ICT-pedagogy integration in teaching BGS. According to the findings, a few teachers were found optimistic about the administration who encouraged them, whereas most of the teachers pointed out that institutional heads had negligence about the ICT-pedagogy integration process in teaching BGS. Therefore, this study emphasized on raising awareness among the heads of the institutions and administrative body so that they might develop a positive view about technology integration and would encourage their colleagues to employ ICT-pedagogy in their classroom activities. At the same time, concerned authorities should come forward to help individual institutions for accelerating the country-wide ICT-pedagogy integration process.

5.4.1.2 Develop ICT Infrastructure

The primary responsibility of the institution was to offer well-equipped ICT-friendly classroom for ICT-pedagogy integration because it made teachers interested in integrating technology and helped to manage class efficiently. However, this study addressed some shortages of infrastructure facilities behind the integration process of ICT-pedagogy in classroom activities. The non-government schools either in rural or urban and in some cases, government schools faced various difficulties like the low quality of infrastructure, inadequate space and less-decorated classroom, poor sitting arrangements, lack of adequate space for multimedia setting with proper placing in the classrooms, uninterrupted power supply, lack of the internet facilitated classrooms, and insufficient ventilation, etc. Moreover, safety issues or maintenance of ICT equipment were the other concerning issues for gentle use of technology while uninterrupted power supply helped teachers to finish the task well. However, any kind of interruptions in the ICT-pedagogy integration process affect the lesson seriously. Therefore, this study could make desire among teachers and educational personnel for improving the existing infrastructure development for better and blending use of ICT-pedagogy in classroom environment. Furthermore, this study also recommended mitigating the addressed challenges for a smooth ICT-pedagogy integration process for the BGS subject.

5.4.1.3 Provide ICT Material with Support Service

The study found a significant correlation between the presence of ICT equipment in classroom and teachers' overall attitudes. Therefore, many schools, including teachers needed necessary ICT support, especially for laptop/computer and multimedia projector for effective ICT-pedagogy integration. At the same time, interactive whiteboards and smartboards could help teachers to conduct teaching-learning activities smartly. Conversely, data showed that teachers' access to ICT equipment was at a minimum level in many schools. Thus, the findings of this study suggested that either the schools or corresponding authorities should take necessary measures to supply required ICT equipment so that teachers could frequently use ICT-pedagogy in classrooms without facing any difficulties. Concurrently, the institution needed to supply internet facilities because there was limited presence of internet connectivity, especially for classroom use. On the other hand, technical support was another barrier that had been identified by teachers in this study. Therefore, teachers required technical support during ICT-pedagogy integration as many of them were beginners in technology use. Thus, it was time being demand that each school should have a technical staff for well maintenance of ICT equipment and could support teachers in classroom teaching-learning activities. The sooner the addressed limitations could be considered by concern authorities; ICT-pedagogy integration might flourish the learning environment as well as helped students efficiently for competitive world.

5.4.1.4 Supply Teaching-Learning Material

Teachers in this study required assistance of quality teaching-learning material because they had a shortage of time to prepare ICT-pedagogy embedded teaching-learning material following textbooks. Many of them had no opportunity or lesser expertise to develop or collect appropriate learning material due to a lack of ICT support at home or in schools. In contrast, prepared teaching-learning material could relieve teachers from the extra load of content preparation though the practice of self-prepared content was found more effective in classrooms. Therefore, the respective authorities should supply subject-based ICT embedded teaching-learning material for making ease integration of ICT-pedagogy and could make available internet support for browsing social science related material.

5.4.1.5 Bridge the Gap between Teachers' Attitudes and Practice

Several types of disparities had been identified based on teachers' attitudes and their practice of ICT-pedagogy in classroom activities. The differences were exposed between rural compared to urban; government against non-government; boys, girls and co-education schools; with or without professional qualification; trained or non-trained teachers; teachers' age; and level of confidence in ICT skills. However, the disparities created several types of barriers and discrimination in the ICT-pedagogy integration process in teaching BGS. The rural and non-government schools were left behind from the opportunities of up-to-date technology. In contrast, government schools were technologically advanced and practiced more than non-government and rural schools. Moreover, the teachers from government schools enjoyed more facilities in various ways than non-government teachers. Therefore, the school, respective authorities, and government should accept effective initiatives to reduce the gap gradually from schools and ensured the level of practice at BGS classroom for interactive ICT-pedagogy integration to present the lesson. This study could have succeeded for minimizing the gap, if the teachers, schools, respective authorities, and government acquired steps for ICT-pedagogy integration in school curriculum regarding the recommendations of current study.

5.4.1.6 Teacher' Capacity Development through Teacher Education and Training

The teachers with a professional degree in this study demonstrated significantly more attitudes than the teachers who did not have a professional degree. Therefore, this study strongly recommended for creating available opportunities of professional development for teachers. Professional development made teachers up-to-date about the new knowledge and offered acquiring educational theory and practice to disseminate in teaching efficiently (Postholm, 2012; Mizell, 2010;). Hence, the finding might help educational policy makers and government to take further steps for being mandatory the professional degree before entering classroom for all newly appointed teachers either government or non-government secondary schools. Education Master Plan-2013 also emphasized on developing professional ICT skills for effective use in education and building up skilled human resource.

Likewise professional development, in-service training had been found as essential indicators for ICT-pedagogy integration. The teachers who participated in in-service training courses possessed significantly more attitudes than non-participated teachers. Moreover, subject-based ICT-pedagogy training helped teachers acquiring and adapting the content knowledge (Cui & Zhang, 2021; Alrasheed, 2009) that made them confident and maintained more control on ICT tools and their use in classroom instruction. Furthermore, teachers wanted to participate in training courses before ICT-pedagogy integration in the classrooms because it required a high level of experience (T-11, 14, 34, 125, 248, & 371). At the same time, they had shortage of training on integrating ICT-pedagogy in teaching. Therefore, subject-based ICT-pedagogy in-service training should arrange either in schools or centrally by the government for developing skills and gradually minimize the gap between ICT-pedagogy integration in the lesson.

5.4.1.7 Reduce Class Size and Class Load

This study identified that the teachers had to conduct BGS classroom activities under the pressure of class load in their daily class routine. Moreover, they engaged in each period in different grades and had no opportunity to prepare for the next session. Furthermore, they were requested to do the extra task in the school other than teaching (T-102, 127, & 386). Conversely, the large class size made it challenging to manage the class perfectly according to the planning of the lesson (Ayeni & Olowe, 2016), whereas oppositely, they had to meet the shortage of class duration. Therefore, both class load and class size should be reduced while class duration, as suggested by NCTB, should be followed for successful ICT-pedagogy integration. Shireen, Mehmood, and Habib (2020) also recommended that classes should not be overcrowded to the best possible circumstances.

5.4.1.8 Ensure Pleasant Working Environment

Another primary responsibility of the institution should provide a congenial working environment because it had a significant positive effect on teachers' job performance.

Similarly, the results suggested that team efforts were needed for ICT-pedagogy practices in school and let teachers work together. In contrast, the interested teachers faced different challenges from internal or external affairs in schools (T-93, 119, 168, 230, 314, & 361). In some cases, the working environment was overlooked and making teachers discontinue from ICT-pedagogy integration. The NIP-20I8 also put emphasis to ensure positive working environment for research and innovation in education and also suggested to ensure effective use of ICT in educational administration. Thus, concerned authorities and teachers' communities should make a pleasant working environment to integrate ICT-pedagogy into classroom instruction.

5.4.1.9 Introduce Reward for ICT-pedagogy Integration

This study had recognized that the teachers were rarely encouraged to use ICT-pedagogy in teaching BGS. At the same time, Motivation and Reward were found correlated with ICT-Pedagogy Integration and Pedagogical Knowledge of teachers. Therefore, this study suggested based on requirement of teachers (T-14, 55, 71, & 158) to offer incentives for teachers based on their performance and participation of ICT-pedagogy in classroom practice (A2I, 2011).

5.4.2 Recommendations for Teachers

This section focused teachers' personal challenges that should be minimized by teachers themselves for effective participation with more confidence in ICT-pedagogy integration in teaching BGS.

5.4.2.1 Develop Professional Attitudes towards ICT-pedagogy Integration

This study suggested that teachers should develop their professional attitudes towards ICT-pedagogy integration. The study also revealed that the teachers' positive attitudes were important factors for practicing ICT-pedagogy in teaching BGS. Moreover, the teachers who possessed positive attitudes practiced more ICT-pedagogy in classroom activities. Therefore, teachers should develop their professionalism through acquiring skill and experience, including participation in in-service training. Additionally, many teachers urge to teachers' community for developing their attitudes towards ICT-pedagogy integration (T-37, 38, 117, 173, 247, 333, & 376). They were also required to enrich themselves by using the benefits of online platforms for collecting, using, storing, and sharing their views with the teachers' community. They also required to making a team effort for ICT-pedagogy integration because a particular teacher could not transform traditional teacher-centric to student-centered learning in classroom through ICT-pedagogy integration. The process required more cooperation and collaboration of all stakeholders related to school education, especially for teachers of respective schools which might promote student-centric teaching-learning activities in BGS subjects. Therefore, this study recommended that teachers needed to develop their attitudes towards ICT-pedagogy integration. Concurrently, the government should take proper steps to upswing teachers' dignity and provide opportunities compared to other professionals.

5.4.2.2 Develop ICT Skills and Expertise

This study found that many teachers faced immense challenges regarding ICT skills and experience. However, the study reported that teachers with more confidence in ICT tools possessed significantly more positive attitudes (Semerci, & Aydin, 2018; Wario, 2014) than lesser or average-skilled teachers. Moreover, the study released high correlations between the level of confidence on ICT and teachers' ICT skills, as well as the overall attitudes and skills on MS Word & MS PowerPoint. Therefore, teachers should acquire ICT skills and experience in office and presentation software to prepare learning material for using ICT-pedagogy independently in classrooms.

They also should improve their skills in using interactive textbooks, browsing internet, and multimedia projectors with simple troubleshooting for smooth use of ICT tools in classroom. They required developing other ICT skills (Google, YouTube, mailing ability) including social media use in education to collect and share their experience (Mahmuda, 2016) in the teacher community. The ICT in Education Master Plan-2013 also emphasized developing professional ICT skills of teachers.

5.4.2.3 Prepare Your Lessons Properly

Despite having class loads, teachers needed to proper preparation for a lesson before entering into class because a lesson plan was a step-by-step guide that directed teachers to deliver lessons purposefully and meaningfully (Jammeh, Karegeya, & Ladage, 2022; Raval, 2013). The lesson plan also helped to achieve the learning outcomes, directed about required teaching strategies and made the opportunity of using ICT for formative assessment timely (Iqbal, Siddiqie, & Mazid, 2021). Furthermore, it helped to engage students in the lesson. They also should have a relevant plan on time management for maximum ICT usage in the lesson.

5.4.2.4 Develop Content Knowledge

This study found that teachers with adequate content knowledge represented themselves more confident in the ICT-pedagogy integration process. Therefore, the teachers needed to prepare for lessons properly and increased their subject knowledge. Thus, they could disseminate the content focusing on students' involvement in lessons according to the curriculum goals and the ability of students understands.

5.4.2.5 Have Pedagogical Acquaintance with Learner Involvement in Lessons

This study illustrated that teachers faced many challenges in pedagogical understanding during ICT-pedagogy integration in teaching BGS. Moreover, the use of multimedia digital content could not always ensure the students' participation in lessons if it was not properly utilized. Furthermore, the proper utilization of multimedia digital content required some other technology support, but there was a shortage of ICT material in the classrooms. On the other hand, teachers were not able to use proper teaching-learning strategies either at the right time or in the right place during the ICT-pedagogy integration process. Therefore, teachers needed to develop their pedagogical acquaintance focusing on teaching-learning methods and strategies for learner involvement in classroom activities.

5.4.2.6 Ensure Integration of ICT-pedagogy and Content Knowledge

There was a strong correlation found between ICT, pedagogy, and content knowledge with pedagogy knowledge and content knowledge separately. However, the teachers in this study had been identified with inadequate knowledge in integrating ICT knowledge, pedagogy knowledge, and content knowledge unitedly in classroom teaching-learning activities. Therefore, teachers needed to develop best practices of ICT knowledge, pedagogy knowledge, and content knowledge unitedly in classroom instruction according to the requirement of knowledge construction.

5.4.2.7 Use ICT as Formative Assessment Tools

The results of this study suggested developing teachers' ICT skills to the best practice in formative assessment because the use of ICT made formative assessment easy, enjoyable, easy record keeping, and saved time compared to traditional types of assessment. Teachers also recommended using ICT as assessment tools to know the students' progress easily and could promptly provide feedback. Therefore, teachers needed to prepare themselves to make use of ICT for lesson presentation and could take preparation of using different assessment software (PowerPoint animation, kahoot, hot potato, nearpod, schoology, etc.) to evaluate students' progress livelily.

5.4.2.8 Develop Instructional Language Skills

Most educational resource, learning material, or content were available in English, while the most teachers of Bangladesh were habituated in their mother tongue or state language, Bangla. Therefore, the teachers needed to develop their language skills, especially in English, for the resourceful use of online material for teaching BGS. They also could acquire language skills for communicating with the teacher's world as a way of professional development.

5.4.2.9 Develop Personal ICT-pedagogy Integration Plan

Based on the above discussion, this study recommended that teachers need to prepare a personal plan for the gradual development of required skills for successful ICT-pedagogy integration in the BGS classroom. Therefore, teachers should have an individual ICT-pedagogy integration plan. The plan created an opportunity to revisit their preparation which made them skilled and confident in doing their job perfectly.

The potentiality of above recommendations depended on how efficiently and rapidly the identified challenges would addressed by concerned authorities and the necessary steps were being initiated to utilize the attitudes of teachers with care. The proper actions towards recommendations would hasten the performance toward integration of ICT knowledge, pedagogy knowledge, and content knowledge into BGS classroom activities unitedly. This study might have importance to educational stakeholders who could carefully and continuously evaluate the features of potential digital learning tools before broad integration, which would stimulate positive results for ICT-pedagogy integration in teaching-learning BGS.

5.5 Suggestions for Further Research

Several recommendations for further research had been developed based on the findings of this study.

- A more extensive review process of ICT-pedagogy integration across the country required a big-scale study for exact policy formation. However, in this study, the researcher covered only secondary school BGS teachers, whereas many other subjects in schools were not considered in this study. Therefore, the ICT-pedagogy integration in BGS or comparison between two or more subjects could be done through an intensive qualitative study.
- A big-scale qualitative study might reinforce this study's findings to explore the pros and cons of the integration process. Moreover, further research might employ a mixed-method research approach in a similar field of study. Finally, after the classroom observation, teachers' in-depth interviews for an extended period of time might promote essential findings for the effective integration process of ICT-pedagogy in classroom instruction.
- In-depth interviews of field-level administrators, teacher educators, education professionals, curriculum experts, and policymakers could add essential insights into the integration process in the BGS curriculum. On the other hand, an experimental study could explore the precise interventions that might have a significant effect on ICT-pedagogy adaptation in teaching BGS. Similarly, the effectiveness of ICT-pedagogy integration in the Bangladesh school environment might be studied in the future.
- ICT-pedagogy integration in classroom instruction might impact on teachers' psychological issues such as anxiety and beliefs, which could be investigated for a reasonable extension of the challenges that they faced in school. In addition, the correlational study with teachers' readiness, ICT skills, and salary status might

have significant effects for incorporating ICT-pedagogy in BGS subjects that were overlooked in this study, could be considered a different research area.

- A further study exploring the correlation between professional training and their classroom practice following ICT-pedagogy integration in teaching BGS and the impact on students' learning could be investigated.
- ICT could have a significant effect on assessing students' progress. Therefore, the impact of ICT integration on students' achievement in BGS might be another avenue for further research.
- The implications of interactive technology, such as interactive textbook, interactive whiteboard, smartboard, could be studied for the way out of practical use in the future in terms of teaching BGS.
- Successful ICT-pedagogy integration by teachers required more support from headteachers, school administration, and executives who were responsible in this sector. Therefore, the role of the school administrator and executive of concerned authorities related to adopting or implementing the process of ICT-pedagogy that was left behind in this study, should be examined through further research.
- Further research was needed to explore more effective ways to assimilate the ICT innovation in education, especially for BGS teaching.

5.7 Conclusion

Education was a socially-oriented human knowledge that rapidly changes with ICT development. The study would expect that the proper steps towards recommendations made change rapidly ICT-pedagogy integration in the BGS classrooms. In contrast, BGS teachers needed to start ICT-pedagogy integration with passionately. It could not be predicted success in this proposed change with any certainty, although the researcher was confident that change was not something that necessarily did come easily. The researcher focused four issues in one frame with secondary school's existing status, their attitudes towards ICT-pedagogy integration, teachers' uses of ICT-pedagogy in classroom activities, and the challenges they had to meet in the integration process. The teachers were found with positive attitudes towards ICT-pedagogy integration, and gradually they were going to practice more in their regular classroom teaching-learning activities despite it was very much slow due to huge challenges. The study concluded that overall results made hope for boosting the use of ICT-pedagogy in BGS classrooms, but effective integration of ICT-pedagogy required more time, sought more attention and intensive engagement of teachers and other stakeholders. Concurrently, this study provided a better understanding of the attitudes of secondary school BGS teachers along with factors and conditions associated with the challenges in the integration process. This study might help teachers, professionals, policymakers, curriculum developers, and ultimately the students who would be directly benefitted from ICT-pedagogy integration in the curriculum.

Above all, this study had been identified a number of requirements for teachers and schools to benefit from ICT-pedagogy integration in BGS classroom. It also required support from the government to overcome the challenges. Concurrently, the policymakers and curriculum developers must realize the consequences of changes to the functions and practices of stakeholders and needed to take specific doing steps from the suggestions, which would be helpful in a successful integration process in the school curriculum.

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APPENDIX-A

ICT Integration in the Classroom of Secondary School in Bangladesh

Questionnaire for Teachers

Dear Colleague

I would like to draw your cooperation in a study entitled "ICT Integration in the Classroom of Secondary School in Bangladesh" as of my PhD research in the Institute of Education and Research (IER), University of Dhaka.

The questionnaire will take you about 25-30 minutes to complete depending on your response. I would be very grateful if you could participate in this study. As I am interested in your views in order to enhance the quality of our profession, teaching-learning activities and in the emerging needs for education in Bangladesh.

I would like to make you sure that the data will be highly confidential and use only for this study. Your name will also never be disclosed anyhow, anywhere.

Thank you very much in anticipation of your cooperation.

Yours Sincerely,

____

(Biplob Mallick)
PhD Researcher
Registration: 06
Session: 2015-2016

তথ্যসমূহ গোপনীয় এবং শুধুমাত্র গবেষণার কাজে ব্যবহার করা হবে। স্বাক্ষর করার প্রয়োজন নেই।

SECTION A: PERSONAL INFORMATION

প্রশ্নমালা পূরণের নির্দেশনা: প্রয়োজনীয় ঘরে টিক (**√**) চিহ্ন দিন।

প্রতিষ্ঠানের নাম: .... উপজেলা: ....

জেলা: .... বিভাগ: .... মোবাইল: ....

তথ্য দাতার নাম: ....

১। বয়স:

□ ২১-৩০ □ ৩১-৪০ □ ৪১-৫০ □ ৫১$^{+}$

২। পদবী:

□ সহকারী শিক্ষক □ সিনিয়র সহকারী শিক্ষক □ সহকারী প্রধান শিক্ষক □ প্রধান শিক্ষক

৩। লিঙ্গ:

□ পুরুষ □ মহিলা

৪। সর্বোচ্চ শিক্ষাগত যোগ্যতা:

□ বি এ □ বি এস এস □ বি এস সি □ এম এ □ এম এস এস

৫। সর্বোচ্চ পেশাগত যোগ্যতা:

□ বি এড □ এম এড □ অন্যান্য___________ □ বি এড ও এম এড □ নেই

৬। শিক্ষকতার অভিজ্ঞতা:

□ ১-৫ বছর □ ৬-১০ বছর □ ১১-১৫ বছর □ ১৬-২০ বছর □ ২১$^{+}$

৭। আপনার শ্রেণিতে গড়ে কতজন শিক্ষার্থী থাকে?

□ ১-৩০ □ ৩১-৪০ □ ৪১-৫০ □ ৫১-৬০ □ ৬০$^{+}$

৮। আইসিটি ব্যবহারে আপনার আত্মবিশ্বাস কেমন?

□ খুব ভালো □ ভাল □ মোটামুটি □ অল্প □ নেই

৯। আপনি পাঠদানের জন্য ইন্টারনেট ব্যবহার করেন কিনা?

□ হ্যাঁ □ না

১০। বিদ্যালয়ে আপনি আত্মবিশ্বাসের সাথে আইসিটি ব্যবহার করেন কিনা?

□ হ্যাঁ □ না

ক) হ্যাঁ হলে, পাঠদানের উদ্দেশ্যে দৈনিক কতঘন্টা ব্যবহার করেন? ......**ঘন্টা**

১১। আপনি ইতোপূর্বে প্রযুক্তি সংক্রান্ত কোন প্রশিক্ষণ কোর্সে অংশগ্রহণ করেছেন কিনা?

□ হ্যাঁ □ না

ক) হ্যাঁ হলে, প্রশিক্ষণের নাম ও সময়কাল, প্রতিষ্ঠান (একাধিক হলে সব লিখুন):

ক্রমিক	প্রশিক্ষণের নাম	ব্যাপ্তি	প্রতিষ্ঠান

খ) না হলে, প্রশিক্ষণের প্রয়োজন রয়েছে কিনা?

☐ হ্যাঁ ☐ না

১২। আপনি প্রযুক্তি ব্যবহার করে সপ্তাহে কয়টি ক্লাস নেন?

☐ কখনো না ☐ ১ টি ☐ ২ টি ☐ ৩ টি ☐ ৪ টি ☐ অন্যান্য

১৩ । আপনার বিদ্যালয়ের প্রযুক্তির বর্তমান তালিকা (প্রযোজ্য স্থানে টিক দিন ও সংখ্যা লিখুন)

ক্রমিক	বিবৃতি	হ্যাঁ (√)	না (√)	পরিমান? (সংখ্যায়)	সচল? (সংখ্যা) (√)
ক	পাঠদানের উদ্দেশ্যে শ্রেণিকক্ষে কম্পিউটার/ল্যাপটপের সংখ্যা			……টি	হ্যাঁ / না
খ	ইন্টারনেট সংযুক্ত শ্রেণিকক্ষ			……টি	হ্যাঁ / না
গ	মাল্টিমিডিয়া ক্লাসরুম/মাল্টিমিডিয়ার সংখ্যা			……টি	হ্যাঁ / না
ঘ	ভিডিও কনফারেন্স সুবিধা			……টি	হ্যাঁ / না
ঙ	স্মার্ট বোর্ড সংযুক্ত শ্রেণিকক্ষ			……টি	হ্যাঁ / না
চ	অডিও সিস্টেম সংযুক্ত শ্রেণিকক্ষ			……টি	হ্যাঁ / না
ছ	বিদ্যালয়ে স্ক্যানারের সংখ্যা			……টি	হ্যাঁ / না
জ	ডকুমেন্ট ক্যামেরার সংখ্যা			……টি	হ্যাঁ / না
ঝ	ওভারহেড প্রজেক্টরের সংখ্যা			……টি	হ্যাঁ / না
ঞ	অন্যান্য (নির্দিষ্ট করুন)……….			……টি	হ্যাঁ / না

১৪। নিম্নোক্ত প্রযুক্তি ব্যবহারের আপনার যোগ্যতা-

১= নেই; **২=** সামান্য; **৩=** মন্তব্য নেই; **৪=** ভাল; **৫=** খুব ভাল

ক্রমিক	বিবৃতি	নেই	সামান্য	মন্তব্য নেই	ভাল	খুব ভাল
ক	MS Word ব্যবহার	১	২	৩	৪	৫
খ	MS PowerPoint ব্যবহার করে প্রেজেন্টেশন তৈরি ও উপস্থাপন	১	২	৩	৪	৫
গ	মেইল ব্যবহারে দক্ষতা (e.g. Gmail, Yahoo, Hotmail)	১	২	৩	৪	৫
ঘ	ইন্টারনেট ব্যবহার করে বিষয়ভিত্তিক শিখন উপকরণ খোঁজা (ইমেজ, ভিডিও, গেম, কন্টেন্ট)	১	২	৩	৪	৫
ঙ	পাঠদানের ক্ষেত্রে YouTube শিখন উপকরণ ব্যবহার	১	২	৩	৪	৫
চ	স্মার্ট বোর্ড ব্যবহার	১	২	৩	৪	৫
ছ	Imaging device ব্যবহার (e.g. scanner, digital or video camera, document camera etc.)	১	২	৩	৪	৫
জ	পাঠদানের ক্ষেত্রে online platform (শিক্ষক বাতায়ন, মুক্তপাঠ, খান একাডেমী) ব্যবহার	১	২	৩	৪	৫
ঝ	পাঠদানের ক্ষেত্রে বিভিন্ন সোশ্যাল মিডিয়া ব্যবহার (e.g. facebook, twitter etc.)	১	২	৩	৪	৫
ঞ	আইসিটি ব্যবহার করে শিক্ষার্থীদের পাঠে অংশগ্রহণ করানো	১	২	৩	৪	৫
ট	আইসিটি ব্যবহার করে শিক্ষার্থীদের দিয়ে কোন সমস্যার সমাধান করানো	১	২	৩	৪	৫

১৫। আইসিটি ব্যবহার করে শ্রেণিকক্ষে পাঠদানের ক্ষেত্রে প্রধান চ্যালেঞ্জ কোনগুলো? (সবচেয়ে বেশি থেকে ক্রমান্বয়ে র‍্যাকিং করুন। যেমন: ১ ২ ৩...)

হ্যাঁ/না	শিক্ষকের অনাগ্রহ		হ্যাঁ/না	নতুন প্রযুক্তি ব্যবহারের ভয়	
হ্যাঁ/না	শিক্ষকের যথাযথ আইসিটি দক্ষতার অভাব		হ্যাঁ/না	কম্পিউটার/ল্যাপটপ নষ্ট থাকা	
হ্যাঁ/না	আইসিটি ব্যবহারে প্রতিষ্ঠান প্রধানের বাঁধা		হ্যাঁ/না	মাল্টিমিডিয়া প্রজেক্টর নষ্ট থাকা	
হ্যাঁ/না	পাঠদানের প্রয়োজনীয় কম্পিউটার/ল্যাপটপের অভাব		হ্যাঁ/না	আইসিটি সংক্রান্ত প্রশিক্ষণের অভাব	
হ্যাঁ/না	বিদ্যুৎ বিভ্রাট		হ্যাঁ/না	পুরস্কারের (reward) এর অভাব	
হ্যাঁ/না	ভাষাগত জটিলতা		হ্যাঁ/না	পর্যাপ্ত পরিমান কনটেন্ট এর অভাব	
হ্যাঁ/না	অতিরিক্ত ক্লাসের চাপ		হ্যাঁ/না	টেকনিক্যাল সাহায্যের অভাব	
হ্যাঁ/না	ইন্টারনেটের শ্লথ গতি/অনুপস্থিতি		হ্যাঁ/না	অন্যান্য	

SECTION B: ATTITUDES TOWARD USING ICT-PEDAGOGY IN TEACHING BGS

নির্দেশনা: প্রত্যেকটি বিবৃতির জন্য প্রযোজ্য ক্ষেত্রে (√) চিহ্ন দিন

১= সম্পূর্ণ দ্বিমত; ২= একমত নই; ৩= মন্তব্য নেই; ৪= একমত; ৫= সম্পূর্ণ একমত

ক্রমিক	ক্ষেত্র	বিবৃতি	সম্পূর্ণ দ্বিমত	একমত নই	মন্তব্য নেই	একমত	সম্পূর্ণ একমত
১	Attitude	আমি শিখন-শেখানো কার্যক্রমে আইসিটি ব্যবহার করতে আগ্রহী	১	২	৩	৪	৫
২		আমি প্রতিনিয়ত শিখন-শেখানো কার্যক্রমে আইসিটির ব্যাবহার করি	১	২	৩	৪	৫
৩		আমি বিশ্বাস করি, আইসিটি আমার দৈনন্দিন পাঠদান প্রক্রিয়ায় উন্নয়ন ঘটাতে পারে	১	২	৩	৪	৫
৪		আমি মনে করি আইসিটি প্রতিনিয়ত অনেক নতুন নতুন বিষয় শিখতে সহায়তা করে	১	২	৩	৪	৫
৫		শিখন-শেখানো কার্যক্রমে ইন্টারনেটসহ আইসিটি ব্যবহারে আমার দক্ষতার উন্নয়ন করতে চাই	১	২	৩	৪	৫
৬		সব বিদ্যালয়ের শিখন-শেখানো কার্যক্রমে আইসিটির প্রয়োগ করা সম্ভব	১	২	৩	৪	৫
৭		পাঠদান কার্যক্রমে আইসিটি ব্যবহার করার পূর্বে বিদ্যালয় সংশ্লিষ্ট সকলের সম্মিলিত প্রয়াস প্রয়োজন	১	২	৩	৪	৫
৮		শিখন-শেখানো কার্যক্রমে আইসিটি ব্যবহারের পূর্বে শিক্ষকদের প্রশিক্ষণ প্রয়োজন	১	২	৩	৪	৫
৯		পাঠদানে আইসিটি ব্যবহারের জন্য শিক্ষকদের যথেষ্ট পরিমানে পূর্ব অভিজ্ঞতা থাকা প্রয়োজন	১	২	৩	৪	৫
১০	Usefulness	আইসিটি ব্যবহার করে শিখন-শেখানো কার্যক্রমকে শিক্ষার্থী বান্ধব করে	১	২	৩	৪	৫
১১		শ্রেণি কার্যক্রমে আইসিটির ব্যবহার পাঠের বিষয়কে আকর্ষণীয় করে	১	২	৩	৪	৫
১২		শ্রেণি কার্যক্রমে আইসিটির ব্যবহার শিক্ষার্থীদের পাঠে মনোযোগ বৃদ্ধি করে	১	২	৩	৪	৫
১৩		শ্রেণি কার্যক্রমে আইসিটির ব্যবহার শিক্ষার্থীর সৃজনশীলতা বৃদ্ধি করে	১	২	৩	৪	৫
১৪		শিখন প্রতিবন্ধকতা/শিখনে বাধাঁগ্রস্থ শিশুদের জন্য আইসিটি খুবই উপকারী	১	২	৩	৪	৫
১৫		পাঠে আইসিটির ব্যবহার শিক্ষার্থীদের ঝরে পড়া রোধ করতে সাহায্য করে	১	২	৩	৪	৫
১৬		পাঠে আইসিটির ব্যবহার সরাসরি পাঠের মত তত কার্যকরী নয়	১	২	৩	৪	৫
১৭		শিখন-শেখানো কার্যক্রমে আইসিটির ব্যবহার দৈনন্দিন শ্রেণি কার্যক্রমের সাথে সাংঘর্ষিক নয়।	১	২	৩	৪	৫
১৮		ইন্টারনেটের ব্যবহার শিখন-শেখানো কার্য পরিচালনায় শিক্ষককে বৃত্তের বাইরে চিন্তা করার সুযোগ দেয়	১	২	৩	৪	৫
১৯	Ease of use	আইসিটি ব্যবহার করে ক্লাস পরিচালনা করতে গিয়ে আমি খুব কম সময়ই দ্বিধাবোধ করি	১	২	৩	৪	৫
২০		আইসিটি ব্যবহার করে শিখন-শেখানোর ক্ষেত্রে আমার খুব কম সাহায্যের প্রয়োজন হয়	১	২	৩	৪	৫
২১		শিখন-শেখানো কাজে ইন্টারনেট ব্যবহার করতে আমি স্বস্তিবোধ করি	১	২	৩	৪	৫
২২		আমার ক্লাসে শিক্ষক-শিক্ষার্থী সকলের প্রযুক্তি ব্যবহারের সুযোগ রয়েছে	১	২	৩	৪	৫
২৩		পাঠদানের সময় আইসিটির ব্যবহার প্রায়শ: হতাশাজনক হয়	১	২	৩	৪	৫
২৪		পাঠদান কার্যক্রমে আইসিটির ব্যবহারকে আমার প্রতিষ্ঠান উৎসাহিত করে	১	২	৩	৪	৫
২৫	Co mp	শিখন-শেখানো কার্যক্রমে আইসিটি ব্যবহারের জন্য প্রশাসনিক সহযোগিতার প্রয়োজন।	১	২	৩	৪	৫

২৬		আইসিটির মাধ্যমে শিখন-শেখানো কার্যক্রমে পরিচালনায় শিক্ষক-শিক্ষার্থীদের প্রয়োজনীয়তা সম্মন্ধে প্রতিষ্ঠানের সজাগ থাকা প্রয়োজন	১	২	৩	৪	৫
২৭		বাংলাদেশ ও বিশ্বপরিচয়ের শিক্ষাক্রমে ব্যবহারিক জ্ঞান ও অভিজ্ঞতার সমন্বয় থাকা প্রয়োজন	১	২	৩	৪	৫
২৮		শিক্ষার্থীদের শিখনের জন্য আইসিটি খুবই গুরুত্বপূর্ণ	১	২	৩	৪	৫
২৯		মূল্যায়নে আইসিটির ব্যবহার	১	২	৩	৪	৫
৩০		পুরুষ শিক্ষকগণের তুলনায় মহিলা শিক্ষকগণ শিখন-শেখানো কার্যক্রমে বেশি আইসিটি ব্যবহার করেন	১	২	৩	৪	৫

SECTION C: CHALLENGES TOWARD USING ICT-PEDAGOGY IN TEACHING BGS

নির্দেশনা: প্রত্যেকটি বিবৃতির জন্য প্রযোজ্য ক্ষেত্রে (√) চিহ্ন দিন

১= সম্পূর্ণ দ্বিমত; ২= একমত নই; ৩= মন্তব্য নেই; ৪= একমত; ৫= সম্পূর্ণ একমত

ক্রমিক	ক্ষেত্র	বিবৃতি	সম্পূর্ণ দ্বিমত	একমত নই	মন্তব্য নেই	একমত	সম্পূর্ণ একমত
১	Technology Support in Classroom	প্রয়োজনীয় অবকাঠামোগত ও বিদ্যুৎ এর অপ্রতুলতা রয়েছে	১	২	৩	৪	৫
২		তাৎক্ষণিক আইসিটি সংক্রান্ত সমস্যার সমাধানে সাহায্য পাওয়ার সুযোগ কম	১	২	৩	৪	৫
৩		শিক্ষকদের ব্যবহার উপযোগী প্রয়োজনীয় কম্পিউটার/ল্যাপটপ ও অন্যান্য সুযোগ সুবিধার স্বল্পতা রয়েছে। (e.g. smartboard, electricity, multimedia projector, lab facilities, internet charge/speed)	১	২	৩	৪	৫
৪		শ্রেণিকক্ষে শিক্ষার্থীদের ব্যবহার উপযোগী কম্পিউটার/ল্যাপটপের স্বল্পতা রয়েছে	১	২	৩	৪	৫
৫		বিদ্যালয়ে পাঠদানের ক্ষেত্রে ইন্টারনেট ব্যবহারের সুযোগ কম	১	২	৩	৪	৫
৬	Integration of ICT-Pedagogy	প্রয়োজনীয় আইসিটি দক্ষতার অভাব	১	২	৩	৪	৫
৭		শ্রেণিকার্যক্রম পরিচালনায় আইসিটি ও পেডাগজি (TPACK) সমন্বয়ের অভাব	১	২	৩	৪	৫
৮		শ্রেণিকার্যক্রম পরিচলনায় আইসিটি ব্যবহারের অভিজ্ঞতার অভাব	১	২	৩	৪	৫
৯		শ্রেণিকার্যক্রমে আইসিটি প্রয়োগের প্রশিক্ষণের অভাব	১	২	৩	৪	৫
১০		আইসিটি ব্যবহার করে শ্রেণি পাঠদানে সময়কে যথাযথভাবে কাজে লাগানো যায়	১	২	৩	৪	৫
১১		আইসিটি ব্যবহার করে পাঠদানের সময় শিক্ষক পুরোপুরি আইসিটির উপর নির্ভরশীল থাকেন	১	২	৩	৪	৫
১২		আইসিটি ব্যবহার করে শিক্ষার্থীদের মূল্যায়ন করা অত্যন্ত কঠিন	১	২	৩	৪	৫
১৩	Pedagogical Knowledge	আইসিটি ব্যবহারের মাধ্যমে কার্যকরী শিখন পরিবেশের সৃষ্টিতে শিখন-শেখানো পদ্ধতির সঠিক প্রয়োগ হয়	১	২	৩	৪	৫
১৪		সমগ্র পাঠে শিক্ষার্থীরা মনোযোগী থাকে	১	২	৩	৪	৫
১৫		আইসিটি ব্যবহার করে শিক্ষার্থী মূল্যায়নে শিক্ষকের দক্ষতার অভাব রয়েছে	১	২	৩	৪	৫
১৬		শ্রেণিকক্ষে শিক্ষার্থীদের সৃজনশীল চিন্তন দক্ষতা, সমস্যা সমাধানের দক্ষতা উন্নয়নের জন্য প্রদত্ত কার্যাবলী/কর্মপত্রের অভাব রয়েছে	১	২	৩	৪	৫
১৭		সুশৃঙ্খল শ্রেণিকার্যক্রম পরিচালনায় শিক্ষকের দক্ষতার অভাব রয়েছে	১	২	৩	৪	৫
১৮		শিক্ষার্থীরর শ্রেণি, বয়স ও সক্ষমতা অনুয়ায়ী শিক্ষকের বিষয়জ্ঞানের ঘাটতি রয়েছে	১	২	৩	৪	৫
১৯		আইসিটি ব্যবহার করে শিখন-শেখানো কার্যক্রমে প্রয়োজনের সময় শিক্ষার্থীদের পাঠে মনোযোগ বৃদ্ধি করার জন্য জীবন ঘনিষ্ঠ বিষয়ের অবতারণা করা হয়	১	২	৩	৪	৫

২০		আইসিটি ব্যবহার করে পাঠদানের সময় পাঠের পর্যাপ্ত/উপযুক্ত বিশ্লেষণ করা হয় না	১	২	৩	৪	৫
২১		পাঠদানের সময় আই সি টি ব্যবহার করে শিক্ষার্থীদের পাঠে সক্রিয় অংশগ্রহণ করানো কষ্টকর	১	২	৩	৪	৫
২২		আইসিটি ব্যবহার করে পাঠদানের সময় শিক্ষার্থীদের দিয়ে দলীয় কাজ করানো কস্টসাধ্য	১	২	৩	৪	৫
২৩		আইসিটি ব্যবহার করে শিখন-শেখানো কার্যক্রমের ক্ষেত্রে গতানুগতিক প্রশ্ন-উত্তরের মাধ্যমে মূল্যায়নের সুযোগ রয়েছে	১	২	৩	৪	৫
২৪	Motivation & Reward	শিখন-শেখানো কার্যক্রমে আইসিটি ব্যবহারে শিক্ষকের ব্যক্তিগত আগ্রহ রয়েছে	১	২	৩	৪	৫
২৫		শিক্ষায় আইসিটি ব্যবহারকে উৎসাহিত করার জন্য পুরষ্কারের ব্যবস্থা নেই	১	২	৩	৪	৫
২৬		আইসিটি ব্যবহারের ক্ষেত্রে প্রয়োজনীয় প্রশাসনিক সহযোগিতার অভাব	১	২	৩	৪	৫
২৭		আমার বিদ্যালয়ের শ্রেণিকার্যক্রমে আইসিটির ব্যবহার অগ্রাধিকার নয়	১	২	৩	৪	৫
২৮		শ্রেণিকার্যক্রমে আইসিটির ব্যবহার আমার অগ্রাধিকার নয়	১	২	৩	৪	৫
২৯		শ্রেণিকার্যক্রমে আইসিটির ব্যবহার শিক্ষকের পেশাগত চাপ বৃদ্ধি করে	১	২	৩	৪	৫
৩০	Unstructured Challenges	আইসিটিভিত্তিক পাঠ উপকরণ তৈরিতে পর্যাপ্ত সময়ের অভাব	১	২	৩	৪	৫
৩১		আইসিটি নির্ভর কার্যকর শিক্ষা উপকরণের অপর্যাপ্ততা	১	২	৩	৪	৫
৩২		আইসিটি ব্যবহারের ক্ষেত্রে ইংরেজি জ্ঞানের অপর্যাপ্ততা	১	২	৩	৪	৫
৩৩		বাংলাদেশ ও বিশ্বপরিচয় শিক্ষাক্রমে আইসিটি প্রয়োগের অনুপযোগী	১	২	৩	৪	৫
৩৪		Other/অন্যান্য যদি থাকে (ব্যাখ্যা দিন/please explain): -- ---					

APPENDIX-B

ICT Integration in the Classroom of Secondary School in Bangladesh

Questionnaire for Teachers

Dear Colleague

I would like to draw your cooperation in a study entitled "ICT Integration in the Classroom of Secondary School in Bangladesh" as of my PhD research in the Institute of Education and Research (IER), University of Dhaka.

The questionnaire will take you about 25-30 minutes to complete depending on your response. I would be very grateful if you could participate in this study. As I am interested in your views in order to enhance the quality of our profession, teaching-learning activities and in the emerging needs for education in Bangladesh.

I would like to make you sure that the data will be highly confidential and use only for this study. Your name will also never be disclosed anyhow, anywhere.

Thank you very much in anticipation of your cooperation.

Yours Sincerely,

____

(Biplob Mallick)
PhD Researcher
Registration: 06
Session: 2015-2016

Information on this questionnaire is confidential. Please do not sign your name

SECTION A: PERSONAL INFORMATION

Directions: Put tick mark (√) to select the appropriate answer.

Name of Institution: .... Upazila: ....

Zilla: .... Division: .... Mobile: ....

Name of the Participant: ....

1. Age:

   ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51+

2. Position:

   ☐ Assistant Teacher ☐ Senior Asst. Teacher ☐ Asst. Head Teacher ☐ Head Teacher

3. Gender:

   ☐ Male ☐ Female

4. Educational Qualification:

   ☐ BA ☐ BSS ☐ BSc ☐ MA ☐ MSc

5. Professional Qualification:

   ☐ B Ed ☐ M Ed ☐ Others……. ☐ Both B Ed & M Ed ☐ No Prof. Degree

6. Teaching experience:

   ☐ 1-5 years ☐ 6-10 years ☐ 11-15 years ☐ 16-20 years ☐ More than 21 years

7. About how many students are average in your class?

   ☐ 1-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ 60+

8. Level of confidence on ICT skill:

   ☐ Very Good ☐ Good ☐ Moderate ☐ Little ☐ None

9. Do you use internet for teaching purpose?

   ☐ Yes ☐ No

10. Do you usually use ICT with confidence?

   ☐ Yes ☐ No

   a) If yes, how many hours in a day for teaching purpose? ……**hours**

11. Have you participated previously in any ICT related course?

   ☐ Yes ☐ No

   a) If yes- write the name of training, duration and institution (if more, write all).

SL	Name of the Training	Days	Institution

   b) If no- would you to have training?

   ☐ Yes ☐ No

12. How many class do you usually conduct in a week with ICT?

☐ Never ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5^+

13. The current status of ICT equipment in your school? (Please tick and Insert number)

SL	**Statements**	**Yes (√)**	**No (√)**	**How many?**	**Active? (√)**
A	Computer/Laptop in your classroom for teaching			……pcs	Yes / No
B	Internet facilitated classroom			……pcs	Yes / No
C	Multimedia classroom in your school/having multimedia			……pcs	Yes / No
D	Opportunity of video conferencing			……pcs	Yes / No
E	Smart board connected classroom			……pcs	Yes / No
F	Audio system connected classroom			……pcs	Yes / No
G	Number of scanner			……pcs	Yes / No
H	Number of document cameras			……pcs	Yes / No
I	Number of OHP				
J	Others (please specify)……….			……pcs	Yes / No

14. How competent in using the following technologies?

☐ No Experience ☐ Very little Experience ☐ Undecided ☐ Somewhat ☐ A lot of Experience

SL	Statement	No Exp.	Very little	Undecided	Some Exp.	A lot of Exp.
A	MS word	1	2	3	4	5
B	Design presentation by MS PowerPoint	1	2	3	4	5
C	E-mail programs (i.e., Gmail, Yahoo, Hotmail)	1	2	3	4	5
D	Google service for collecting subject-based teaching materials (i.e., image, video, game, content) using internet	1	2	3	4	5
E	Use of YouTube material for contextual content design	1	2	3	4	5
F	Use smart board	1	2	3	4	5
G	Use of imaging devices (i.e., using scanner, digital or video camera, document camera)	1	2	3	4	5
H	Use Teachers Portal, Muktopaath, Khan Academy for your professional development	1	2	3	4	5

I	Use Social Media in education like Facebook, twitter, etc. for teaching purpose	1	2	3	4	5
J	Select and design technology related activities that can involve students in lesson	1	2	3	4	5
K	Design lessons that require students to use technology to gather information to solve a problem?	1	2	3	4	5

15. What are the biggest challenge do you feel during teaching with ICT (give tick √ on Y/N)? (Rank from the biggest to smallest).

Y/N	Teachers Unwillingness	Y/N	Fear about Using New Technology
Y/N	Teachers' Lack of ICT Skill	Y/N	Spoiled Laptop or Computer
Y/N	Hindrance from Institutional Head for ICT Use	Y/N	Spoiled Multimedia
Y/N	Inadequacy of Laptop or Computer in Classroom Teaching	Y/N	Lack of Training on ICT Use
Y/N	Electricity Failure	Y/N	Lack of Reward
Y/N	Language Problem	Y/N	Inadequate Content
Y/N	More Class Load	Y/N	Lack of Technical Help
Y/N	Low Internet Speed or No Internet	Y/N	Others --

SECTION B: ATTITUDE TOWARD INTEGRATION OF ICT-PEDAGOGY IN TEACHING BGS (TA_ICTPI)

Directions: For each statement, please put tick **(√)** in the box that best fits your assessment by using this scale

1= Strongly Disagree 2= Disagree 3= Undecided 4= Agree 5= Strongly Agree

SL	Areas	Statements	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	Attitude	I am encouraged myself to make use of ICT in teaching	1	2	3	4	5
2		I regularly use ICT in teaching	1	2	3	4	5
3		I believe that ICT can really improve my teaching practice	1	2	3	4	5
4		I know that ICT can help me to learn many new things	1	2	3	4	5
5		I want to improve my skills in using ICT including the internet	1	2	3	4	5
6		ICT integration in teaching-learning can be utilized in any school	1	2	3	4	5
7		ICT integration in teaching needs team effort before implementation	1	2	3	4	5
8		Teachers need training before ICT integration in classroom	1	2	3	4	5
9		ICT integration in teaching requires a high level of experience	1	2	3	4	5
10	Perceived Usefulness	ICT can change classroom from teacher to student-centered	1	2	3	4	5
11		ICT makes the subject more interesting	1	2	3	4	5
12		Use of ICT motivate students to the lesson	1	2	3	4	5
13		Use of ICT in teaching increases the level of creativity	1	2	3	4	5
14		Students with learning difficulties can strongly benefit from ICT use	1	2	3	4	5
15		Use of ICT in teaching-learning reduce students' dropout rate	1	2	3	4	5
16		ICT is not as effective as face-to-face classroom teaching	1	2	3	4	5
17		ICT in teaching-learning does not conflict to the regular teaching	1	2	3	4	5
18		Use of internet gives opportunity to extend the boundaries in teaching	1	2	3	4	5
19	d Ea se	I seldom become confused when I integrate ICT in classroom	1	2	3	4	5

20		I seldom need help when using ICT in teaching-learning	1	2	3	4	5
21		I feel comfortable using the internet for instructional purpose	1	2	3	4	5
22		In my class, ICT is accessible for teacher and students	1	2	3	4	5
23		Interacting with ICT is often frustrating	1	2	3	4	5
24		Institution encourages faculties for using ICT in teaching	1	2	3	4	5
25	Affective components	Use of ICT in teaching requires high administrative support	1	2	3	4	5
26		Institution should be concerned about needs of faculties and students	1	2	3	4	5
27		Practical experience should be integrated in BGS curriculum	1	2	3	4	5
28		Importance of ICT for students learning	1	2	3	4	5
29		Use of ICT for students' assessment	1	2	3	4	5
30		Female teachers like more use of ICT in teaching than male teachers	1	2	3	4	5

SECTION C: CHALLENGES TOWARD INTEGRATION OF ICT-PEDAGOGY IN TEACHING BGS (TC_ICTPI)

Directions: For each statement, please put tick **(√)** in the box that best fits your assessment by using this scale

1= Strongly Disagree 2= Disagree 3= Undecided 4= Agree 5= Strongly Agree

SL	Areas	Statements	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	Technology Support in Classroom	Lack of infrastructure with insufficient power supply	1	2	3	4	5
2		Lack of immediate help for instant ICT problem	1	2	3	4	5
3		Shortage or limited access of computers or laptops in classroom use for teachers (i.e., smart board, electricity, multimedia projector, lab facilities, internet charge/speed)	1	2	3	4	5
4		Inadequacy of computers or laptop in classrooms	1	2	3	4	5
5		Lack of internet facilities in school for teaching	1	2	3	4	5
6	Integration of ICT-Pedagogy	Lack of relevant ICT skill	1	2	3	4	5
7		Inadequate knowledge on integrating TPACK in classroom teaching-learning activities	1	2	3	4	5
8		Lack of experience in using ICT in teaching	1	2	3	4	5
9		Lack of training for integrating ICT in teaching	1	2	3	4	5
10		Utilize time properly in class by using ICT	1	2	3	4	5
11		Completely dependence on ICT during teaching	1	2	3	4	5
12		Difficulties to assess students by using ICT	1	2	3	4	5
13	Teachers' Pedagogical Knowledge	Creating interactive learning environment by using appropriate teaching methods in lesson	1	2	3	4	5
14		Learners remain fully engage throughout the lesson	1	2	3	4	5
15		Lack of ability for evaluating students' activities by using ICT	1	2	3	4	5
16		Lack of work sheet for creative thinking skill, problem solving skill of learners	1	2	3	4	5
17		Lack of teachers' ability in disciplined classroom activities	1	2	3	4	5
18		Lack of subject knowledge of teachers in context of learners' class, age and ability	1	2	3	4	5
19		Enhancing attention by real life example while requires by using ICT	1	2	3	4	5

20		Inadequacy of analysis about lessons by using ICT	1	2	3	4	5
21		Difficulties in participating of learners in ICT oriented classroom activities	1	2	3	4	5
22		Difficulties involving learners in group work in ICT oriented classroom	1	2	3	4	5
23		Opportunity of traditional question-answering in ICT oriented classroom	1	2	3	4	5
24	Motivation & Reward	Having self-interest of teachers in ICT usage in teaching	1	2	3	4	5
25		Absence of reward for encouraging ICT usage in teaching	1	2	3	4	5
26		Lack of necessary administrative support for using ICT	1	2	3	4	5
27		Using ICT is not my school's priority	1	2	3	4	5
28		Using ICT is not my priority	1	2	3	4	5
29		Using ICT in education increases of teaching load for teachers	1	2	3	4	5
30	Unstructured Challenges	Inadequate time to prepare materials based on ICT	1	2	3	4	5
31		Inadequacy of effective learning materials	1	2	3	4	5
32		Lack of knowledge of English language in using ICT	1	2	3	4	5
33		BGS curriculum is not appropriate to integrate ICT	1	2	3	4	5
34		Other (please explain): -- --					

APPENDIX-C

ICT Integration in the Classroom of Secondary School in Bangladesh

Classroom Observation Checklist

Institution Name: ………………………………………………. Address: .………………………
……………………. Teaching Subject: ……………………... Class Duration: …………

SL	Steps	Statements	Yes	No	Minimum	Poor	Moderate	Good	Very Good
1	Lesson Preparation	ICT resources has been prepared and ready before lesson in schools.			1	2	3	4	5
2		Teacher sets realistic learning outcomes.			1	2	3	4	5
3	Content Knowledge	Level of content knowledge according to learning outcomes.			1	2	3	4	5
4		Relevant analysis is aimed to learning objectives.			1	2	3	4	5
5		Explanation is enough according to content area.			1	2	3	4	5
6		Discussion has gone through level of students' understanding.			1	2	3	4	5
7	Pedagogical Knowledge	Students can participate in different activities following teachers' instruction.			1	2	3	4	5
8		Learners remain fully engage throughout the lesson.			1	2	3	4	5
9		Interactive learning environment between teacher and students.			1	2	3	4	5
10		Teacher is flexible enough to allow for individual differences in learning (gender, language, cultural, social backgrounds etc.).			1	2	3	4	5
11	Integration of ICT-Pedagogy and Content Knowledge	Technology has been designed creative and innovative learning opportunities for students.			1	2	3	4	5
12		Technology makes opportunity to express opinion and engage in discussion.			1	2	3	4	5
13		Employed instructional strategies, media and materials foster critical thinking and problem solving ability of learners			1	2	3	4	5
14		Use of ICT encourages students to learn the lesson.			1	2	3	4	5
15		Use of ICT helps students to clear the lesson.			1	2	3	4	5
16		Teacher extends the boundaries about use of ICT in the wider world (wider context/perspective)			1	2	3	4	5

17		Teacher effectively manages time to provide maximum access/use to ICT resources.			1	2	3	4	5
18		Teacher's role during session (teaching/learning activities using technology) is confident and spontaneous.			1	2	3	4	5
19		Teacher use the technology pedagogically sound with purposeful and meaningful			1	2	3	4	5
20		Teacher use the technology pedagogically sound consistent with the age and ability of the pupils.			1	2	3	4	5
21		Level of ICT-Pedagogy integration in content as a whole.			1	2	3	4	5
22	Assessment and others	Teacher assessed students' progress during lesson by ICT			1	2	3	4	5
23		Teacher assessed students' progress during lesson traditionally			1	2	3	4	5
24		Achieve todays learning outcomes.			1	2	3	4	5
25		A good pace maintained throughout the lesson.			1	2	3	4	5
26		Interruptions of ICT resources during class time (technology disturb, electricity failed, technological help)			1	2	3	4	5
27		Other notes:			1	2	3	4	5

APPENDIX-D

SEMI-STRUCTURED REFLECTIVE SURVEY FOR OBSERVED TEACHER

Directions: For each statement, please put tick (√) in the box.
You can Choice **Multiple Answer.**

Institution Name: …………………………………… Address: ………………… ……………………… Teaching Subjects: ……………… Class Duration: …………..

---

1. How do you plan a lesson to integrate technology?
   - ☐ Use multimedia presentations
   - ☐ Use YouTube material
   - ☐ Use google resource
   - ☐ Use google classroom
   - ☐ Use whiteboard
   - ☐ Use interactive textbook
   - ☐ Insert relevant image & video in lesson
   - ☐ Use assessment tool like kahoot, hot potato
   - ☐ Encourage students to play educational games
   - ☐ Others ....

2. What advantages did you see integrating technology in your classroom today?
   - ☐ Improve engagement
   - ☐ Improve knowledge retention
   - ☐ Encourage individual learning
   - ☐ Encourage collaboration effectively
   - ☐ Improve teaching
   - ☐ Clear the lesson
   - ☐ Improve creative and innovative learning opportunities
   - ☐ Differentiate for needs of students
   - ☐ Provide an equal voice for students
   - ☐ Can identify students' progress
   - ☐ Extend the boundaries from classroom environment to wider world
   - ☐ Others ....

3. What disadvantages did you see integrating technology in your classroom today?
   - ☐ Expensive
   - ☐ Time consuming
   - ☐ Access to inappropriate content
   - ☐ Incomplete lesson in due time
   - ☐ May be misguided by the wrong information
   - ☐ Make learners disconnected from the real world

- May be affected by cyberbullying trap
- Creating enough room for cheating
- Transforming learners into inefficient learners
- Opportunity of copying assignments/project work/presentation
- Others ....

4. What were the biggest challenges to integrate technology in today's class or in preparation of class?
   - Electricity interruption
   - Language barriers
   - Poor internet bandwidth
   - Personal knowledge and expertise on ICT
   - Multimedia projector does not properly work
   - Laptop/computer does not work properly
   - Lack of technical help
   - Others ....

5. How was your lesson affected when technology fails?
   - Cutting off learning time
   - Incomplete lesson
   - Students lose their attention
   - Unable to manage noisy classroom
   - Unsatisfied to use ICT
   - Others ....

6. How does your administration support your use of technology in the classroom?
   - Provide multimedia projector
   - Provide laptop without internet
   - Provide laptop with internet
   - Save from criticism
   - Inspire for training
   - Compliment for contribution
   - Offer reward
   - Others ....

7. To what extent do you use technology? (please tick (√) only one)
   - Never
   - 1 day in a week
   - 2 days in a week
   - 3 days in a week
   - 4+ days in a week
   - Once in a month
   - Twice in a month

8. How do you usually evaluate your students' progress in lesson unless use ICT materials?
   - ☐ Question-answer
   - ☐ Giving task in pair/group
   - ☐ Class test
   - ☐ Assignment/Home work
   - ☐ Individual Performance Observation
   - ☐ Others ....

9. What materials do you usually use unless use ICT materials?
   - ☐ Textbook
   - ☐ White/Black board
   - ☐ Printed materials except text book
   - ☐ Internet resources
   - ☐ Poster
   - ☐ Model, chart
   - ☐ Self-study
   - ☐ Others ....

10. What are some suggestions you would give to integrate technology in your school for education purpose?
    - ☐ Positive attitude to integrate technology
    - ☐ Capable to integrate technology in teaching with pedagogical knowledge
    - ☐ In-service teacher training including head teacher
    - ☐ Friendly working environment
    - ☐ Introduce technology for assessment
    - ☐ Reward for motivation
    - ☐ Technological support including support service
    - ☐ Infrastructure development
    - ☐ Need multimedia classroom monitoring
    - ☐ Need personal ICT integration plan
    - ☐ Others ....

11. How could you improve future if you get all facilities?

    …………………………………………………………………………………………

    ……..………………………………………………………………………………...

APPENDIX-E

Team of Experts for Validation of Instrument

SL	Name	Position	Institution	Specialization
1	Dr. Md. Zainal Abedin Khan	Professor	Principal, Teachers Training College	Technology and Pedagogy
2	Dr. Taposh Kumar Biswas	Professor	IER, University of Dhaka	Pedagogy and Curriculum
3	Dr. Mohammad Lutfor Rahman	Professor	ISRT, University of Dhaka	Statistician
4	Dr. Happy Kumar Das	Associate Professor	University of Rajshahi	Pedagogy and Curriculum
5	Mr. Md. Akter Hossain Kutubi	Associate Professor	Vice-Principal, Teachers Training College	Pedagogy and Statistician
6	Dr. Mohammed Rahim Uddin	Associate Professor	Teachers Training College	Technology and Pedagogy
7	Ms. Nowreen Yasmin	Assistant Professor	Noakhali Science and Technology University	Pedagogy and Evaluation

APPENDIX-F

Request Letter

APPENDIX-G

Guideline for Teachers and Research Assistants

শ্রদ্ধেয় শিক্ষকগণ

আমি বিপ্লব মল্লিক, ঢাকা বিশ্ববিদ্যালয়ের শিক্ষা ও গবেষণা ইনস্টিটিউটে অধ্যয়নরত পিএইচডি (খন্ডকালীন) গবেষক। আমার রেজিস্ট্রেশন নম্বর ০৬; শিক্ষাবর্ষ ২০১৫-২০১৬। আমার গবেষণার শিরোনাম **"ICT Integration in the Classroom of Secondary School in Bangladesh"**। উল্লিখিত বিষয়ে গবেষণা কার্য পরিচালনার জন্য আপনাদের সহযোগিতা বিশেষভাবে প্রয়োজন। তথ্য সংগ্রহের লক্ষ্যে একটি প্রশ্নমালা প্রণয়ন করা হয়েছে এবং উক্ত প্রশ্নমালা পূরণ করতে সম্ভাব্য ১৫-২০ মিনিট সময় প্রয়োজন হতে পারে। আপনাদের সকলের স্বতঃস্ফুর্ত অংশগ্রহণ আমার কাজটিকে এগিয়ে নিতে সাহায্য করবে। উল্লেখ্য যে, আপনাদের নাম কোথাও উল্লেখ করা হবে না এবং তথ্যসমূহ শুধুমাত্র গবেষণার কাজে ব্যবহার করা হবে।

খ) তথ্য সংগ্রহকারীদের জন্য নির্দেশনা:

- মার্জিত আচরণ করবেন।
- প্রতিটি বিদ্যালয়ে সরাসরি যেতে হবে।
- বিদ্যালয়ের প্রধান শিক্ষকের সাথে বা দায়িত্বপ্রাপ্ত শিক্ষকের সাথে সৌজন্য সাক্ষাৎ করবেন ও মাধ্যমিক ও উচ্চ শিক্ষা অধিদপ্তর কর্তৃক প্রদত্ত অনুমতি পত্রের অনুলিপি প্রদর্শন করবেন
- বিদ্যালয়ের প্রধান শিক্ষকের সাথে বা দায়িত্বপ্রাপ্ত শিক্ষককে তথ্য সংগ্রহের উদ্দেশ্য ব্যাখ্যা করে প্রয়োজনীয় সহযোগিতার অনুরোধ করবেন।
- সংশ্লিষ্ঠ শিক্ষককে তথ্য সংগ্রহের উদ্দেশ্য ব্যাখ্যা করবেন এবং কিছুটা সময় দিবেন।
- শিক্ষক যেন নিজের মতামত প্রদান করতে সক্ষম হন সেভাবে প্রয়োজনীয় সহযোগিতা করবেন ও ধৈর্য ধরে অপেক্ষা করবেন।
- শিক্ষকের প্রশ্নমালা পূরণ করা শেষ হলে সেটি সংগ্রহ করে সবাইকে ধন্যবাদ জানিয়ে বিদ্যালয়গৃহ ত্যাগ করবেন।

ধন্যবাদান্তে-

বিপ্লব মল্লিক
পিএইচডি গবেষক
রেজিস্ট্রেশন নম্বর ০৬
শিক্ষাবর্ষ ২০১৫-২০১৬।

Guideline for Classroom Observation

শ্রদ্ধেয় শিক্ষকগণ

আমি বিপ্লব মল্লিক, ঢাকা বিশ্ববিদ্যালয়ের শিক্ষা ও গবেষণা ইনস্টিটিউটে অধ্যয়নরত পিএইচডি (খন্ডকালীন) গবেষক। আমার রেজিস্ট্রেশন নম্বর ০৬; শিক্ষাবর্ষ ২০১৫-২০১৬। আমার গবেষণার শিরোনাম **"ICT Integration in the Classroom of Secondary School in Bangladesh"**। উল্লিখিত বিষয়ে গবেষণা কার্য পরিচালনার জন্য আপনাদের সহযোগিতা বিশেষভাবে প্রয়োজন। গবেষণার পরিকল্পনা অনুযায়ী শ্রেণিকক্ষে উপস্থিত থেকে সম্পূর্ণ শ্রেণি কার্যক্রম পর্যবেক্ষণ করার প্রয়োজন রয়েছে। আপনাদের সকলের স্বতঃস্ফুর্ত অংশগ্রহণ আমার কাজটিকে এগিয়ে নিতে সাহায্য করবে। উল্লেখ্য যে, আপনাদের নাম কোথাও উল্লেখ করা হবে না এবং তথ্যসমূহ শুধুমাত্র গবেষণার কাজে ব্যবহার করা হবে।

খ) তথ্য সংগ্রহকারীদের জন্য নির্দেশনা:

- মার্জিত আচরণ করবেন।
- প্রতিটি বিদ্যালয়ে সরাসরি যাবেন।
- বিদ্যালয়ের প্রধান শিক্ষকের সাথে বা দায়িত্বপ্রাপ্ত শিক্ষকের সাথে সৌজন্য সাক্ষাৎ করবেন ও মাধ্যমিক ও উচ্চ শিক্ষা অধিদপ্তর কর্তৃক প্রদত্ত অনুমতি পত্রের অনুলিপি প্রদর্শন করবেন।
- বিদ্যালয়ের প্রধান শিক্ষকের সাথে বা দায়িত্বপ্রাপ্ত শিক্ষককে তথ্য সংগ্রহের উদ্দেশ্য ব্যাখ্যা করে প্রয়োজনীয় সহযোগিতার অনুরোধ করবেন।
- সংশ্লিষ্ঠ শিক্ষককে তথ্য সংগ্রহের উদ্দেশ্য ব্যাখ্যা করবেন এবং কিছুটা সময় দিবেন।
- শিক্ষকের সাথে শ্রেণিকক্ষে প্রবেশ করবেন এবং শ্রেণির পেছনে সুবিধজনক অবস্থানে বসে ধৈর্য ধরে পাঠের সকল বিষয় পর্যবেক্ষণ করবেন ও শিক্ষকের সাথে শ্রেণিকক্ষ ত্যাগ করবেন।
- শ্রেণি কার্যক্রমে শিক্ষক বা শিক্ষকের সহায়তাকারীর কোন কাজে হস্তক্ষেপ করা যাবে না।
- শ্রেণিকার্যক্রম শেষ হওয়ার পর যত দ্রুত সম্ভব শ্রেণি পর্যবেক্ষণ চেকলিস্ট পূরণ করতে হবে।
- চেকলিস্ট পূরণের সময় যথাযথ মান বিচার করে প্রতিটি আইটেমকে ৫ খুব ভালো, ৪ ভালো, ৩ মোটামুটি, ২ কম এবং ১ সামান্য হিসাব ধরে পূরণ করবেন। একই আইটেমে একাধিক টিক দেওয়া যাবে না।
- কাজ শেষে সবাইকে ধন্যবাদ জানিয়ে বিদ্যালয়গৃহ ত্যাগ করবেন।

ধন্যবাদান্তে-

বিপ্লব মল্লিক
পিএইচডি গবেষক
রেজিস্ট্রেশন নম্বর ০৬
শিক্ষাবর্ষ ২০১৫-২০১৬।

Guideline for Semi-structured Reflective Survey

শ্রদ্ধেয় শিক্ষকগণ

আমি বিপ্লব মল্লিক, ঢাকা বিশ্ববিদ্যালয়ের শিক্ষা ও গবেষণা ইনস্টিটিউটে অধ্যয়নরত পিএইচডি (খন্ডকালীন) গবেষক। আমার রেজিস্ট্রেশন নম্বর ০৬; শিক্ষাবর্ষ ২০১৫-২০১৬। আমার গবেষণার শিরোনাম **"ICT Integration in the Classroom of Secondary School in Bangladesh"**। উল্লিখিত বিষয়ে গবেষণা কার্য পরিচালনার জন্য আপনাদের সহযোগিতা বিশেষভাবে প্রয়োজন। গবেষণার পরিকল্পনা অনুযায়ী শ্রেণিকক্ষে উপস্থিত থেকে সম্পূর্ণ শ্রেণি কার্যক্রম পর্যবেক্ষণ করা ও শ্রেণি কার্যক্রমের অভিজ্ঞতা নিয়ে প্রশ্নামালাভিত্তিক জরিপ কার্য পরিচালনা করা প্রয়োজন রয়েছে। আপনাদের সকলের স্বতঃস্ফুর্ত অংশগ্রহণ আমার কাজটিকে এগিয়ে নিতে সাহায্য করবে। উল্লেখ্য যে, আপনাদের নাম কোথাও উল্লেখ করা হবে না এবং তথ্যসমূহ শুধুমাত্র গবেষণার কাজে ব্যবহার করা হবে।

খ) তথ্য সংগ্রহকারীদের জন্য নির্দেশনা:

- মার্জিত আচরণ করবেন।
- প্রতিটি বিদ্যালয়ে সরাসরি যাবেন।
- বিদ্যালয়ের প্রধান শিক্ষকের সাথে বা দায়িত্বপ্রাপ্ত শিক্ষকের সাথে সৌজন্য সাক্ষাৎ করবেন ও মাধ্যমিক ও উচ্চ শিক্ষা অধিদপ্তর কর্তৃক প্রদত্ত অনুমতি পত্রের অনুলিপি প্রদর্শন করবেন।
- বিদ্যালয়ের প্রধান শিক্ষকের সাথে বা দায়িত্বপ্রাপ্ত শিক্ষককে তথ্য সংগ্রহের উদ্দেশ্য ব্যাখ্যা করে প্রয়োজনীয় সহযোগিতার অনুরোধ করবেন।
- সংশ্লিষ্ঠ শিক্ষককে তথ্য সংগ্রহের উদ্দেশ্য ব্যাখ্যা করবেন এবং কিছুটা সময় দিবেন।
- শিক্ষকের সাথে শ্রেণিকক্ষে প্রবেশ করবেন এবং শ্রেণির পেছনে সুবিধজনক অবস্থানে বসে ধৈর্য ধরে পাঠের সকল বিষয় পর্যবেক্ষণ করবেন ও শিক্ষকের সাথে শ্রেণিকক্ষ ত্যাগ করবেন।
- শ্রেণিকার্যক্রম শেষ হওয়ার পর যত দ্রুত সম্ভব শিক্ষকের জন্য নির্ধারিত প্রশ্নমালা দিয়ে তাঁকে পর্যাপ্ত সময় দিবেন।
- কোন সহযোগিতা লাগলে শিক্ষককে জিজ্ঞাসা করতে বলুন ও সহযোগিতা করুন।
- শিক্ষককে বলুন একই আইটেমে একাধিক টিক দেওয়া যাবে।
- কাজ শেষে সবাইকে ধন্যবাদ জানিয়ে বিদ্যালয়গৃহ ত্যাগ করুন।

ধন্যবাদান্তে-

বিপ্লব মল্লিক
পিএইচডি গবেষক
রেজিস্ট্রেশন নম্বর ০৬
শিক্ষাবর্ষ ২০১৫-২০১৬।

APPENDIX-H

Teachers' Serial Number

T-01	T-41	T-81	T-121	T-161	T-201	T-241	T-281	T-321	T-361
T-02	T-42	T-82	T-122	T-162	T-202	T-242	T-282	T-322	T-362
T-03	T-43	T-83	T-123	T-163	T-203	T-243	T-283	T-323	T-363
T-04	T-44	T-84	T-124	T-164	T-204	T-244	T-284	T-324	T-364
T-05	T-45	T-85	T-125	T-165	T-205	T-245	T-285	T-325	T-365
T-06	T-46	T-86	T-126	T-166	T-206	T-246	T-286	T-326	T-366
T-07	T-47	T-87	T-127	T-167	T-207	T-247	T-287	T-327	T-367
T-08	T-48	T-88	T-128	T-168	T-208	T-248	T-288	T-328	T-368
T-09	T-49	T-89	T-129	T-169	T-209	T-249	T-289	T-329	T-369
T-10	T-50	T-90	T-130	T-170	T-210	T-250	T-290	T-330	T-370
T-11	T-51	T-91	T-131	T-171	T-211	T-251	T-291	T-331	T-371
T-12	T-52	T-92	T-132	T-172	T-212	T-252	T-292	T-332	T-372
T-13	T-53	T-93	T-133	T-173	T-213	T-253	T-293	T-333	T-373
T-14	T-54	T-94	T-134	T-174	T-214	T-254	T-294	T-334	T-374
T-15	T-55	T-95	T-135	T-175	T-215	T-255	T-295	T-335	T-375
T-16	T-56	T-96	T-136	T-176	T-216	T-256	T-296	T-336	T-376
T-17	T-57	T-97	T-137	T-177	T-217	T-257	T-297	T-337	T-377
T-18	T-58	T-98	T-138	T-178	T-218	T-258	T-298	T-338	T-378
T-19	T-59	T-99	T-139	T-179	T-219	T-259	T-299	T-339	T-379
T-20	T-60	T-100	T-140	T-180	T-220	T-260	T-300	T-340	T-380
T-21	T-61	T-101	T-141	T-181	T-221	T-261	T-301	T-341	T-381
T-22	T-62	T-102	T-142	T-182	T-222	T-262	T-302	T-342	T-382
T-23	T-63	T-103	T-143	T-183	T-223	T-263	T-303	T-343	T-383
T-24	T-64	T-104	T-144	T-184	T-224	T-264	T-304	T-344	T-384
T-25	T-65	T-105	T-145	T-185	T-225	T-265	T-305	T-345	T-385
T-26	T-66	T-106	T-146	T-186	T-226	T-266	T-306	T-346	T-386
T-27	T-67	T-107	T-147	T-187	T-227	T-267	T-307	T-347	T-387
T-28	T-68	T-108	T-148	T-188	T-228	T-268	T-308	T-348	T-388
T-29	T-69	T-109	T-149	T-189	T-229	T-269	T-309	T-349	T-389
T-30	T-70	T-110	T-150	T-190	T-230	T-270	T-310	T-350	T-390
T-31	T-71	T-111	T-151	T-191	T-231	T-271	T-311	T-351	T-391
T-32	T-72	T-112	T-152	T-192	T-232	T-272	T-312	T-352	
T-33	T-73	T-113	T-153	T-193	T-233	T-273	T-313	T-353	
T-34	T-74	T-114	T-154	T-194	T-234	T-274	T-314	T-354	
T-35	T-75	T-115	T-155	T-195	T-235	T-275	T-315	T-355	
T-36	T-76	T-116	T-156	T-196	T-236	T-276	T-316	T-356	
T-37	T-77	T-117	T-157	T-197	T-237	T-277	T-317	T-357	
T-38	T-78	T-118	T-158	T-198	T-238	T-278	T-318	T-358	
T-39	T-79	T-119	T-159	T-199	T-239	T-279	T-319	T-359	
T-40	T-80	T-120	T-160	T-200	T-240	T-280	T-320	T-360	

APPENDIX-I
Classroom Observation Serial Number

COB-1	COB-17
COB-2	COB-18
COB-3	COB-19
COB-4	COB-20
COB-5	COB-21
COB-6	COB-22
COB-7	COB-23
COB-8	COB-24
COB-9	COB-25
COB-10	COB-26
COB-11	COB-27
COB-12	COB-28
COB-13	COB-29
COB-14	COB-30
COB-15	COB-31
COB-16	COB-32

APPENDIX-J
Class Size

SL	Students	n	Percent
1	60+	180	47
2	51-60	81	21
3	41-50	70	18
4	31-40	40	10
5	1-30	17	4
6	Total	388	100

APPENDIX-K

Age, Experience and Teaching Position of Teachers

SL	Categories		Sample n	Sample %
1	Participants' Age	21-30	53	13.6
		31-40	207	52.9
		41-50	113	28.9
		51+	18	4.6
2	Years of Experience	1-5 years	134	34.3
		6-10 Years	108	27.6
		11-15 Years	69	17.6
		16-20 Years	51	13.0
		21+ years	29	7.4
3	Teaching Position	Assistant Teacher	296	75.7
		Senior Assistant Teacher	86	22.0
		Assistant Head Teacher	8	2.0
		Others	1	.3
Total (N for each category)			391	100

APPENDIX-L

Internet Facilitated Classroom, Internet Use, Teachers' Training

Level of Confidence on Taken Class with ICT

SL	Categories		Sample n	Sample %
1	Number of internet facilitated classrooms	Yes	188	48.1
		No	203	51.9
2	Interest of using internet for teaching purpose	Yes	309	79.8
		No	78	20.2
3	In-service Training	Yes	305	78
		No	86	22
		No	203	51.9
4	Level of Confidence on ICT skill	No Skill	1	.3
		Poor	33	8.4
		Average	131	33.5
		Good	178	45.5
		Very Good	48	12.3
5	Conducted class in a week by technology	Never	121	30.9
		1-5	109	27.9
		6-10	105	26.9
		$11\text{-}15^{+}$	56	14.3
5	Total (N for each category)		391	100

APPENDIX-M

Teachers' Academic and Professional Qualifications

SL	Categories		Sample	
			n	%
1	Academic Qualification	BA	47	12.0
		BSS	95	24.3
		MA	89	22.8
		MSS	148	37.9
		Others	12	3.1
2	Professional Qualification	B Ed	216	55.2
		M Ed	43	11.0
		B P Ed	6	1.5
		Others	2	.5
		No Professional Degree	124	31.7
Total (N for each category)			391	100

APPENDIX-**N**

Attitudinal Views towards ICT-Pedagogy Integration

SL	Statements	N	M	SD
1	I am encouraged myself to make use of ICT in teaching	391	4.62	.58
2	I regularly use ICT in teaching		3.59	1.13
3	I believe that ICT can really improve my teaching practice		4.64	.60
4	I know that ICT can help me to learn many new things		4.71	.48
5	I want to improve my skills in using ICT including the internet		4.66	.52
6	ICT integration in teaching-learning can be utilized in any school		3.85	1.09
7	ICT integration in teaching needs team effort before implementation		4.49	.76
8	Teachers need training before ICT integration in classroom		4.73	.49
9	ICT integration in teaching requires a high level of experience		4.21	.99
Total		391	4.39	.41

APPENDIX-O

Usefulness of ICT-Pedagogy Integration

SL	Statements		N	M	SD
1	Students' centric	ICT can change classroom from teacher to student-centered	391	4.42	.74
2		ICT makes the subject more interesting		4.64	.57
3		Use of ICT motivate students to the lesson		4.62	.54
4		Use of ICT in teaching increases the level of creativity		4.53	.60
5		Students with learning difficulties can strongly benefit from ICT use		4.24	.76
6		Use of ICT in teaching-learning reduce students' dropout rate		4.23	.71
7	Teachers' centric	ICT is not as effective as face-to-face classroom teaching		1.87	.76
8		ICT in teaching-learning does not conflict to the regular teaching		4.09	.76
9		Use of internet gives opportunity to extend the boundaries in teaching		4.48	.65
Total			391	4.08	.43

APPENDIX-P

Ease of Use toward ICT-Pedagogy Integration

SL	Statements	N	M	SD
1	I seldom become confused when I integrate ICT in classroom	391	3.76	1.13
2	I seldom need help when using ICT in teaching-learning		3.73	1.16
3	I feel comfortable using the internet for instructional purpose		4.00	.96
4	In my class, ICT is accessible for teacher and students		3.11	1.38
5	Interacting with ICT is often frustrating		2.42	1.12
6	Institution encourages faculties for using ICT in teaching		4.02	1.04
		Average	3.51	.64

APPENDIX-Q

Attitudes towards Affective Components for ICT-Pedagogy Integration

SL	Statements	N	M	SD
1	Use of ICT in teaching requires high administrative support	391	4.39	.88
2	Institution should be concerned about needs of faculties and students		4.47	.72
3	Practical experience should be integrated in BGS curriculum		4.53	.68
4	Importance of ICT for students learning		4.55	.70
5	Use of ICT for students' assessment		3.60	1.11
6	Female teachers like more use of ICT in teaching than male teachers		2.37	1.21
Average			3.99	.55

APPENDIX-R

Attitude toward ICT-Pedagogy Integration by Divisions

Division	Mean	n	SD	Std. Error of Mean	Variance	Maximum	Minimum
Barisal	3.99	49	.38	.05	.14	4.72	3.15
Chattogram	4.04	49	.35	.05	.12	4.67	3.28
Dhaka	4.09	50	.39	.06	.15	4.78	3.03
Khulna	4.05	48	.41	.06	.17	4.97	2.88
Mymensing	3.99	49	.37	.05	.14	4.68	3.36
Rajshahi	3.82	48	.36	.05	.13	4.64	2.96
Rangpur	3.98	50	.37	.05	.14	4.81	2.97
Sylhet	3.98	48	.43	.06	.19	4.90	2.79
Total	3.99	391	.39	.02	.15	4.97	2.79

APPENDIX-S

Practice of ICT-pedagogy in BGS classrooms by School Categories

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.171	2	2.085	6.703	.004
Within Groups	9.022	29	.311		
Total	13.193	31			

APPENDIX-T
Attitude by School Categories

Categories of School	Mean	N	Std. Deviation
Boys	4.1073	11	.46473
Girls	4.0397	72	.37671
Co-Education	3.9761	308	.38600
Total	3.9915	391	.38686

APPENDIX-U
Practice by School Categories

Categories of School	Mean	N	Std. Deviation
Boys	3.2838	6	.52835
Girls	3.6869	10	.41216
Co-Education	2.8685	16	.63757
Total	3.2021	32	.65236

APPENDIX-V
Practice by Age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.922	3	1.974	7.603	.001
Within Groups	7.271	28	.260		
Total	13.193	31			

APPENDIX-W
Attitude against practice by Age

	Attitude			Practice		
Age Group	Mean	N	Std. Deviation	Mean	N	Std. Deviation
21-30	4.0194	53	.31552	3.0977	6	.36871
31-40	3.9695	207	.38944	2.7953	14	.60297
41-50	4.0434	113	.41369	3.6698	10	.45397
51+	3.8356	18	.33406	4.0245	2	.09771
Total	3.9915	391	.38686	3.2021	32	.65236

APPENDIX-X
Attitude by Professional Qualifications

Professional Qualification	Mean	N	Std. Deviation
B Ed	4.0051	216	.38866
M Ed	4.1092	43	.36808
Others	3.9514	2	.52051
B P Ed	3.7963	6	.29550
Having No Prof Degree	3.9369	124	.38524
Total	3.9915	391	.38686

APPENDIX-Y
Confidence and Possessed Attitude

Level of Confidence	Mean	N	Std. Deviation
No Skill	3.9167	1	.
Poor	3.8148	33	.28203
Average	3.8735	131	.38814
Good	4.0583	178	.35626
Very Good	4.1887	48	.41902
Total	3.9915	391	.38686

APPENDIX-Z
Challenges according to mean by Teachers' Age

Age Group	N	Mean	Std. Deviation
21-30	53	3.4027	.55322
31-40	207	3.4349	.42668
41-50	113	3.4330	.41453
51+	18	3.3789	.44471
Total	391	3.4274	.44178

APPENDIX-Z
Challenges according to ANOVA by Teachers' Age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.090	3	.030	.153	.928
Within Groups	76.025	387	.196		
Total	76.115	390			

APPENDIX-AA
Challenges according to Mean by Professional Qualifications

Professional Degree	N	Mean	Std. Deviation
Having No Prof Degree	124	3.4243	.45987
B Ed	216	3.4396	.42779
M Ed	43	3.3928	.42158
Others	2	3.1061	.85526
B P Ed	6	3.4080	.67331
Total	391	3.4274	.44178

APPENDIX-AA
Challenges according to
ANOVA by Professional Qualifications

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.294	4	.073	.374	.827
Within Groups	75.821	386	.196		
Total	76.115	390			

APPENDIX-BB
Challenges according to Mean by Confidence on ICT Skills

	N	Mean	Std. Deviation
No Skill	1	3.1690	.
Poor	33	3.5336	.37477
Average	131	3.4433	.40181
Good	178	3.4080	.44523
Very Good	48	3.3886	.56370
Total	391	3.4274	.44178

APPENDIX-BB
Challenges according to ANOVA by Confidence on ICT Skills

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.612	4	.153	.782	.538
Within Groups	75.504	386	.196		
Total	76.115	390			

Appendix-CC
Works published from this study

1. Mallick, B., & Salam, M. A. (2021).Technology-pedagogy integration in secondary school BGS classrooms in Bangladesh. *Journal of Noakhali Science and Technology University (JNSTU), 5*(1), p13-22.

2. Mallick, B., & Salam, M. A. (2021). Teachers' Attitude toward ICT integration in classrooms of Secondary Schools in Bangladesh. *The Teacher's World*, *Journal of the Institute of Education and Research, 47*(004).