

**Feasibility of Flipped Classroom Approach at  
Bachelor in Electrical and Electronic Engineering  
Courses: Engineering Colleges Perspective of  
Bangladesh**

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# Declaration

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I declare that the work is carried out by the author alone. Whole or any part of the work has not been submitted before as a research proposal. The content of the paper is the result of work which has been carried out since the approval of this research program. All the ethics procedures and guidelines have been followed properly while preparing the research.

Signature

Date

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# Abstract

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Face-to-face class delivery blended with self-paced interactive learning via online technology has been a well-known and effective teaching and learning practice in different countries. However, due to lack in infrastructure, students from under-developed and developing countries are underprivileged from such an effective teaching and learning strategy. Recent need for delivering online education due to prolonged lockdown during Covid-19 pandemic, it became inevitable to integrate blended learning pedagogy into the learning and teaching unprecedentedly in a developing country such as Bangladesh. Furthermore, as a part of 'Bangladesh government's vision to establish the country as "Digital Bangladesh" by 2030, it is imperative to catch up with global digital technological trends in every sector including education system.

Like many other countries in the region, Blended learning is a concept in the higher education sector in Bangladesh. Therefore, it is important to understand the scope and challenges of blended learning in the higher education sector at various institutes. The specific goal of the study is to analyze the feasibility of one of the Blended Learning strategies e.g., Flipped Classroom learning approach for Undergraduate Engineering courses for the Engineering Colleges in Bangladesh. In addition, scopes, facilities, and challenges for implementing Flipped Classroom are being analyzed through this study under 04 distinct research questions.

The beneficiaries and experts within 4 Engineering Colleges are identified and considered for data collection. A multi method research involving quantitative and qualitative data has been conducted. Following the principle of purposive sampling, data were collected through Key Informant Interview (KII) with administrative heads of all the institutes, Focused Group Discussion (FGD) with 16 teachers who are subject matter experts in their teaching courses in the undergraduate program and 2 IT experts and, a survey response to semi structured questionnaires from 160 students in the program.

Data required for this research work have been collected and analysed using statistical data analysis tool SPSS. From the collected data it can be visualized that all the Engineering Colleges have technological potentials to implement the Flipped Classroom strategy. A SWAC analysis has been performed from the outcomes of the data analysis to find strengths, weaknesses, opportunities, and challenges of the flipped classroom approach in the current context. The analysis reveals that the concept is new for the teachers and students, they cannot cope with the flow spontaneously. Thus, more motivation and training sessions are necessary to make them accustomed to the process. Moreover, incompetency for using technology has also been found among the beneficiaries which could be one of the leading factors towards blended learning adaptation hesitancy.

Based on the preliminary findings from the research, it can be reiterated that despite the concept being new to Engineering Colleges, there is ample opportunities to implement the Flipped Classroom technique which would remarkably enhance teaching and learning effectiveness in these institutes. Hesitancy towards adapting new method and technology in teaching and learning context is quite common in the cultural context of Bangladesh and it can be readily overcome with appropriate training, campaign, and progressive implementation of the Flipped learning approach.

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# Chapter 1

## Introduction of the Study

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### 1.1 Introduction

The current era is one of e-learning. It has transformed the traditional method of learning with chalk and board. The field of education has undergone significant changes as a result of changing technology. Blended learning is not a new concept in the educational system. Blended learning is a method of teaching and learning that combines face-to-face classroom learning with technology-based online learning approaches. Combining the benefits of e-learning and traditional learning environments has resulted in a new learning environment known as "blended learning," which combines traditional physical classes with virtual learning elements (Finn & Bucci, 2004; Garrison & Kanuka, 2004).

In the research literature, the terms "blended learning," "hybrid learning," "technology-mediated instruction," "web-enhanced instruction," and "mixed-mode instruction" are frequently used interchangeably (Martyn & Margie, 2003). The concept of blended learning emerged in the 1960s, but it did not gain formal terminology until the late 1990s. With the spread of the internet throughout the world, blended learning has become the most popular model of learning in many developed countries. On the other hand, educationists are conducting numerous research papers in order to initiate blended learning in Asian regions. This appears to be a significant challenge because these countries have a large number of students. Furthermore, the adoption of technology in developing countries is highly commendable. They are constantly working to integrate a technologically based education system in order to keep up with developed countries. The researchers believe that the corona virus will survive in the coming years. In this case, educational institutions may be the most vulnerable. As a result, education researchers must consider this issue and attempt to develop a new model for future education. Because Bangladesh is a developing country, implementing blended learning with adequate technical support and well-designed infrastructure is difficult (Hossain, 2013).

The implementation of blended learning in TVET institutes appears difficult because they rely solely on government funding on a large scale. This research will look at the potentials of blended learning, identify the challenges, and suggest some potential solutions.

However, in comparison to other countries, blended learning is a relatively new concept in the teaching and learning arena in Bangladesh. While there is substantial evidence for the effectiveness and merit of blended learning in the education system, there is also sufficient evidence that most HEIs in Bangladesh may not fully implement blended learning. This failure can be explained in part by teachers' resistance to online teaching tools as well as a lack of awareness of new innovative teaching pedagogies. Most teachers in Bangladesh's HEIs currently have very limited opportunities to incorporate online tools into their teaching process. In most cases, teachers only post their teaching materials, such as lecture notes, and submit online grades to students.

In this paper, we will discuss the concept of blended learning, the steps to creating a blended learning program, the benefits of a blended learning environment, some challenges in implementing blended learning programs at Bangladeshi HEIs, and finally recommendations to overcome the identified challenges.

## 1.2 Statement of the problem

Blended learning refers to courses that are taught by combining two distinct paradigms: classroom-synchronous and online-asynchronous learning. Teachers in a blended learning environment integrate online work with traditional face-to-face activities in a planned, systematic way that adds value to the overall learning process. Graham (2006) defines blended learning as "an organic integration of thoughtfully selected and complementary face-to-face and online approaches and technologies." Blended learning combines physical and virtual components, and it can be viewed as a critical strategy for HEIs (Cobcroft et al., 2006). In simple terms, blended learning is a learning program that uses more than one delivery mode to optimize learning outcomes while lowering program delivery costs. Blended learning allows teachers to take advantage of the advantages of both traditional classroom instruction and online instruction.

Face-to-face interactions between teachers and students are possible in traditional classroom teaching, which aids in synchronous communication. Teachers in traditional teaching settings can provide immediate feedback to their students on any question, while students are positively influenced by their teacher's personality, behavior, and value system. Virtual classrooms, on the other hand, allow students to learn from anyone, anywhere, at any time. Students in blended learning can always meet in virtual classrooms with their co-students and teachers, regardless of geographical barriers. They can learn and share their knowledge without fear of being mocked. Furthermore, because technological advancements have transformed our world into a global village, students can communicate with experts from other parts of the world and expand their knowledge.

The experiences of blended learning pioneers show that by implementing such an innovative learning program, one can achieve radical improvements in learning effectiveness, reach, and cost. The effectiveness of blended learning in educational systems is further demonstrated by various observations that blended learning courses provide students with a wider range of affordances, enhancing the learning experience beyond either online or face-to-face modes alone. Today, blended learning is often referred to as the "new normal" in higher education, according to Norberg et al. (2011). Means et al. (2010) reported a meta-analysis of 50 studies that found students who were taught in a blended learning environment performed significantly better than those who were taught in a non-blended environment. Blended learning, which combines online and face-to-face components, gives students a one-of-a-kind experience by allowing flexibility in terms of time, place, and pace of student learning. According to Ramsden (2003), blended learning gives students more options for selecting the best learning mode for their individual needs.

By combining in-class and out-of-class teaching, blended learning maximizes educational impact for students. It enables educators to break the one-size-fits-all teaching model by expanding education beyond the physical classroom setting and allowing students to learn at any time and from any location. Teachers deliver lectures in a traditional classroom setting, and students are passive recipients. A blended learning program, on the other hand, reimagines the roles of a teacher and a student.

## **1.3 Conceptual Framework**

Technology integration in the classroom is now required. Students today are being raised with internet and communication technology. It is necessary to improve the use of technology in the classroom in order to get them interested in the internet. Feng Su and Namrata Rao (2020) conducted a blended learning study and concluded that blended online pedagogy will combine face-to-face synchronous learning (such as Zoom, Google Classroom, Flipped Classroom, etc.) with asynchronous learning to provide opportunities for cognitive participation, allowing students to process and reflect on their learning. They recommend some key factors to consider when designing a successful blended learning environment. They discuss the formation of a learning community and the assignment of students to mixed ability groups to work on online tasks that may encourage peer learning. Academics must be present in students' learning journeys. Teachers may be able to appear and perform their duties virtually via Zoom or in person. A weekly structure would be beneficial to the success of blended learning classroom activities.

Faieza (2020) attempts to argue in her paper that virtual classrooms can also be used to administer online quizzes, short exams, and other types of assessments. Academic institutions in Bangladesh can organize awareness programs, seminars, and discussion forums on the concept of blended learning to instill the necessary mindset for its successful implementation.

Hani (2018) investigated blended learning. She suggests that both teachers and students broaden their acceptance of new dimensions of teaching and learning. Because two-way learning is more effective, it must be monitored so that students do not risk it. Students may be able to strike a balance between their academic and professional careers. Finally, she recommends that the university administration manage proper infrastructure and a training program on blended learning, if possible, to ensure a better outcome.

Belal (2013) conducted research to identify various types of disadvantages of blended learning. Lack of technical knowledge, political instability, insufficient funding, insufficient power supply, and poor infrastructure have all been identified as barriers to the implementation of blended learning in Bangladesh. He contends that high-quality support for blended learning is required at all levels, including organizational infrastructure, course and faculty development, and consistent student learning support mechanisms.

### **1.3.1 Flipped Classroom Approach**

A flipped classroom is a type of blended learning strategy that aims to increase student engagement and learning by having students' complete readings at home and work on live problem-solving during class time. This pedagogical style incorporates activities, including those that were previously considered homework, into the classroom. In a flipped classroom, students watch online lectures, participate in online discussions, or conduct research at home while actively engaging concepts in the classroom under the supervision of a mentor.

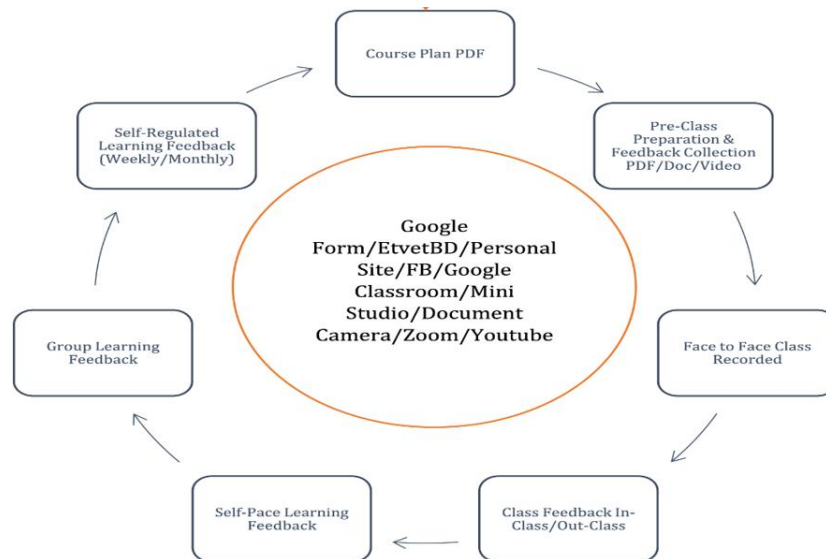
The teacher is typically the leader of a lesson, the focus of attention, and the primary disseminator of information during the class period in traditional classroom instruction. Students defer to the teacher for guidance and feedback while the teacher responds to questions. Many traditional instructional models rely on lecture-style presentations of individual lessons, restricting student engagement to activities in which students work independently or in small groups on application tasks devised by the teacher. The teacher usually takes the lead in class discussions, directing the flow of the conversation. This teaching style typically includes

assigning students at-home tasks such as reading from textbooks or practicing concepts by working on problem sets, for example.

The flipped classroom intentionally shifts instruction to a learner-centered model, in which students are frequently introduced to new topics outside of school, freeing up classroom time for more in-depth exploration of topics, creating meaningful learning opportunities. 'Content delivery' in a flipped classroom can take many forms, including video lessons prepared by the teacher or third parties, but it can also include online collaborative discussions, digital research, and text readings. The most widely reported study of optimum video length found video segments of 6 min or less had the most positive outcomes (Slemmons K E H et. al. (2018)).

In-class activities are also reimagined in flipped classrooms. To engage students in the content, in-class lessons accompanying flipped classroom may include activity learning or more traditional homework problems, among other practices. Class activities may include: using math manipulative and emerging mathematical technologies, conducting in-depth laboratory experiments, analyzing original documents, presenting a debate or speech, discussing current events, peer reviewing, project-based learning, and skill development or concept practice. Because these types of active learning enable highly differentiated instruction, more time in class can be spent on higher-order thinking skills such as problem-finding, collaboration, design, and problem solving as students tackle difficult problems, work in groups, research, and construct knowledge with the assistance of their teacher and peers.

In a flipped classroom, a teacher's interaction with students can be more personalized and less didactic, and students are actively involved in knowledge acquisition and construction as they participate in and evaluate their learning. The conceptual framework of the flipped classroom approach is depicted in Fig. 1.1.



**Fig. 1.1: Conceptual Framework of Flipped-Classroom Learning Model**

In a flipped classroom, however, some of the lectures can be delivered by the instructors via an online platform, allowing students to spend the majority of their class time brainstorming, doing group activities such as group projects, or conducting experiments, which will eventually help them learn how to practically apply their book knowledge in real-life scenarios. Finally, there are three steps to practically implementing a flipped classroom model of blended learning in TVET institutes:

- First, motivate the teachers and students to change their views into positive sense.
- Second, set the cost-effective online educational learning management systems properly.
- Third, accustomed teachers and students for using online educational LM systems and transform the classroom from a “traditional” one to a “flipped” one.

## **1.4 Rationale and Audiences of the Study**

### **1.4.1 Improved learning outcomes**

Teachers serve as gatekeepers to learning opportunities. Through the selection and design of learning delivery modes, teachers can influence the nature and quality of student learning. What students learn is a byproduct of the experience that a teacher provides through his or her teaching style. Teachers use both online tools and classroom teaching modes in blended learning. According to Garrison and Kanuka (2004), the key to a successful blended learning program is the thoughtful integration of face-to-face classroom learning with online interactive tools. Classroom lectures frequently move at a single pace, and students who are timid or shy frequently fall behind in class. This issue can be solved by incorporating more elements into the teaching and learning environment. Teachers can maximize the benefits of both traditional and online learning by incorporating online learning tools. Students benefit from online learning as well as traditional classroom lectures in a blended learning environment. As a result, blended learning improves learning outcomes by giving students more options for how they want to learn the material from their chosen courses. For some students, interactive online delivery mode is better suited to their desired learning style than traditional in-class lectures. As a result, blended learning improves student performance because it allows them to learn the required course materials in the most effective way for them.

Stanford University and the University of Tennessee conducted blended learning research, which found that blended learning outperformed both traditional methods and online learning modes when used alone. According to Professor Andaleeb, digital needs to be the new reality in Bangladesh, and by incorporating technology into education, teachers can be much more creative. He goes on to say that if teachers serve as role models for digital skills, students will learn quickly (The Daily Star, 2017).

### **1.4.2 Greater Access**

Traditional classroom instruction restricts the reach of a learning program to students who can attend the class at a specific time and location. Students who live in geographically isolated areas or who are physically unable to attend formal classes can, however, access all lectures through online portals in blended learning, where E-learning is integrated with conventional teaching. Virtual classrooms, almost all teachers agree, do not have the time and space constraints that physical classrooms do. Teachers can access their students and share materials from anywhere at any time in an online environment.

Furthermore, some teachers point out that, due to time constraints, the teacher may not be able to cover all of the materials in a formal classroom. In this regard, the online classroom can be advantageous because it allows teachers to share additional teaching notes and provide additional feedback to students' questions, which may not always be possible in a physical classroom setting due to time constraints. As a result, by incorporating blended learning into

the education system, HEIs can easily increase student enrollment regardless of geographical boundaries. According to Professor Omar Rahman, they intend to implement distance learning courses such as MOOCs (Massive Online Open Courses). He claims that because brick-and-mortar universities cannot be established everywhere, distance learning has the potential to revolutionize the country's entire educational system (The Daily Star, 2017).

### **1.4.3 Upgraded and better-quality education**

Because of the constant advancements in technological and scientific fields, it is critical to keep up with rapidly changing markets and new innovations. Teachers must ensure that the content delivered to students is revised on a regular basis and that the syllabus is kept up to date. Teachers in Bangladesh, where formal classroom teaching is more common, frequently fail to update their course syllabus. The use of blended learning at HEIs in Bangladesh will allow teachers to easily update their course content using online tools with little time and effort.

According to Islam (2019), education in Bangladesh today fails to understand the future of work, which will necessitate both radical curriculum changes and quality shifts in teaching and learning practices to be truly competitive. Individualization, personalization, and relevance in teaching are all improved by blended learning. It enables the course instructor to tailor the course content to meet the diverse needs of the students in his or her class. Students' learning experiences improve as a result of their exposure to both face-to-face classroom instruction and online learning. Although formal classroom settings add a human touch to the teaching process, online tools can assist instructors in fostering a high level of active participation and greater learning flexibility. Learning becomes more purposeful as blended learning provides students with a more dynamic learning experience and a high-quality education.

Furthermore, EEE department teachers and students in ECs are the first categorical audiences for the flipped classroom approach. Prior learners are also a special class of beneficiaries of this website, as previously stated. Finally, the general population of Bangladesh may benefit from the use of this flipped classroom approach. Finally, it can be concluded that the flipped classroom approach has the potential to play a critical role in developing Bangladesh's socioeconomic picture by fascinating the role of ECs.

## **1.5 Purpose of the Study**

The study's overarching goal is to provide insight and understanding into the elevation of the FC approach at ECs in Bangladesh in light of global trends. However, the study's specific goal is:

- *To analyze the feasibility of flipped classroom learning approach for Bachelor in Electrical & Electronics Engineering courses at ECs in Bangladesh.*

## **1.6 Research Questions of the Study**

To make the study's objective clearer, 04 study questions were created to demonstrate the feasibility of adopting the FC technique in ECs. RQs are as follows:

1. What are the scopes of using flipped classroom strategy among the teachers?
2. What are the scopes of using flipped classroom strategy among the students?



3. What types of facilities are required to introduce flipped classroom learning strategy?
4. What are the challenges of implementing the flipped-classroom learning strategy?

Following the creation of the study's RQs, a questionnaire was created based on each question's hypothesis.

## **1.7 Methodology**

This section introduces in-depth knowledge about the process so that one can clearly understand the feasibility of implementing the flipped classroom approach. As a result, the methodology of data analysis has been discussed in detail and the goal is to generate a clear picture of feasibility.

### **1.7.1 Strategy of Inquiry**

This is an exploratory study that uses both quantitative and qualitative data. It is both descriptive and empirical. The data was collected using a multi-method design based on the nature of the data sources, which means quantitative data was collected from students using a semi-structured questionnaire because students find it easy to answer concisely. On the other hand, qualitative data was collected from teachers in order to collect detailed answers about the feasibility of flipped classrooms. Similarly, KII has been designed with the principals to investigate feasibility and depend on their expertise. Finally, a focus group discussion (FGD) with IT experts was held to analyze the technical aspects. Table 1.1 is a summary of the preceding discussion.

### **1.7.2 Sample and Sampling**

Four questionnaires were used to collect data for the study. The researcher was in charge of the instruments. The first questionnaire was for a survey of ECs teachers' attitudes toward the flipped classroom approach. Out of the 16 questionnaires distributed, 16 copies were returned, resulting in a 100% return rate. The second questionnaire consisted of five parts divided into five sections.

It had a total of 28 questions. The questions were designed to determine the feasibility of flipped classroom implementation in ECs by identifying students' attitudes toward availability, scopes, and opportunities, technological and pedagogical challenges. Third, KII was conducted using 05 questionnaires to identify the scopes and opportunities, technological and pedagogical challenges, and administrative and governance challenges associated with implementing flipped classroom. Fourth, 05 focus group discussions were held to briefly discuss the flipped classroom concept, infrastructure requirements, the LM system, support services, and budgets needed to implement the flipped classroom. Because they are directly involved in the teaching of technical subjects, the respondents who filled out the questionnaire were ECs teachers, students, and principals.

**Table 1.1: Strategy of Inquiry**

RQs	Focus on Research Questions	Types of Data	Data Sources	Tools of Data	Overall Strategy of Inquiry
1	What are the scopes of using flipped classroom strategy among the teachers?	Qualitative & Quantitative	Teacher Student Principals	Structured Questionnaire & KII	Multi Method Design
2	What are the scopes of using flipped classroom strategy among the students?	Qualitative & Quantitative	Teacher Student Principals	Structured Questionnaire & KII	
3	What types of facilities are required to introduce flipped classroom learning strategy?	Qualitative & Quantitative	Teacher Student Principals IT Experts	Structured Questionnaire, KII & FGD	
4	What are the challenges of implementing the flipped-classroom learning strategy?	Qualitative & Quantitative	Teacher Student-Principals IT Experts	Structured Questionnaire, KII & FGD	

**Table 1.2: Sampling Plan**

Designation	Institute	Sample Size	Sampling type	Total Sample		
Teacher	SEC	4	Purposive sampling	16		
	MEC	4				
	FEC	4				
	BEC	4				
Students	SEC	40		Purposive sampling	160	
	MEC	40				
	FEC	40				
	BEC	40				
Principals	SEC	1			Purposive sampling	04
	MEC	1				
	FEC	1				
	BEC	1				
IT Expert	Root Soft IT	1	Purposive sampling			02
	Web Shark IT	1				

Because the aforementioned factors had to be considered in the study in order to reflect on the variability, a purposive sampling method had to be used to allow for the inclusion of data sources from all categories. It should be noted that in order to have meaningful data analysis, a minimum number of sample units from various sources were taken. Table 1.2 shows the total number of samples taken from each category. According to the sampling plan, a total of 182 samples were collected from various sources in accordance with the research questions.

It should be noted that in order to have meaningful data analysis, a minimum number of sample units from various sources were taken. Table 1.2 shows the total number of samples taken from each category.

### **1.7.3 Data Analysis Technique**

A massive data set was generated by conducting a feasibility study in ECs using a semi-structured questionnaire from 160 students, a structured questionnaire from 16 teachers, KII from four principals, and a focus group discussion with two IT experts. The information gathered here can be divided into two categories: qualitative and quantitative. SPSS has also been used in this study to analyze quantitative data. The following section contains in-depth explanations of what SPSS is and how it is used. Also, it can be noted that, after cleaning the dataset only 155 data remained. So, further research has been analyzed with 155 data instead of 160 data. Additionally, in order to emphasize on the outcome, some new issues and indicators were found during the data computation process. For resolving these issues and indicators a new set of research questionnaire has been designed and the 2<sup>nd</sup> phase data has been collected from 80 students in Sylhet Engineering College.

SPSS is an IBM statistical software suite for data management, advanced analytics, multivariate analysis, business intelligence, and criminal investigation. The software's name was changed from Statistical Package for the Social Sciences (SPSS) to Statistical Product and Service Solutions to reflect the original market. SPSS is a popular statistical analysis program in social science. Market researchers, health researchers, survey companies, government, education researchers, marketing organizations, data miners, and others use it as well.

The content analysis technique was used to analyze the qualitative data from the structured questionnaire, KII, and FGD. Each question has a detailed discussion that has been summarized. It was attempted to properly dictate the qualitative analysis in order to find the feasibility study from the gathered data. Finally, the data was presented using the SWOC analysis technique. SWOC analysis is the study of a concept's Strengths, Weaknesses, Opportunities, and Threats.

### **1.7.4 Pre-Test**

A pre-testing sampling plan was carried out prior to collecting data from participants via semi structured questionnaire, structured questionnaire, KII, and FGD in order to visualize the hypothetical acceptance of the designed sample questions. Pre-Test Sampling was done in four stages: by an English Language Expert, by teachers, by students, and by KII. SEC data samples were collected, and 1 English expert, 1 teacher, 40 students, and 1 principal took part in the procedure. The sampling plan's data summary is shown in Table 1.3

**Table 1.3: Pre-Test Sampling Plan**

Pre-Test		Institute	Sampling type	Total Sample
Pre-Test#01	Pre-test by English Language Expert	SEC	Purposive sampling	01
Pre-Test#02	Pre-test by Teachers	SEC		01
Pre-Test#03	Pre-test by Students	SEC		40
Pre-Test#04	Pre-test by KII	SEC		01

Now, individual data outputs will be discussed in the following sections.

### **1.7.5 Outcomes of Pre-Test # 01**

Pre-Test #01 was dictated by an English Language Expert, who suggested minor changes and acknowledged the overall designed sampling process. As a result, to ensure that the process was error-free, the grammatical issues and expert suggestions were implemented in order to make the questionnaire hypothetically valid.

### **1.7.6 Outcomes of Pre-Test # 02**

A structured questionnaire was created for pretesting purposes in order to evaluate the overall validity hypothetically. SEC had one teacher participate in this process, and the questionnaire data was qualitatively analyzed. Finally, the outcome demonstrated that the process followed the hypothesis.

### **1.7.7 Outcomes of Pre-Test # 03**

For pre-testing purposes, quantitative data were collected from 40 SEC students. The data were analyzed using SPSS software, and it was discovered that the collected data were perfectly in line with the planned hypothetical theory. Before processing the final outputs of collected data, a statistical analysis was performed. Finally, statistics from the collected data can be used to strongly support the hypothesis.

### **1.7.8 Outcomes of Pre-Test # 04**

One KII was obtained from the principal of SEC in order to analyze the pretest samples. The response was analyzed qualitatively, and the results met the hypothetical requirements.

Overall, all of the sampling data collected and analyzed during the pre-testing phase, such as semi-structured questionnaires, structured questionnaires, KII, and English expert opinion, have suggested that the results are feasible for implementing the strategy, and the hypothesis is proving its realistic nature through the analyzed data.

### **1.7.9 SPSS Questionnaire**

In this step, we will examine Availability/Accessibility, Perception, Scopes, Opportunities, and Challenges in order to implement the flipped classroom technique in ECs from the students'

point of view. RQs are designed in such a way that the feasibility of using a flipped classroom technique can be thoroughly investigated. As a result, the Likert-Scale method was used to analyze the data. The Likert-Scale has been thoroughly explained in the following section.

**Table 1.4: Likert Scale Questionnaire for SPSS**

Variables		Items	Agreement Scale				
			SA	A	N/A	DA	SDA
Perception	Per1	I am confident in using Internet services (including Apps mentioned above)					
	Per2	I am confident in using Internet as an aid to my study					
	Per3	I am familiarized with blended learning concept					
	Per4	I am familiarized with flipped classroom learning style					
	Per5	I am familiarized with online learning management system					
Scopes to the teachers	Sco1	Teachers can teach better when Learning resources are variety of types (e.g., video, simulation, eBooks, soft copy of lecture notes etc.) are used					
	Sco2	Teacher student engagement can be enhanced through online-based activity					
	Sco3	Online Interactive content can greatly enhance teaching capability for teachers in the technical subjects					
Opportunities	Opp1	Learning resources are better when a variety of types (e.g., video, simulation, eBooks, soft copy of lecture notes etc.) are used					
	Opp2	Classroom engagement can be enhanced through online-based activity					
	Opp3	Online Interactive content can greatly enhance my learning in the technical subjects					
	Opp4	A common learning management system can greatly aid the technical education system					
	Opp5	I will feel more engaged in learning with Flipped classroom approach					
Challenges	Cha1	Flipped classroom could require additional time and effort for my study					
	Cha2	I may have to deal with technological challenges in a flipped classroom approach					
	Cha3	I might overly focus on online technology than my study if Flipped classroom is implemented					
	Cha4	I might find difficult to adapt a new way of learning other than traditional learning method					
	Cha5	Online based learning can be a means of distraction to my usual learning style					
	Cha6	I am concerned about getting sufficient support to adapt flipped classroom approach					

The collected data will be analyzed using frequency count and percentage in accordance with the research question (Raihan, A.M. and Han, S.L. 2012). The study will attempt to quantify the value (in percentage, weighted average). In addition, we will use the 'Likert-Scale' with five categories: 5 (Strongly Agree) = SA, 4 (Agree) = A, 3 (None) = N, 2 (Disagree) = D, and 1 (Strongly Disagree) = SD. The renowned SPSS software was used to investigate the Likert-Scale. Additionally, the responses of the participants have been presented using group variables to represent the mean of the data, as shown in Table 1.4.

## **1.8 Ethical Considerations**

Throughout the Research Process, Ethical Practices Ethical practices must be followed at all stages of the research process. Following a set of static guidelines, such as those from professional associations, or conforming to guidelines from campus institutional review boards, is not enough to practice ethics. From the beginnings of a research study to its completion and distribution, ethics has become a more pervasive concept. Ethics should be a primary consideration rather than a secondary consideration, and it should be at the top of the researcher's priority list (Hesse-Bieber & Leavy, 2006). Of all the steps in the research process, it is most closely related to data collection, reporting, and report distribution than any other phase of research. Some of these issues will be addressed here.

### **1.8.1 Some Ethical Issues in Data Collection**

It is critical to respect the location where the research is taking place. This respect should be demonstrated by obtaining permission before entering a site, disturbing the site as little as possible during a study, and viewing oneself as a "guest" at the study location. Lincoln Public Schools (n.d.) in Lincoln, Nebraska, provides illustrative guidelines for conducting research while causing the least amount of disruption to a school district. Their guidelines include a number of reasons why a project might not be approved. Disapproved projects are those that require a significant amount of teacher, administrator, or office time (the district may request reimbursement for the costs of compiling information, staff time, or materials); interfere with district data collection or the work of current research projects; are scheduled for the first or last month of the school year; or are received too late in the year to be adequately reviewed. Another method for respecting the research site while causing the least amount of disruption is to gain access through gatekeepers (or officials). Researchers may need to consult with various gatekeepers at various levels within an organization. Other ethical issues arise during data collection and are linked to specific research designs. You must not deprive some participants of beneficial treatments on purpose, only publish positive results, or fail to disclose the purpose of the study to participants. It is beneficial to involve stakeholders in assessing participant risk and to avoid pressuring participants to sign consent forms.

### **1.8.2 Some Ethical Issues in Data Reporting**

We must respect the audiences who read and use research findings. Data should be reported honestly, with no changes or alterations made to satisfy certain predictions or interest groups. However, it may be appropriate for the primary investigator to provide a preliminary copy of any publications to those at the research site. Furthermore, studies completed by others should not be plagiarized, and credit for material quoted from other studies should be given. This credit entails citing the authors and the date of publication, as well as listing the publication in the

study's reference section. Furthermore, research should be devoid of jargon and understandable to those being studied. As ethical educators, we must make every effort to communicate the practical significance of our research to the community of researchers and practitioners in order to encourage and use inquiry. Educational researchers have an ethical obligation to conduct high-quality research and to report their findings in ways that communicate the fundamental assumptions they are making. This also implies that research should not go unpublished and that researchers should share their findings openly (Brown & Hedges, 2009). Even if the findings contradict accepted standards, the findings should be published and disseminated (S. Levy, personal communication, May 3, 2010).

Following the collection of data using the aforementioned methodology and tools, the final results were discussed in the following chapter.

## 1.9 Outline of the Report

The rest of this thesis is organized as follows:

- **Chapter 1: *Introduction*:** This chapter discusses the study's basic introduction. In addition, the study's goal is to provide insight and understanding on the advancement of the FC approach in Bangladesh from the standpoint of global trends. It starts with a detailed discussion of various research questions. Meanwhile, it includes the logic of the research that underpins his work.
- **Chapter 2: *Factors of Scopes using Flipped Classroom Approach among students*.** The study's findings on the factors that influence students' willingness to use a flipped classroom approach will help teachers, students, and principals understand why flipped-classroom learning should be implemented, especially in the aftermath of the Corona pandemic, and what the benefits of this educational system are. The final results from the instruments that is semi-structured questionnaire are briefly discussed in this chapter, in accordance with the conversations.
- **Chapter 3: *Factors of Scopes using Flipped Classroom Approach among teachers*.** The study's findings on the factors that influence teachers' willingness to use a flipped classroom approach will help teachers, students, and principals understand why flipped-classroom learning should be implemented, especially in the aftermath of the Corona pandemic, and what the benefits of this educational system are. The final results from the instruments that is structured questionnaire are briefly discussed in this chapter, in accordance with the conversations.
- **Chapter 4: *Factors of Facilities Required to Implement Flipped Classroom Approach*.** The goal of this chapter is to identify the necessary facilities for the implementation of the FC approach in ECs using data collected from teachers, students, principals, and IT experts in order to recognize that the implementation of the FC learning model is a demand of time, especially in the aftermath of the Corona pandemic, and what the benefits of this educational system are. The final results from the instruments are briefly discussed in this chapter, in accordance with the conversations.
- **Chapter 5: *Factors of Challenges to Implement Flipped Classroom Approach*** The goal of this chapter is to identify the challenges for the implementation of the FC approach in ECs using data collected from teachers, students and principals in order to recognize that the implementation of the FC learning model is a demand of time, especially in the aftermath

of the Corona pandemic, and what the benefits of this educational system are. The final results from the instruments are briefly discussed in this chapter, in accordance with the conversations.

- **Chapter 6:** *Major Findings of the Study.* This chapter describes the major accomplishments and also answers the research questions that were raised throughout the process.
- **Chapter 7:** *Implication and Conclusion.* This chapter summarizes the entire process study and discusses the implications for practice and future directions.



# Chapter 2

## Factors of Scopes using Flipped Classroom Approach among Students

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The study's findings on the factors that influence students' willingness to use a flipped classroom approach will help teachers, students, and principals understand why flipped-classroom learning should be implemented, especially in the aftermath of the Corona pandemic, and what the benefits of this educational system are. The final results from the instruments that is semi-structured questionnaire are briefly discussed in this chapter, in accordance with the conversations.

### Outcomes

It was originally discussed that data will be collected via a structured questionnaire for EEE students and teachers, as well as a KII for principals of the 04 ECs. Students provided quantitative data, which was examined using the 'Likert-Scale' and SPSS. Teachers' and principals' data, on the other hand, were subjected to qualitative examination. After that, the final results are analyzed and summarized to arrive at the final conclusions. The following are summaries of the conclusions based on the RQ's primary issues surrounding students:

### 2.1 Issue 01 # Accessibility

The first essential difficulty in determining the scopes of applying the FC strategy is determining the technical accessibility of EC students. Three indications have been chosen to demonstrate this. The next sections address the arguments behind these indicators and the triangulation of data received from teachers, students, and principals.

#### 2.1.1 Personal Accessibility

Most of the teachers, students and principals have good attitude regarding this indicator. From this study it is found that, *“Majority of students have the accessibility of personal Laptop/Desktop, smartphone, internet connection of moderate speed and used to with social media, Google forms, email services, YouTube, and Google”*. Fig. 2.1 has been discovered from the students' point of view, and it reveals that, 87.5 percent of students utilize personal computers or laptop PCs. A moderate-speed internet connection is also available to 81.9 percent of students.

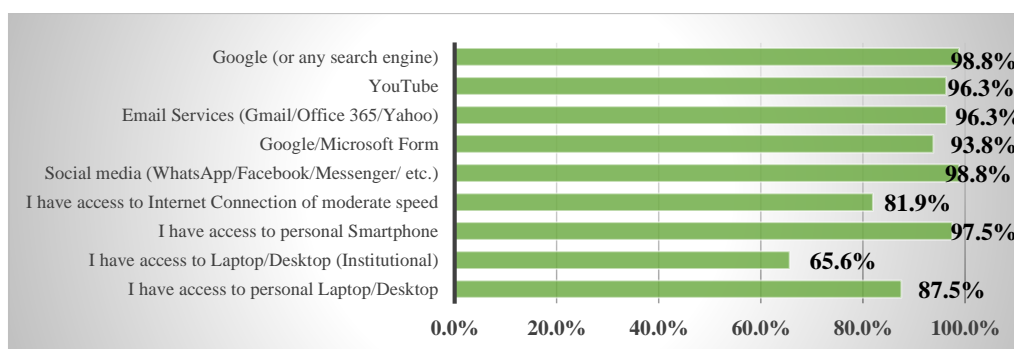


Fig. 2.1: Accessibility of technology about flipped classroom

According to Fatema et al. (2020), 94% of Bangabandhu Sheikh Mujibur Rahman Science and Technology University respondents in Gopalganj, Bangladesh, have their personal internet connectivity and utilize it on a regular basis. About are actively using the internet, while 6% are not using it at all and have no online access. However, according to Raihan (2013), just 10% of respondents used the internet in 2013. However, the current situation has drastically changed.

Now, one teacher commented on the topic of technology accessibility, "Currently Bangladesh has enough technological supports with less expenditure, which is why students have enough access to technology and which is a prerequisite to implement the flipped classroom approach." Furthermore, it has been stated via KII with principals that nearly all students have their own laptops or desktop computers, and nearly all students have smartphones with internet access. In particular, during the corona pandemic, the usage of these technologies spread rapidly.

### **2.1.2 Institutional Accessibility**

This indicator's goal is to determine technology accessibility, such as access to institutional laptops/desktops, broadband/wifi, and the LM system. According to Jannat et al. (2021), only 54% students have accessed the institutional technologies. The study found that *Students get a lot of technological access from institution though there are some limitation.*

Despite the fact that all of the ECs now have free wi-fi, only 65.6% of students have access to institutional technology, as shown in Fig. 2.1. Furthermore, structured questionnaires revealed that all teachers stated that students have access to institutional technical facilities such as desktop computers and the internet. The institution, however, does not have an LM system. Finally, while principals agreed that desktops are accessible and ECs require their own LM system to expand the scope of the FC approach's implementation.

### **2.1.3 Internet Services**

*"Students are accustomed to various internet services such as social media (WhatsApp/Facebook/Messenger/etc.), Google Forms, YouTube, and Email services".* According to Fig. 2.1, 98.8% of students are aware of online services such as social media (WhatsApp/Facebook/Messenger/etc.), Google Forms, YouTube, and email. Students are also accustomed to using numerous internet services such as social media (WhatsApp /Facebook/ Messenger/etc.), Google Forms, YouTube, and email services, according to principals. Furthermore, all teachers consider that all students have sufficient knowledge to use various online services such as Email, Facebook, and YouTube at this time. According to Fatema et al. k. (2020), 100% of Bangabandhu Sheikh Mujibur Rahman Science and Technology University respondents in Gopalganj, Bangladesh, use different internet services.

## **2.2 Issue 02 # Perception**

The second key issue is perception regarding FC approach among the students of ECs. To reveal this, two indicators has been chosen. Arguments related these indicators and triangulation of collected data from teacher, students and principals has been discussed in the following sections.

### **2.2.1 Confident of using internet**

It is found that, *"All of the students have confident to use internet as an aid to their study"*. From Fig. 2.2 it has been seen that, 99.3% students have confident that they are capable to use

internet services as an aid to their study. On the other hand, most of the teachers strongly commented that, “*corona pandemic teaches us to use internet as an aid to study*”. Principals also agree that students have the potential to use the internet to enhance their learning. Also, one study reveals that more than 80% students have confidents of using internet (Fatema et al. k. (2020)).

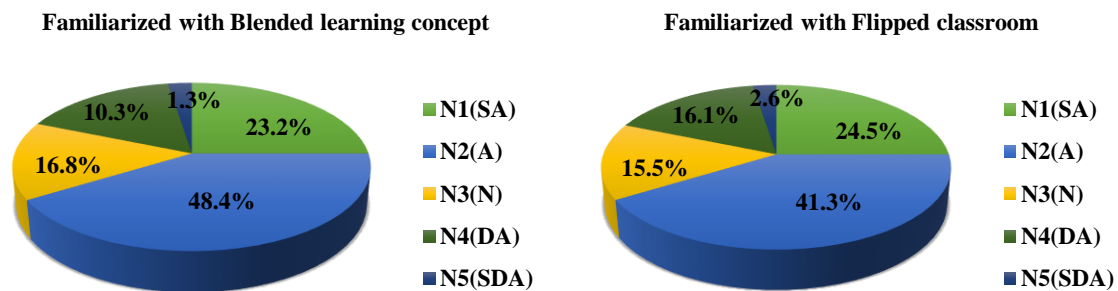


**Fig. 2.2: Confidence level about of using internet services**

### 2.2.2 Familiarization with Blended/Flipped learning

“Majority students have the idea about blended/flipped learning approach”, that’s why Fig. 2.3 shows that 65.8% students have the idea about this approach. Also, according to Jannat et al. (2021), more than 70% students of different public universities have idea about Blended learning.

Teachers also say that, most of the students have an idea of the flipped classroom approach but still it is new to them. Similarly, principals said that seminars or workshops are helpful to acquaint the students with this new teaching learning approach.



**Fig. 2.3: Familiarization level about Blended/Flipped approach**

### 2.2.3 Familiarization with LM system

The statement found “Majority students have the idea about LM system”. Fig. 2.4 shows the prominent results that, more than 82% of students responded positive that they have idea about the LM system. According to Husniyah (2018), this learning platform is not available for free and should be purchased, usually by the institutions.

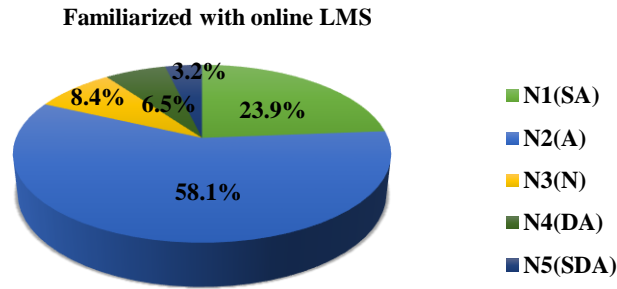


Fig. 2.4: Familiarization level about LM system

Teachers also say that, due to the corona pandemic most of the students have an idea of the LM system but still it is new to them. Similarly, principals said that seminars or workshops are helpful to accustom the students with LM system.

### 2.3 Issue 03 # Availability

The third key issue is availability of resources for implementation of FC approach among the students of ECs. To reveal this, two indicators has been chosen. Arguments related these indicators and triangulation of collected data from teacher, students and principals has been discussed in the following sections.

#### 2.3.1 Open Educational Resources (OER)

The study found that, “Numerous open educational resources available”. From Fig. 2.5 it has been seen that, 95% students have agreed that in internet huge open educational resources (e.g., video, simulation, eBooks, soft copy of lecture notes etc.) are available. Husniyah (2018) also asserted that there are several open educational resources available on the internet.

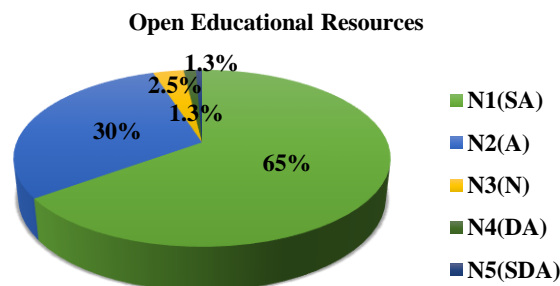


Fig. 2.5: Availability of Learning Resources

In keeping with this, all of the teachers and principals stated that educational resources are currently available on the internet and one teacher remarked that, “*Due to the free availability, open educational resources have become frequent platforms for students*”.

### 2.3.2 Interactive Contents

“There are numerous interactive contents available”. Fig. 2.6 reveals that, 80% of students agreed that interactive content is available on the internet. According to Husniyah (2018), engaging content makes studying more interesting.

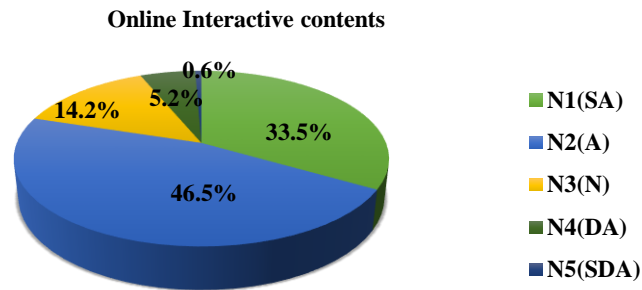


Fig. 2.6: Availability of Learning Resources

In keeping with this, most of the teachers and principals stated that interactive contents are currently available on the internet and one teacher remarked that, “*Students are increasingly using free interactive content as a learning platform*”.

## 2.4 Issue 04 # Opportunity

The fourth key concern is the opportunities that the FC plan would provide students if it were implemented in ECs. Two indications have been chosen to demonstrate this. The next sections address the arguments behind these indicators and the triangulation of data received from teachers, students, and principals.

### 2.4.1 Better Learning Resources

It is found that, “*Learning resources are better when a variety of types (e.g., video, simulation, eBooks, soft copy of lecture notes etc.) are used*”. From Fig. 2.7 it has been seen that, almost 98.1% students agreed that after implementation of FC approach learning resources are better when a variety of types (e.g., video, simulation, eBooks, soft copy of lecture notes etc.) are used.

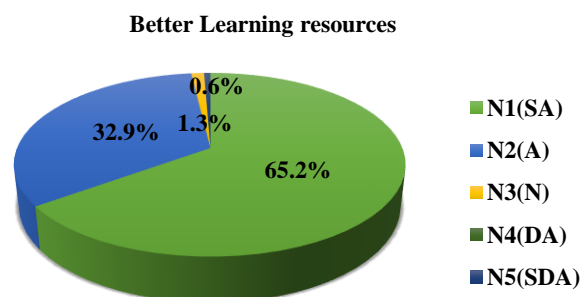


Fig. 2.7: Better Learning Resources

In keeping with this, teachers and principals believed that the FC approach definitely gives more learning materials to pupils. In-depth knowledge is ensured by the FC technique, which mixes offline learning with online educational materials. Learning resources are better when an individual integrates online content, according to Faieza (2020).

### 2.4.2 Enhance Classroom Engagement

The statement is, “*Enhanced Classroom engagement through online-based activity*”. 83.9% students put positive attitude that after implementation of FC approach classroom engagement must be enhanced through online activity. Furthermore, all of the teachers and principals felt that employing internet technologies, the FC approach obviously provides pupils with more classroom amenities. Because the FC method is a technology-assisted teaching and learning method. As a result, after implementing the FC method, classroom engagement will improve. Harrell and Harris (2006), and Young and Lewis (2008) discovered that teachers generally have positive feedback to blended learning in terms of overall satisfaction and enjoyment. Students’ satisfaction was also found in the findings of this study.

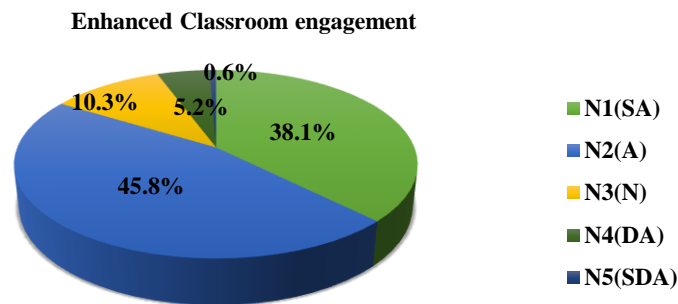


Fig. 2.8: Enhanced Classroom Engagement

### 2.4.3 Enhance Learning

Feng Su and Namrata Rao (2020) carried a study on blended learning and said that the blended online pedagogy will combine face-to-face synchronous learning (such as Zoom, Google Classroom, Flipped Classroom etc.) with asynchronous learning to offer opportunities for cognitive participation which allows students to process the learning and reflect on the learning. The study has found that, “*Online Interactive content can greatly enhance my learning in the technical subjects*”. Almost 85.2 % of students agreed that of FC approach enhance the learning especially in technical subjects due to its online interactive contents, shown in Fig. 2.9.

Also, teachers and principals agreed that the FC approach clearly provides students with greater learning in technical subject’s facilities using online tools. Because the FC approach is technology enabled teaching learning approach. That’s why, classroom engagement will be enhanced after implementing FC strategy. One of the principals stated that, “*Because ECs offers engineering degrees, students have a better chance to improve their technical expertise through the FC approach*”.

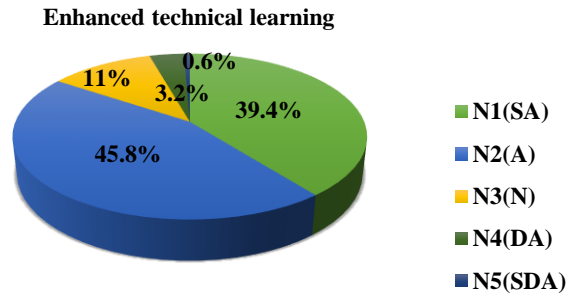


Fig. 2.9: Enhanced Technical Learning

#### 2.4.4 LM System Aid Learning

“A common learning management system can greatly aid the technical education system”. 85.8% of students agreed that to implement FC approach a common LM system is necessary and also, they reveal that LM systems can play an important role to aid their technical learning, shown in Fig. 2.10. The main advantage of using this platform is its simple design and user interface, followed by beautiful design and easy access, although this platform is not much different from Google Classroom (Garote Jurado, et.al., 2013).

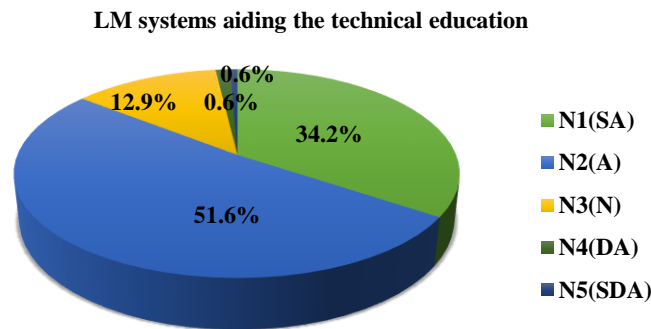


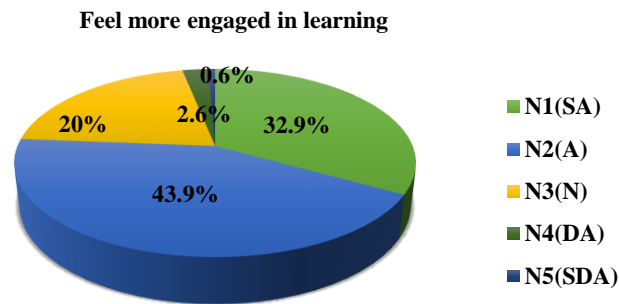
Fig. 2.10: Learning Management System Aids Technical Learning

Furthermore, teachers and principals agreed that the LM system is very necessary to implement the FC approach. One teacher also mentioned that, “*Australia and the United States, respectively, EDMODO and Blackboard are utilized as LM systems to enhance teaching and learning*”.

#### 2.4.5 Feeling Engaged

“Students will feel more engaged in learning with Flipped classroom approach”. 76.8% of students put positive attitude to the statement that combining traditional and online learning will result in a better learning environment, as shown in Fig. 2.11. As students were engaged in more varied situations and authentic materials, students found learning more enjoyable and interesting (Peacock, 1997). All of the teachers and principals agreed that the FC approach of teaching learning provides better learning environment for the students and they will feel better engagement in learning. This is one of the main benefits of using internet for learning process, since students can access materials they find more fun where the traditional classrooms could not provide. Students were also more motivated because they could learn with their own pace,

something they find it difficult to do in traditional face-to-face classrooms. This is especially useful for low-level students. They can provide themselves more time to understand the materials and finish the homework in a more flexible pace. Students were also more involved in the task as they need to accomplish the task individually.



**Fig. 2.11: Feeling Engaged in Learning**

## 2.5 Summary

Finally, after summarizing the regarding issues and indicators to find the scopes of implementing the FC approach among the students using the collected data from the students, teachers and principals of ECs it can be concluded that, most of the students, teachers and principals revealed that FC approach has ample scopes to implement among the students in ECs due to the following findings:

- Majority of students have the accessibility of personal Laptop/Desktop, smartphone, internet connection of moderate speed and used to with social media, Google forms, email services, YouTube, and Google
- Students get a lot of technological access from institution though there are some limitations.
- Students are accustomed to various internet services such as social media (WhatsApp/Facebook/Messenger/etc.), Google Forms, YouTube, and Email services.
- All of the students have confident to use internet as an aid to their study
- Majority students have the idea about blended/flipped learning approach
- Majority students have the idea about LM system
- There are numerous open educational resources available
- There are numerous interactive contents available
- Learning resources are better when a variety of types (e.g., video, simulation, eBooks, soft copy of lecture notes etc.) are used
- Enhanced Classroom engagement through online-based activity
- Online Interactive content can greatly enhance my learning in the technical subjects
- A common learning management system can greatly aid the technical education system
- One will feel more engaged in learning with Flipped classroom approach

Now, scopes of implementing FC approach among the teachers will discussed in the next chapter.



## Chapter 3

# Factors of Scopes using Flipped Classroom Approach among Teachers

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The study's findings on the factors that influence teachers' willingness to use a flipped classroom approach will help teachers, students, and principals understand why flipped-classroom learning should be implemented, especially in the aftermath of the Corona pandemic, and what the benefits of this educational system are. The final results from the instruments that is structured questionnaire are briefly discussed in this chapter, in accordance with the conversations.

### Outcomes

It was originally discussed that data will be collected via a structured questionnaire for EEE students and teachers, as well as a KII for principals of the 04 ECs. Students provided quantitative data, which was examined using the 'Likert-Scale' and SPSS. Teachers' and principals' data, on the other hand, were subjected to qualitative examination. After that, the final results are analyzed and summarized to arrive at the final conclusions. The following are summaries of the conclusions based on the RQ's primary issues surrounding students:

### 3.1 Issue 01 # Perception

The first key issue is perception regarding FC approach among the teachers of ECs. To reveal this, two indicators has been chosen. Arguments related these indicators and triangulation of collected data from teacher, students and principals has been discussed in the following sections.

#### 3.1.1 Familiarization with Blended/Flipped learning

It is found from the study that “*Majority teachers have the idea about blended/flipped learning approach*”. Although FC is a new approach of teaching learning, enough number of teachers are familiar with this approach. According to Jannat (2021), Teachers of the public university were asked if they have interest in incorporating blended learning education system in their classroom or not. Most of the teachers put positive answer.

As a result of the data gathered, teachers from all of the ECs have expressed a good attitude for the idea of a flipped classroom technique, which is a positive attitude towards an outcome. ***"Blended learning can be defined as an organic blending of intelligently selected and complementing face-to-face and online methodologies and technologies"*** one of the teachers said. Similarly, principals also have the positive mindset that teachers have enough idea regarding this FC approach especially due to the corona pandemic teachers have been more familiar with this approach.

#### 3.1.2 Affordability in teaching practice

According to the indicator affordability of FC approach it has been tried to find easiness of sustainable implementation of FC approach in teaching practice. After analyzing the collected qualitative data from structured questionnaire and KII, “*Basically, in our infrastructure, FC*

*approach will be relatively affordable to implement in teaching learning practice*”, the statement has been found. Most of the teachers has been given strong opinion that in the current infrastructure of ECs this approach is affordable to implement because now ECs have enough technological supports. In addition, all of the teachers also have their personal technologies. On the other hand, some teachers said that, though we have enough facilities to afford FC approach but for the proper implantation of this approach we need to stronger the technological basement. In line with this, KII also shows the positive perception that “***Due to technological advancements in both personally and institutionally, teachers are able to afford this FC approach in their teaching practice***”. According to Jannat (2021), 60% of the teachers responded as “yes” that they have enough infrastructural support. 30% of the teachers pointed out their lacking in funding and responded negatively. And the rest of the other 10% kept no opinion.

### **3.2 Issue 02 # Availability**

The second key issue is availability of resources for implementation of FC approach in teaching practice. To reveal this, four indicators has been chosen. Arguments related these indicators and triangulation of collected data from teacher and principals has been discussed in the following sections.

#### **3.2.1 Personal Technologies**

According to K. Fatema et al. (2021), most of the respondents (67.5%) like to use the internet on smartphones because a smartphone is bearable and its functions are also too much easy to understand. The current era has ample technological facilities. Today it is impossible to sustain without using technology even in personal life. So, definitely the following argument has been found is “*Every instructor has their own technology resources, which are required for the FC strategy to be implemented*”. In line with this, 100% of teachers and principals claimed that due to the availability of personal technology such as smartphones, laptops, and internet access, every teacher has their own technological assistance to apply the FC method in teaching practice.

#### **3.2.2 Institutional Technologies**

“*ECs have enough technology resources, which are required for the FC strategy to be implemented*”. Also, from different studies it has been found that, the government of Bangladesh has taken necessary steps to raise funds for providing technological facilities in each and every institution to facilitate the education system. In line with this, 100% of teachers and principals claimed that due to the availability of institutional technology such as desktop/laptops, multimedia classroom, document camera and broadband/wi-fi facility etc., FC approach demands its implementation to enhance the teaching learning environment.

#### **3.2.3 Interactive Contents**

The study found that, “*Available online Interactive content can greatly enhance teaching capability for teachers in the technical subjects*”. Now a days, different types of interactive contents are available in online. These teaching learning contents facilitate the teaching capability. So, when blended method has been used in teaching practice then teachers have to use online contents which also enhance their teaching capability and it is fun way of teaching to engage the students in learning. Among total respondents 56% use the internet for academic or educational purpose (K. Fatema et al. 2021).

Also, Fig. 2.6 in chapter 2 shows that, students are agreed that numerous online interactive contents are available. In keeping with this, teachers and principals stated that interactive contents are currently available on the internet and one principal remarked that, *“Teachers are increasingly using free interactive content as a teaching platform”*.

### 3.2.4 Open Educational Resources (OER)

*“Available Open Educational Resources can greatly enhance teaching capability”*. Internet has huge open educational resources (e.g., video, simulation, eBooks, soft copy of lecture notes etc.) which facilitate the teaching and learning environment in a great extent (Faieza, 2020).

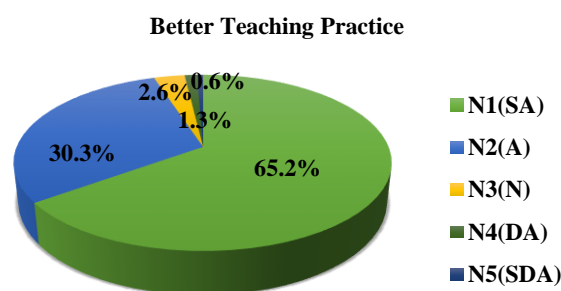
Also, from the students' perspective, Fig. 2.5 shows that 95% of students agree that there are many different types of open educational resources on the internet are available. According to the results of the structured questionnaire and the KII, open educational resources are currently available on the internet, and one teacher stated, *“Open educational resources have become regular platforms in teaching practice due to their free availability”*.

## 3.3 Issue 03 # Opportunity

The third key concern is the opportunities that the FC plan would provide teachers if it were implemented in ECs. Two indications have been chosen to demonstrate this. The next sections address the arguments behind these indicators and the triangulation of data received from teachers, students, and principals.

### 3.3.1 Better Teaching

According to Jannat (2021), A question was put to the teachers that blended learning system can develop the techno-skill of the students and create an opportunity for the students to continue part time job or not. 90% of the teachers responded as “yes”, that it would be very helpful for the students. The current study has been found that, *“Teaching is better when a variety of types online resources (e.g., video, simulation, eBooks, soft copy of lecture notes etc.) are used”*. Teachers can now restructure their classrooms and teach students in new ways. Blended learning is the combination of in-person instruction and online technology that enables student-centered learning.



**Fig. 3.1: Better Teaching Practice**

From Fig. 3.1 it has been seen that, 95.5% students agreed that after implementation of FC approach teaching is better when a variety of types (e.g., video, simulation, eBooks, soft copy of lecture notes etc.) are used. In keeping with this, all of the teachers and principals believed that the FC approach definitely provides better teaching environment. Moreover, in-depth

knowledge is ensured by the FC technique, which mixes offline learning with online educational materials. One of the principals' stated that, *"The FC technique ensures better teaching, and it is a globally known concept"*.

### 3.3.2 Enhance Knowledge

According to Professor Andaleeb (2017), digital needs to be the new reality in Bangladesh, and by incorporating technology into education, teachers can be much more creative. The experiences of blended learning pioneers show that by implementing such an innovative teaching program, one can achieve radical improvements in teaching effectiveness as well as enhancing the knowledge. In line with this the current study also found the statement as *"FC approach must enhance the knowledge especially in technical subjects"*.

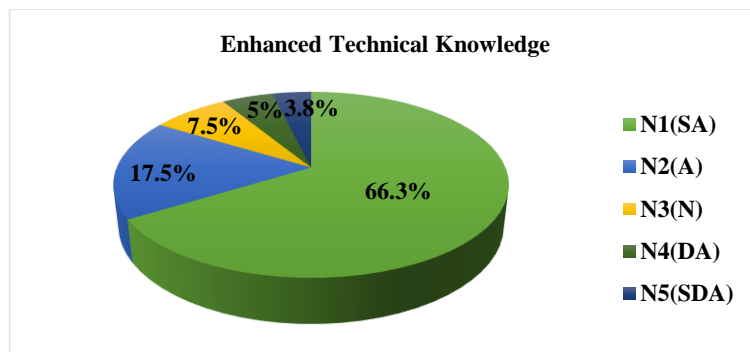


Fig. 3.2: Enhanced Technical Knowledge

The FC approach, according to all of the teachers and principals, online resources clearly gives in-depth knowledge in technical topics. Also, 83.8% student's, shown in Fig. 3.2, gives similar response that, since FC method is a technology-assisted teaching and learning method, so that it's enhance the technical knowledge. As a result, after implementing the FC method, classroom engagement will improve. *"Because ECs offers engineering degrees, teachers have a better chance to increase their technical knowledge through the FC approach"*, one of the principals said.

### 3.3.3 Enhance Teacher Student Engagement

According to Faieza, 2020, "as the advancement of technology has turned our world into a global village, it is possible for students to communicate with experts from other parts of the world and enhance their knowledge". In line with this the current study also found the statement as *"FC approach must enhance teacher student engagement"*.

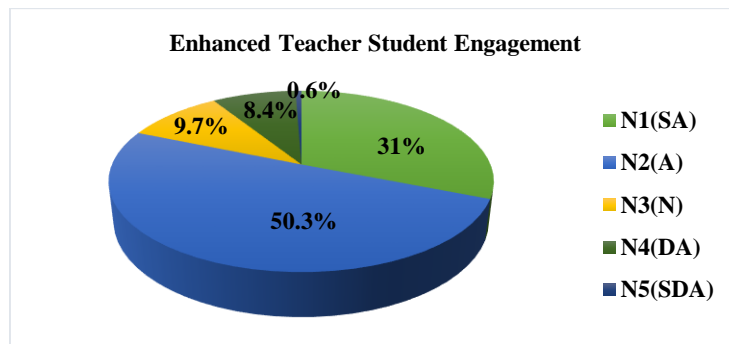


Fig. 3.3: Enhanced Teacher Student Engagement

This study also reveals that, most of the teachers and principals respond that, FC approach definitely facilitate the teacher student engagement. Also, 81.3% student's, shown in Fig. 3.3, gives similar response that, FC method is a technology-assisted teaching and learning method, so that it's enhance the teacher student engagement virtually.

### 3.4 Summary

Finally, after summarizing the regarding issues and indicators to find the scopes of implementing the FC approach among the teachers using the collected data from the students, teachers and principals of ECs it can be concluded that, most of the students, teachers and principals revealed that FC approach has ample scopes to implement in teaching practice in ECs due to the following findings:

- Majority teachers have the idea about blended/flipped learning approach
- Basically, in our infrastructure, FC approach will be relatively affordable to implement in teaching learning practice
- Every instructor has their own technology resources, which are required for the FC strategy to be implemented.
- ECs have enough technology resources, which are required for the FC strategy to be implemented.
- Available online Interactive content can greatly enhance teaching capability for teachers in the technical subjects
- Available Open Educational Resources can greatly enhance teaching capability
- Teaching is better when a variety of types online resources (e.g., video, simulation, eBooks, soft copy of lecture notes etc.) are used
- FC approach must enhance the knowledge specially in technical subjects

Now, facilities required of implementing FC approach in ECs will discussed in the next chapter.

# Chapter 4

## Factors of Facilities Required to Implement Flipped Classroom Approach

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The goal of this chapter is to identify the necessary facilities for the implementation of the FC approach in ECs using data collected from teachers, students, principals, and IT experts in order to recognize that the implementation of the FC learning model is a demand of time, especially in the aftermath of the Corona pandemic, and what the benefits of this educational system are. The final results from the instruments are briefly discussed in this chapter, in accordance with the conversations.

### Outcomes

It has already been discussed that, data will be collected via a structured questionnaire for EEE students and teachers, as well as a KII for principals of the 04 ECs and 05 FGDs for IT experts. Students provided quantitative data, which was examined using the 'Likert-Scale' and SPSS. And data from Teachers', principals' and IT experts, on the other hand, were subjected to qualitative examination. After that, the final results are analyzed and summarized to arrive at the final conclusions. The following sections discussed the issues and its' indicators regarding the RQ of finding the necessary facilities for the implementation of FC approach in ECs.

### 4.1 Issue 01 # Personal Facilities

Technological facilities can be divided into two types, such as personal technologies and institutional technologies. The factors related the issue and arguments related these indicators has been discussed below. Each indication has been triangulated using data acquired from teachers, students, principals, and IT professionals, as detailed in the sections below.

#### 4.1.1 Laptop/desktop Computers, Smart phones, OERs & Internet Access

According to the literature, the national policies for science and technology are planned and developed by the National Council for Science and Technology which is controlled by the ministry of science and technology. Bangladesh was ranked 116th in the Global Innovation Index in 2019, 2020, and 2021. And argument which can be claimed is as *“Every inhabitant of Bangladesh now has access to personal technologies such as laptop/desktop computers, smart phones, open educational resources, and free internet”*.

From Fig. 2.1 in chapter one, it has been revealed that, near about 98.8% students have accessed their personal technologies. As a result of the data gathered, teachers, students, and principals from all of the ECs have expressed their opinion personal technologies such as Laptop/desktop Computers, Smart phones, OERs & Internet Access are the prerequisites for the implementation of FC approach. And it is to be desired that these types of technology are now available to every Bangladeshi person (K. Fatema et al. 2020). The growing rate of availability of this type of technology, particularly following the corona epidemic, is really astounding.

## 4.2 Issue 02 # Institutional Facilities

Without institutional technological facilities it is impossible to implement the FC approach. So, the factors related the issue and arguments related these indicators has been discussed below. Each indication has been triangulated using data acquired from teachers, students, principals, and IT professionals, as detailed in the sections below.

### 4.2.1 Institutional Laptop/desktop Computers, Smart phones & free Broadband/wi-fi

Government of Bangladesh has taken necessary steps to raise funds, so that all institutions have ample technologies to support their teachers and students. Then the argument which can be claimed is as follows: “ECs now provide access to technologies such as laptop/desktop computers, smart phones and free Broadband/wi-fi”.

From Fig. 2.1 in chapter 02, it has been found that, only 68% students have accessed their institutional technologies. Also, according to Jannat et al. (2021), only 54% students have accessed the institutional technologies. As a result of the data gathered, teachers, students, and principals from all of the ECs have expressed their opinion that the ECs should give simple access to laptops or desktops for both students and teachers. Second, free Wi-Fi access should be required throughout the institution. And it is to be desired that these types of technology are now available to all ECs. And the growing rate of availability of this type of technologies, particularly following the corona epidemic, is really astounding.

### 4.2.2 Learning Management System

“ECs must provide a learning management system to support the flipped classroom approach”. A common learning management system is the most important requirements to implement FC approach. The main advantage of using this platform is its simple design and user interface, followed by beautiful design and easy access, although this platform is not much different from Google Classroom (Garote Jurado, et.al., 2013).

Fig. 4.1 it has been shown that, 85% students agreed that a common learning management system should be provided by the institutions. Also, all of the teachers’ principals revealed that, to implement FC approach appropriately a well-designed learning management system is the most important indicator. “A flexible LM system may assure enhanced and quality education,” one of the teachers noted.

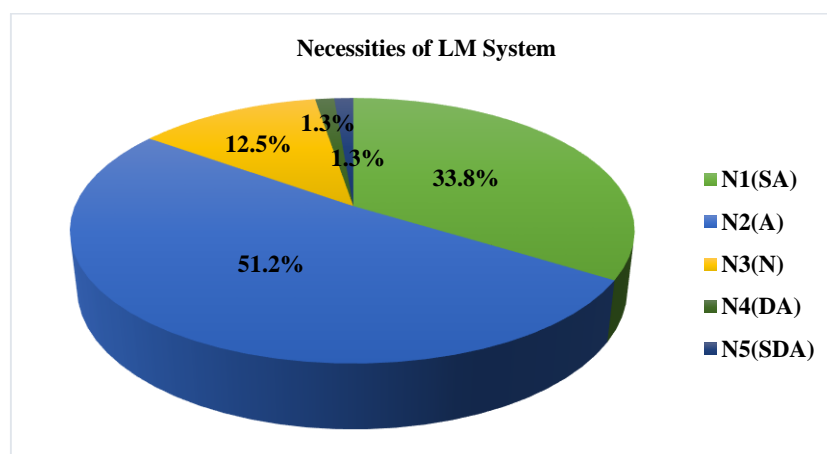


Fig. 4.1: Necessities of learning management system

### 4.2.3 Free Access to Paid Tools

The study found that, *“ECs must provide free access to paid tools”*. Another important tool for the FC approach is paid tools, but institutions should take necessary steps to free up these tools so that teacher and student can enhance their teaching learning capability. Learning through technology demands reliable hardware, user-friendly software, high bandwidth network along with proper knowledge and skills (Faieza, 2019).

Paid tools or websites are highly vital, according to the teachers, and principals, because these websites provide a lot of sophisticated information. As a result, institutions should take steps to provide free access to these paid tools in order to increase the likelihood of taking advantage of the FC strategy.

### 4.2.4 Training

*“Training is one of the most important requirements for the implementation of FC approach”*. Teachers should receive required training on the usage of the latest educational technologies from HEIs in Bangladesh to educate them about innovative teaching using technology (Faieza, 2019). Professor Majumder, speaking at a lecture session on the use of Google Classroom in Blended Learning at one of Bangladesh's private universities, said that using the latest innovative teaching and learning as well as information technology in the education system is critical to building a Digital Bangladesh. He also recommended that all faculty members become familiar with Google Classroom (Majumder and Sarker, 2017).

The main reason for displaying resistance to the FC strategy is a lack of technical expertise. As a result, ensuring that teachers and students receive appropriate training is a crucial obligation of institutions, as agreed upon by all teachers and principals. According to one of the teachers, *“Technical trainings help teachers and students to apply the FC approach in their teaching and learning practices”*.

## 4.3 Issue 03 # Skills

Without necessary skills it is impossible to implement the FC approach for both in teaching practice and students learning. So, the skills related indicators has been discussed below. Each indication has been triangulated using data acquired from teachers, students, principals, and IT professionals, as detailed in the sections below.

### 4.3.1 Skills in Teaching

*“Communication, collaboration, adaptability, and empathy are needed abilities of the flipped classroom method in teaching practice”*. To transform the traditional face to face class into flipped classroom approach that is technology enabled classroom, teachers' skills in using technology is one of the vital indicators to justify the implementation of FC approach. The importance of, and need for, continuing professional development for teachers with sufficient time for development should be acknowledged (Vaughan, 2007).

From teachers' point of view, it has been revealed that Communication, collaboration, adaptability, and empathy are needed abilities of the flipped classroom method in teaching practice. Similarly, principals of ECs have the same thoughts that teachers must have the technical knowledge's that is how to drive online tools and hardware tools. *“Teachers with technical skills can play an important role in motivating students to participate in learning through the FC approach”*, one principal remarked.



### 4.3.2 Skills in Learning

The study found that, “Communication, teamwork, and technical knowledge are required skills of flipped classroom method in students learning”. Creating a culture of innovativeness automatically helps individuals to be creative in nature and provides a broader base for unique ideas in society (Faieza 2019). But one needs more than that to create an environment for technology development. Now a days a lot of seminars, workshops and conferences has been taken through online tools. Due to the above reasons, learning is fully dependent on technology. Also, all of the teachers’ and principals strongly said that, students must have Communication, teamwork, and technical knowledge are required skills of FC approach in students learning.

## 4.4 Issue 04 # Hardware Facilities

From the country context, hardware facilities such as server and optical fiber connections for high-speed internet is necessary to facilitate the implementation of FC approach. Now, the required hardware facilities have been discussed below. Each indication has been triangulated using data acquired from teachers, students, principals, and IT professionals, as detailed in the sections below.

### 4.4.1 Server and Optical Fiber Connections

“Bangladesh has own server and optical fiber connection which is a preliminary element for the FC approach”. Digital Bangladesh implies the broad use of computers, and embodies the modern philosophy of effective and useful use of technology in terms of implementing the promises in education, health, job placement and poverty reduction (ICE Business Report January, 2020). In line with this, Bangladesh now has its own technological facilities which offer the easy implementation of FC approach in teaching and learning.

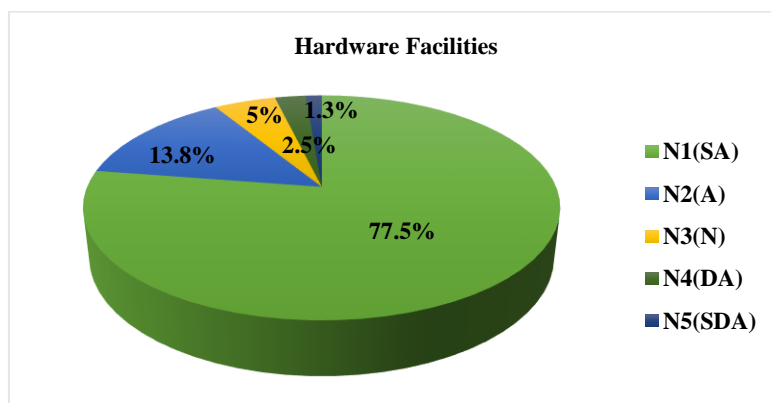


Fig. 4.2: Available Hardware Facilities

To justify the current argument FGD has been done among the IT experts to find the real picture of current country context regarding technological advancement. “Bangladesh has own server and optical fiber connection which is a preliminary element for the FC approach, and which supports are available in Bangladesh”, one IT expert remarked. Also, from Fig. 4.2, it has been seen that, 91.3% students have positive response. Futhermore, all of the teachers and principals believe that, in Bangladesh there are hardware facilities now available in a satisfaction level to support the FC approach.

## 4.5 Issue 05 # Software Facilities

Software technology A general term covering the development methods, programming languages, and tools to support them that may be used in the development of software. Some common examples of software include Microsoft Word, Adobe Photoshop, Adobe Reader, Google Chrome, Gmail, PowerPoint, VLC, and many other similar computer programs that we often use in our daily life. Now, the required software facilities have been discussed below. Each indication has been triangulated using data acquired from teachers, students, principals, and IT professionals, as detailed in the sections below.

### 4.5.1 HTML, CSS, JAVASCRIPT, PHP, LARAVEL, and Android & IOS-based app

A lot of software is now available in online. Now in Bangladesh there are enough IT experts available who are capable to develop their own software. The study found that, “HTML, CSS, JAVASCRIPT, PHP, LARAVEL, and Android & IOS-based app are available in Bangladesh”. To support the current argument, a FGD was conducted among IT specialists to determine the true picture of the current country's technological advancement situation. All IT experts stated proudly that they have sufficient expertise to design their own software and that many types of vital software are also available online for free. This argument was likewise supported by all of the teachers and principals. The software development industry of Bangladesh seems to be a promising destination for business process outsourcing (S. Rahim et al. 2017).

## 4.6 Issue 06 # Experts

An information technology expert works to monitor and manage computer hardware, software and networks within an organization. This expert is known by a wide range of titles, including network administrator, information security analyst, and business information technology analyst and information technology project manager. Now, the required experts for FC approach have been discussed below. Each indication has been triangulated using data acquired from teachers, students, principals, and IT professionals, as detailed in the sections below.

### 4.6.1 Networking, Web & App developer

“Bangladesh has a large number of experts with sufficient technological knowledge”. To support the statement, according to the Zerina et al. 2008, it is clear that only 44% professional are from Computer science graduate and 56% from other education background. Bangladesh has focused on producing technology experts in tandem with the advancement of technology.

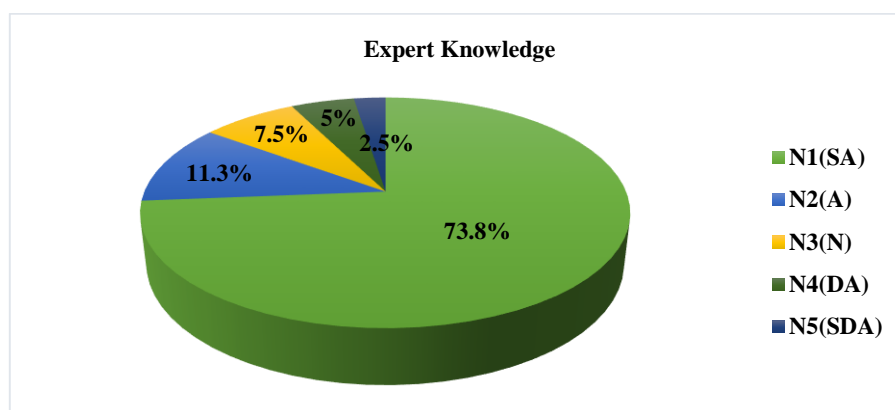


Fig. 4.3: Expert Knowledge

From FGD, IT specialists disclosed that three types of professionals are required to deploy the FC strategy, including networking, web, and app developers. They also claimed to be present in Bangladesh and possess sufficient technological knowledge. All of the teachers and principals have the same viewpoint. Similarly, 85.1% students have the positive response with our statement.

## 4.7 Issue 07 # Budgets

Bangladesh has an impressive track record of growth and development. It has been among the fastest growing economies in the world over the past decade, supported by a demographic dividend, remittances, and stable macroeconomic conditions. Now, the required experts for FC approach have been discussed below. Each indication has been triangulated using data acquired from teachers, students, principals, and IT professionals, as detailed in the sections below:

### 4.7.1 Available Funds & ICT Projects

*“Bangladesh is now economically well developed to support the FC approach”*. Funding and other ICT projects are required for the FC strategy to be implemented, and it is hoped that Bangladesh will now be able to declare the budget as required. All of the teachers, principals and IT experts said that, Bangladesh is now economically well developed to support the FC approach. And in addition, *“ECs also receive a healthy sum of money, which can be used to help the FC approach's implementation in ECs”*, one principal remarked. Though, according to Faieza (2019), it is revealed that, In Bangladesh, with the exception of a few, most HEIs do not have sufficient funds to initiate such new, ground-breaking concepts. But, The government has proposed raising allocation in the education sector by 17 percent to Tk 61,118 crore in the budget for the next fiscal year compared to the revised allocation in the outgoing fiscal year (Daily Star 2022).

## 4.8 Summary

Finally, after summarizing the regarding issues and indicators to find the essential facilities of implementing the FC approach in ECs using the collected data from the students, teachers and principals of ECs and IT experts, it can be concluded that, most of the students, teachers, principals and IT experts revealed that FC approach has ample facilities to implement FC approach in ECs due to the following findings:

- Every inhabitant of Bangladesh now has access to personal technologies such as laptop/desktop computers, smart phones, open educational resources, and free internet
- ECs now provide access to technologies such as laptop/desktop computers, smart phones and free Broadband/wi-fi
- ECs must provide a learning management system to support the flipped classroom approach
- ECs must provide free access to paid tools
- Training is one of the most important requirements for the implementation of FC approach
- Communication, collaboration, adaptability, and empathy are needed abilities of the flipped classroom method in teaching practice

- Communication, teamwork, and technical knowledge are required skills of flipped classroom method in students learning
- Bangladesh has own server and optical fiber connection which is a preliminary element for the FC approach
- HTML, CSS, JAVASCRIPT, PHP, LARAVEL, and Android & IOS-based app are available in Bangladesh
- Bangladesh has a large number of experts with sufficient technological knowledge.
- Bangladesh is now economically well developed to support the FC approach

Now, challenges of implementing FC approach in ECs will discussed in the next chapter.

# Chapter 5

## Factors of Challenges to Implement FC Approach

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The goal of this chapter is to identify the challenges for the implementation of the FC approach in ECs using data collected from teachers, students and principals in order to recognize that the implementation of the FC learning model is a demand of time, especially in the aftermath of the Corona pandemic, and what the benefits of this educational system are. The final results from the instruments are briefly discussed in this chapter, in accordance with the conversations.

### Outcomes

It has already been discussed that, data will be collected via a structured questionnaire for EEE students and teachers, as well as a KII for principals of the 04 ECs. Students provided quantitative data, which was examined using the 'Likert-Scale' and SPSS. And data from Teachers', principals' and IT experts, on the other hand, were subjected to qualitative examination. After that, the final results are analyzed and summarized to arrive at the final conclusions. The following sections discussed the issues and its' indicators regarding the RQ of challenges for the implementation of FC approach in ECs.

### 5.1 Issue 01 # Technological Challenges

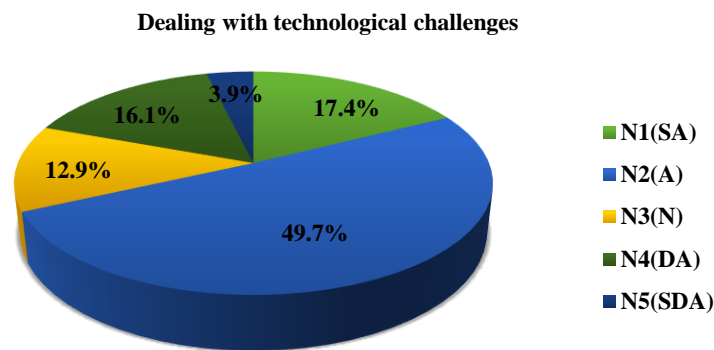
Blended learning which combines in-class teaching with e-learning is not a simple system to implement in Bangladesh. Learning through technology demands reliable hardware, user-friendly software, high bandwidth network along with proper knowledge and skills. Porter et al. (2016) investigated drivers and barriers to blended learning at the institutional level. Galvis (2018) later build upon this research in his article. He also provided a blue-print for supporting institutional decision-making process related to Blended learning. According to Hossain (2013), some barriers to overcoming the problems to implementing blended learning in Bangladesh includes political instability, electricity supply, poor infrastructure and limited funds of academic institutions. So, the factors related the issue and arguments related these indicators has been discussed below. Each indication has been triangulated using data acquired from teachers, students and principals, as detailed in the sections below.

#### 5.1.1 Lack of technical knowledge

Despite Bangladesh's technical advancements, the majority of the population is unaware of them. Many instructors, students, and other educated people are also unaware of how to use various web tools and how to integrate technology into education. According to Swenson and Redmond (2009), both teachers and students must adjust to the crucial shift from a classroom-only setting to one that includes online components. In accordance with this, *one of the major obstacles to the application of the FC approach in the context of ECs is a lack of technical understanding.*

According to Fig. 5.1, 67.1 percent of students believe that they will have difficulty using technology due to a lack of technical understanding. Furthermore, 16 percent of students stated that they will have no difficulty using technology. Similarly, the majority of teachers and

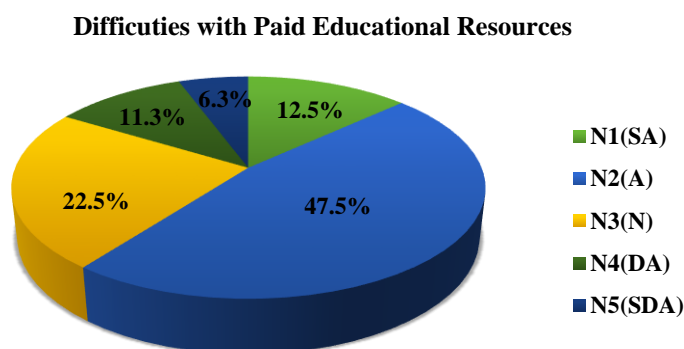
principals indicate that teachers may have difficulty using technology, but that proper training will be able to overcome these deficiencies.



**Fig. 5.1: Difficulties using Technology**

### 5.1.2 Paid educational resources

Learning with technology, according to Faieza (2020), necessitates dependable hardware, user-friendly software, a high-bandwidth network, as well as appropriate knowledge and abilities. Porter et al. (2016) looked into the institutional drivers and challenges of blended learning. Despite the fact that issues with internet speed have been resolved, "Paid Educational Resources" pose a hurdle in implementing the FC strategy in ECs.



**Fig. 5.2: Difficulties with Paid Educational Resources**

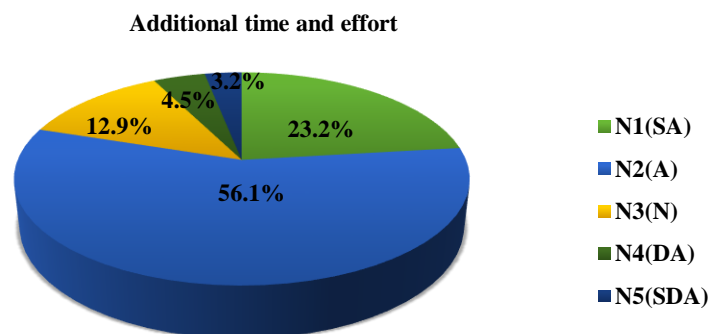
According to Fig. 5.2, 60% of students believe that using online resources will be challenging owing to budgetary constraints. Furthermore, just 17% of students answered that using online tools will be easy for them because they are accustomed to using free open educational resources. Similarly, the majority of EC teachers and principals believe that free educational resources provide sufficient information, but that paid educational tools provide in-depth expertise, particularly in technical topics. As a result, institutional support is required to gain access to these paid tools or websites in order to improve teaching and learning. One principle says, "*Principals should take the required steps to raise the necessary cash for offering free access to paid instructional sites*".

### 5.1.3 Unwilling to adapt to new technology

Another key obstacle that may obstruct the proper implementation of blended learning in Bangladesh's higher education institutions is some teachers' rigid mindsets and attitudes, according to Faieza (2020). Some teachers still believe that the traditional method of teaching with chalk and board is the most effective way to teach kids and that all other new teaching aids are ineffective. Teachers must have a more open mindset and be more inclined to include internet teaching aids into their lessons. According to Heaton-Shrestha et al. (2009), teachers are less enthusiastic about the advantages of online learning components. Similar to the debate above, the current research work has discovered that, "Some teachers and students still refuse to use technology in the classroom".

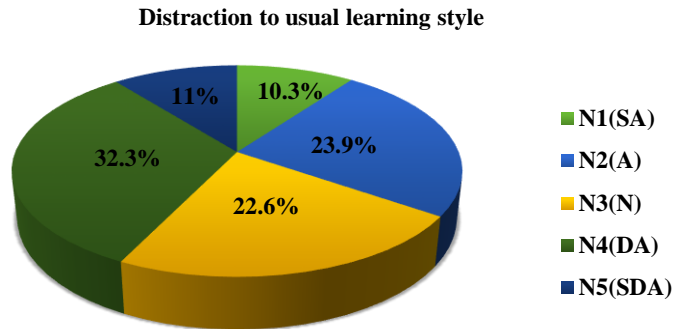
To effectively highlight students' unwillingness to adopt technology in the classroom, the problems that underpin this unwillingness might be explained in several ways. For example, Fig. 5.3 reveals that 79.3% of students believe that using online resources will involve more time and effort, which will impede their learning. In this regard, EC teachers share the same viewpoint. Other teachers and students, on the other hand, have the opinion that employing technology in education will result in improved time management.

Finally, the whole data, both primary and secondary, yields the following conclusion: "Learning becomes more meaningful as blended learning provides students with a more dynamic learning experience and a high-quality education."



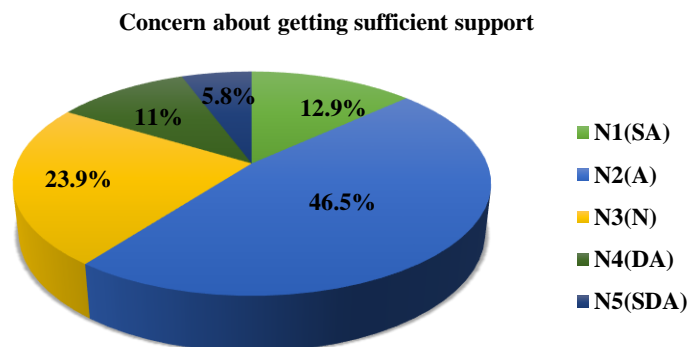
**Fig. 5.3: Required additional time and effort**

According to Fig. 5.4, just 34.2% of students believe that integrating technology into school will cause a disruption in their regular learning method. And 43% of students said that technology will not interfere with their normal studying approach. Similarly, teachers and 100% of principals agreed that incorporating technology will not detract from the traditional learning method. "While formal classroom settings offer a human touch to the educational process," one teacher observes, "**Online tools can help teachers achieve a high level of active involvement and greater flexibility in learning.**"



**Fig. 5.4: Distraction to usual learning style**

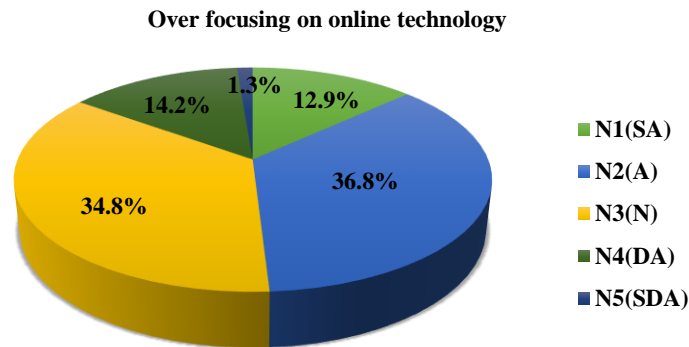
Again, Fig. 5.5 has been shown that, 59.4% students pointed out that they are concern about getting enough technical support from the institutions, because ECs have weak networking infrastructure and there are no IT experts. But 16.8% students responded that they are capable to use technology without any help of any experts, which shows a prominent result for the implementation of FC approach in ECs. Additionally, most of the teachers of ECs also put positive attitude that, they also have concerned to get sufficient technical and financial support for the FC approach. One of the principals of ECs said that, *“Even though ECs have several technical shortcomings, they nonetheless have a good chance of grasping the FC method.”*



**Fig. 5.5: Concern about getting sufficient support**

Finally, 49.7% of students strongly agree that using online resources in learning has a negative impact on the internet, shown in Fig. 5.6. Other students, on the other hand, have a neutral attitude. Similarly, instructors and principals have stated that excessive usage of the internet might impede learning and teaching. Negative effects include internet addiction, loss of face-to-face communication, time wasting, excessive use of social networking sites, and sadness, according to Fatima, K. (2020). Finally, the study suggests that, *“Because the internet is considered an inseparable element of human life, students should be aware of how they use it.”*





**Fig. 5.6: Over focusing on online technology**

## 5.2 Issue 02 # Pedagogical Challenges

Due to the advent of various educational technologies, such as Google Classroom, Moodle, Edmodo, and Schoology, today, educators are trying to utilize various online tools to replicate the physical classroom experience in a digital environment. However, a common misconception among most educators is the belief that they can teach any content using any form of technology. Such a flawed perception can result in poor planning and wastage of valuable time and resources. Hence, before incorporating any new technology in education, it is crucial to consider its pedagogic and psychological effects.

Zhao and Frank (2003) argue that when integrating technology in education, it is important to emphasize not only on how much computers are used but also how they are being utilized to enhance the education quality. According to UNESCO Innovative Teaching and Learning (ITL) research project, “ICT has great potential to support innovative pedagogies, but it is not a magic ingredient.” They also point out that when considering the use of ICT in education sector, it is important to focus not on flash but on student learning and twenty-first-century skills that ICT can enable. According to Professor Aminul Hoque, “universities in Bangladesh should not only adopt technology for skills improvement but also provide a right platform to make the best use of it” (Bari and Chowdhury, 2018).

It is important for educators to realize that technology alone cannot ensure productive and enriched learning as human elements are still needed in technology enhanced environment. Educators should develop blended learning programs in which one can match every type of content to the most appropriate medium of technology. Here, the process is to use learning outcomes (LO) and assessment techniques (AT) to determine the best technological aids for specific content taught in the class using models such as Bloom’s Digital Taxonomy of Learning for guidance. This will ensure that students gain mastery of both lower-order level learning and higher order level learning with the help of both self-paced technologies and collaborative technologies.

Three steps to create a flipped classroom model of blended learning

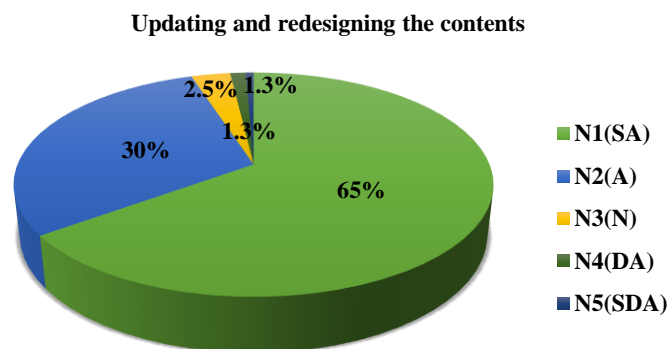
- First, set clear learning outcomes (LO) and select appropriate assessment techniques (AT).
- Second, match the LO and AT to appropriate teaching technological aids using Bloom’s Digital Taxonomy of Learning.
- Third, transform the classroom from a “traditional” one to a “flipped” one.

So, the factors related the issue and arguments related these indicators has been discussed below. Each indication has been triangulated using data acquired from teachers, students and principals, as detailed in the sections below.

### 5.2.1 Updating and Redesigning the Contents

The ability to flip the classroom is a fundamental benefit of implementing a blended learning program at ECs. This paradigm, according to Bergmann and Sams (2012), is an educational technique that uses an online platform to distribute instructional information, reversing the usual learning environment. In a traditional classroom, students must attend classroom lectures and then return home to complete certain duties, such as assignments assigned by the course instructor as homework. In a flipped classroom, however, some of the lectures can be delivered by the instructor via an online platform, allowing students to spend the majority of their class time brainstorming, working on group projects, or conducting experiments, all of which will eventually help them learn how to apply their textbook knowledge in real-world scenarios (Faieza, 2020).

"Is updating and revamping the material according to the needs of the FC method challenging?" teachers and principals were asked about this indicator. This declaration has been endorsed by all of the teachers and principals. *"To build an effective blended learning program, one must first identify what goals he or she wants to achieve from a particular course and how they want to assess the students' knowledge of that course,"* one teacher noted. Also, Fig. 5.7 shows that, 95% students have agreed that it's difficult to keep the content up to date and remodel it to meet the demands of the FC technique.



**Fig. 5.7: Updating and redesigning the contents**

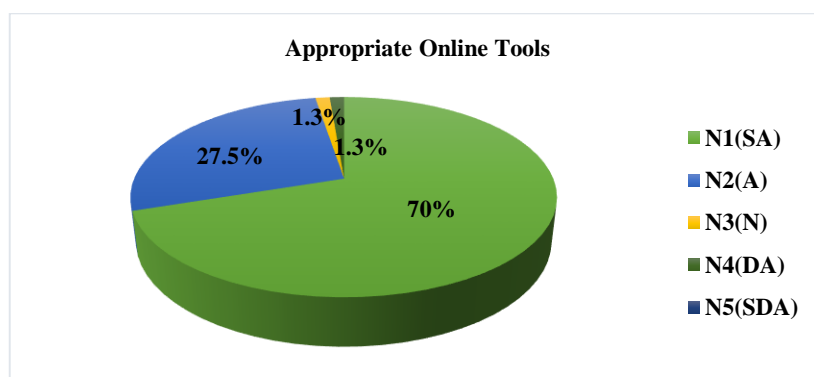
It is vital, according to Faieza (2020), that educators develop explicit measurable educational goals that are precise and thorough. The learning objectives (LO) are statements about what the instructor wants students to learn after completing a course of study. With the guidance of Bloom's Taxonomy of Learning, it is best to utilize right action verbs to set appropriate LO. The final step is to identify which AT should be used to assess students' mastery of the course. This is an important stage since there is a clear link between teaching evaluation approaches and the proper technology for providing content to students.

### 5.2.2 Choosing appropriate online tools

According to Faieza (2020), it is important for educators to realize that technology alone cannot ensure productive and enriched learning as human elements are still needed in technology enhanced environment. Educators should develop blended learning programs in which one can

match every type of content to the most appropriate medium of technology. Bergmann and Sams (2012) described this model as an instructional strategy that reverses traditional learning environment by delivering the instructional content in an online platform.

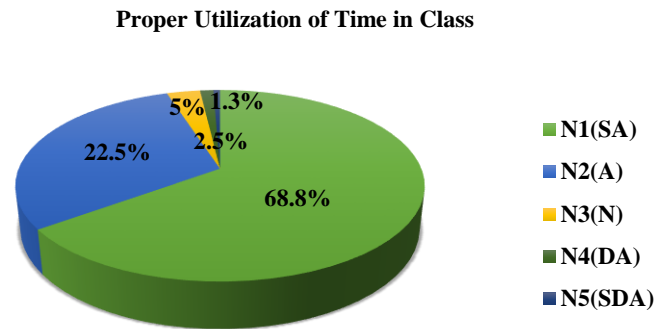
Teachers find it difficult to choose proper instruments, according to this study. According to qualitative research, 100 percent of teachers stated that, as a result of the introduction of various educational technologies such as Google Classroom, Moodle, Edmodo, and Schoology, educators are now attempting to mimic the physical classroom experience in a digital setting. Most educators, on the other hand, have the misperception that they can teach any subject using any technology. A faulty perception can lead to poor planning and the waste of time and money. As a result, it is critical to assess the pedagogic and psychological implications of every new technology before introducing it into school. In addition, principals agreed with the above statement, and 97.5 percent of students felt that choosing the correct tools is difficult.



**Fig. 5.8: Choosing appropriate online tools**

### 5.2.3 Proper Utilization of Time in Class

Due to the advent of new technologies and digital learning platforms, flipping the classroom has now become easier and more effective. Here, the main goal is to utilize most of the class time for conducting high-cognitive activities and achieve a higher order level of learning (Faieza, 2020). However, the study found that, properly utilizing class time is difficult. Fig. 5.9 shows that; 91.3% students have agreed that properly utilizing class time is difficult. The majority of teachers and principals agreed with the remark, and one teacher stated that, “*the instructor must first prepare a video of his or her lecture detailing the essential theories or topics that will be covered in the next session. The teacher will then post the video lecture as an assignment for the students on an online learning site. The students are required to watch the video lecture and complete a quick online exam based on the video lecture content. The test report from the online exam will tell the teacher which parts of the video lecture students had trouble understanding, and this knowledge will help the teacher plan more effectively for his or her next in-class lecture. As a result, the teacher can devote the majority of the face-to-face class time to those essential areas in which pupils require additional attention. Furthermore, by flipping the classroom, teachers will be able to spend more time in class with their students, solving difficulties, answering questions from online lectures, and assisting students with group projects.*”



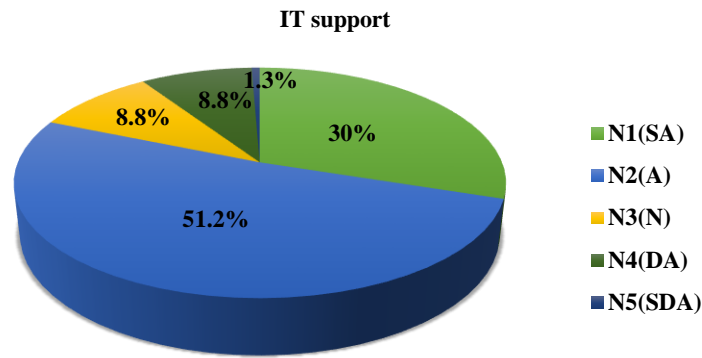
**Fig. 5.9: Proper Utilization of Time in Class**

### 5.3 Issue 03 # Administrative Challenges

Implementation of blended learning at HEIs in Bangladesh requires full dedication on the part of government authorities and university management in Bangladesh. According to Faieza (2020), Individuals at every level of the hierarchy must contribute and formulate a well-designed plan regarding how to implement innovative teaching program. So, the factors related the issue and arguments related these indicators has been discussed below. Each indication has been triangulated using data acquired from teachers, students and principals, as detailed in the sections below.

#### 5.3.1 Weak Infrastructure

In order to make knowledge and education correspond with the present digital world, it is essential to increase the exposure of all parties – students, teachers and administrators – to technology-supported learning tools. However, the study has found that, *at present most of the teachers and students in Bangladesh face various difficulties on using technology in the classroom including slow internet connection, system crash and hardware problems.* Furthermore, Zamari et al. (2012) points out that the slow internet speed hinders the classroom atmosphere in Bangladesh. Fig. 5.10 depicts that; 81.2% students of ECs have agreed with this statement. And all of the teachers and principals said that, it is a challenge to overcome this barrier, as it is important for all ECs in Bangladesh to build and expand their network infrastructure. Husniyah et al. (2018) points out that blended learning requires strong IT infrastructure and network services supported by highly qualified technical staffs. Therefore, it is apparent that without IT infrastructure, it is not possible to implement blended learning at HEIs in Bangladesh.

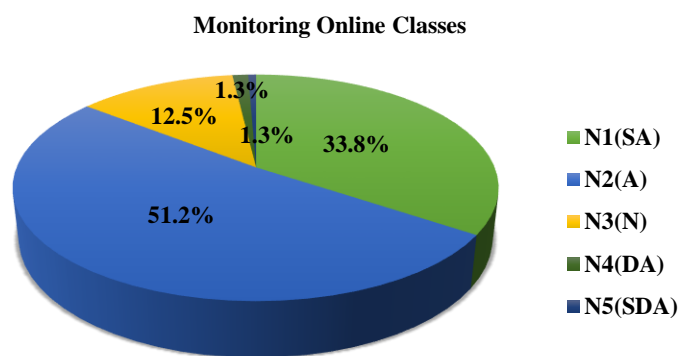


**Fig. 5.10: Weak Infrastructure (IT support)**

### 5.3.2 Monitoring Online Classes

According to Maria et al. (2017), Monitoring can be described as tracking learner’s activities and outcomes. Learners can monitor themselves (self-monitoring) or learners can be monitored by another person, usually by a teacher or an administrator. Monitoring can be activity-centred (process) or outcome-centred (product) (Florian-Gaviria et al., 2013). Monitoring can take place in real-time or post-hoc. Monitoring learners’ performance aims to make trends, patterns, or changes available to stakeholders.

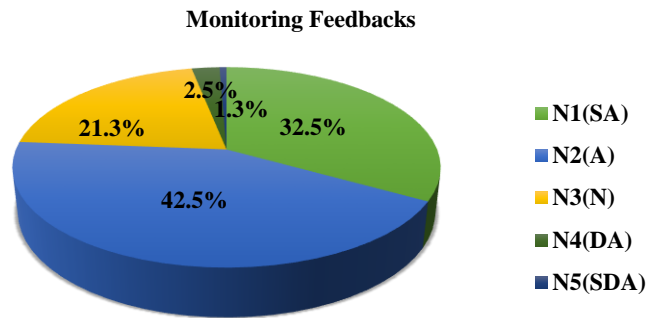
The administration faces a hurdle in supervising online classes, according to the current study. The statement was agreed upon by 85% of students. And the majority of the teachers provide the same response. Also, EC principals stated that supervising online classes is extremely difficult, adding that they have already experienced the corona pandemic.



**Fig. 5.11: Monitoring Online Classes**

### 5.3.3 Monitoring Feedbacks

According to the findings, the management faces a difficult task in continuously monitoring feedback from teachers and students. Figure 5.12 shows that 75 percent of students and all of the instructors agreed with the statement, and one of the principals stated that, “*it is difficult to monitor FC method input if teachers and students are not cooperative.*” According to Jannat et al. (2021), the FC approach's feedback is a critical component for fully exploiting the approach's potential.



**Fig. 5.12: Monitoring Feedbacks**

## 5.4 Summary

Finally, after summarizing the relevant issues and indicators to determine the challenges of implementing the FC approach in ECs using data collected from students, teachers, and principals of ECs, as well as IT experts, it can be concluded that, while ECs face numerous challenges in implementing the FC approach, there is reason to believe that ECs have significant potential to accept the FC approach. The findings are summarized as follows:

- Lack of technical knowledge.
- Paid educational resources
- Unwilling to adapt to new technology
- Updating and re-designing the course contents.
- Choosing appropriate online tools.
- Proper utilization of class time
- Weak infrastructure
- Monitor online classes
- Monitoring Feedbacks

Now, implications FC approach in ECs will discussed in the next chapter.

## Chapter 6

# Major Findings of the Study

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Face-to-face interactions between teachers and students are possible in traditional classroom teaching, which aids in synchronous communication. Teachers in traditional teaching settings can provide immediate feedback to their students on any question, while students are positively influenced by their teacher's personality, behavior, and value system. Virtual classrooms, on the other hand, allow students to learn from anyone, anywhere, at any time. Students in blended learning can always meet in virtual classrooms with their co-students and teachers, regardless of geographical barriers. They can learn and share their knowledge without fear of being mocked. Furthermore, because technological advancements have transformed our world into a global village, students can communicate with experts from other parts of the world and expand their knowledge.

Based on the foregoing, it can be stated that implementing the flipped classroom concept for improving educational quality is in high demand. As a result, a feasibility study for implementing the flipped classroom approach in ECs is critical. In addition, the current study has been conducted to determine the feasibility of the flipped classroom approach. To gather data for the current study, 182 samples were chosen, including 160 students, 16 teachers, 04 principals, and 02 IT experts. After analyzing the collected data, major conclusions about the feasibility of flipped classrooms were reached.

SWOC analysis was successfully incorporated to exemplify the major findings from structured and semi-structured questionnaires, KII, and FGD. The following section will examine the study's major findings in more detail.

### 6.1 SWOC Analysis

A SWOC analysis is a tool for taking a realistic, fact-based, data-driven look at the strengths and weaknesses of an organization, initiative, or industry. The organization must maintain the study's accuracy by avoiding preconceived notions or gray zones and focusing instead on real-world scenarios. Businesses should treat it as a suggestion rather than a prescription. Analysts depict a SWOC analysis as a square divided into four quadrants, each of which is dedicated to a different aspect of SWOC. This visual representation gives a quick overview of the company's current state. Even if not all of the elements under a given subject are equally important, they should all provide important insights into the balance of opportunities and risks, benefits and drawbacks, and so on. As a result, the final results, as shown in Fig. 6.1, have been presented using the SWOC analysis.

According to Fig. 6.1, ECs have significant strengths and opportunities to implement the flipped classroom approach. On the other hand, there were only a few flaws and threats. Furthermore, it may be possible to overcome the weaknesses and threats by implementing some necessary measures and providing proper motivation regarding the benefits of the flipped classroom approach to ensure better education.

## SWOC Analysis

Strength (S)	Weakness (W)
<ol style="list-style-type: none"> <li>1. Personal technological resources are readily available</li> <li>2. Multimedia classrooms that are available</li> <li>3. A high-speed broadband/wi-fi connection</li> <li>4. Access to a large number of free instructional resources</li> <li>5. Access to free apps and online services</li> </ol>	<ol style="list-style-type: none"> <li>1. Inadequate technological knowledge</li> <li>2. A lack of motivation and enthusiasm in utilizing technology</li> </ol>
Opportunities (O)	Challenges (C)
<ol style="list-style-type: none"> <li>1. Increased teacher and student participation in the classroom</li> <li>2. A pleasant learning-teaching environment</li> <li>3. Improved materials based on knowledge</li> <li>4. Gained a deeper understanding</li> <li>5. Creating a trained workforce</li> </ol>	<ol style="list-style-type: none"> <li>1. The frontier of complex management</li> <li>2. Inappropriate internet usage</li> </ol>

**Fig. 6.1: SWOC analysis of feasibility of flipped classroom approach in 04 ECs**

According to the SWOC analysis illustrated in Fig. 6.1, ECs have significant amount of scopes and chances to implement the flipped classroom strategy.

### 6.2 Overall Scenario of the Research Findings

Now, to get more insight of the data complete findings and recommendations from the data analysis tools has been presented in Table 6.1. From Table 6.1 the overall scenario of the analysis from various aspects can be seen.

**Table 6.1: Overall scenario of the research work**

Research questions	Research Finding
What are the scopes of using flipped classroom strategy among the teachers?	100% teachers, 83% students and 100% KIIs have strongly recommended that there is enough scopes and opportunities to implement of flipped classroom approach.
What are the scopes of using flipped classroom strategy among the students?	100% teachers, 84% students and 100% KIIs have identified that flipped classroom approach perfectly suits with the students. It is noteworthy that 98% students are accustomed to use technologies.
What types of facilities are required to introduce flipped classroom learning strategy?	100% teachers, 91% students, 100% KIIs & 100% IT experts opined that sufficient amount of technological supports are already available in ECs. However, additional technical facilities are required (i.e., LMS) to improve the overall outcome of flipped classroom approach.
What are the challenges of implementing the flipped-classroom learning strategy?	100% teachers, 92.1% students, 100% KIIs & 100% IT experts have suggested that despite of technological, pedagogical, motivational and administrative challenges, flipped classroom approach has a great future ahead from the perspective of ECs.



It can be concluded that the purpose of this research work is to provide insight and understanding on the advancement of blended learning in Bangladesh from the standpoint of global trends. It begins with a detailed discussion of various literature reviews and techniques that are currently being used in various sectors. Meanwhile, it also includes the motivations for this work. This work also exemplifies the scope and opportunities of the flipped classroom approach in Bangladesh.

It is hoped that the proposed flipped classroom approach will play an important role in Bangladesh's development through the development of the ECs Education system. Finally, it has the potential to make our nation's father's dream a reality, and Bangladesh will be recognized as a developed country in the world.

# Chapter 7

## Implication and Conclusion

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### 7.1 Implications for Practice

Teachers and students of ECs have been implicated in the proposed Flipped Classroom strategy. Because they are directly benefited by this noble approach. Furthermore, it is very much applicable in practice because the Online Education facility is so much more readily available that teachers and students alike enjoy learning everything through an online platform. Furthermore, distance learning is very important. As a result, the proposed Flipped Classroom approach is extremely effective in ensuring quality education.

#### 7.1.1 Implications for Students

Students in ECs benefit directly from this Flipped Classroom strategy. Furthermore, due to institutional capacity constraints, it is not possible to provide facilities to everyone in the traditional teaching-learning system. As a result, the proposed model will provide the opportunity to take blended courses, which will then be assessed by teachers and skilled.

#### 7.1.2 Implications for Teachers

Teachers from ECs benefit directly from the Flipped Classroom strategy as well. Improved teaching capability, increased knowledge, and improved course content can all be incorporated directly into their teaching mechanism as a result of this approach. As a result, the proposed model will provide the opportunity to teach in a blended mode and thus become skilled.

Finally, it is possible to conclude that the Flipped Classroom approach has the necessary capability to play an important role in the development of the educational environment of ECs.

### 7.2 Implications for Further Research

It is a fantastic effort when research from one direction can be applied to another to create new things. Only the feasibility of implementing the Flipped Classroom approach was examined in this study. As a result, there is a significant opportunity to implement it practically on a larger scale and incorporate the benefits of this approach. Additionally, teaching abilities, student learning abilities, and classroom engagement will be investigated.

So, in order to meet the requirements and necessities of this study, it is planned to implement the entire concept in the classroom alongside the teachers and students at SEC's EEE department.

### 7.3 Conclusion

Many people in Bangladesh today recognize the importance of education reform and innovation. Because ECs are social institutions that serve to meet the needs of society, it is critical for these institutions to meet the challenges of a rapidly changing and unpredictable globalized world. Because of this changing environment, teachers, administrators, researchers, and policymakers must adopt new teaching and learning theories and practices. The

Government of Bangladesh has undertaken some significant projects in recent years, signaling to everyone in the education sector that a revolution is underway.

In the field of education, innovation can take the form of a new pedagogic theory, methodological approach, teaching technique, instructional tool, learning process, or institutional structure. Unquestionably, technology-based education will grow in the future, so ECs in Bangladesh must prepare for educational reforms. According to Massy and Zensky (1995), technology should be used to increase academic productivity. ECs should investigate new technologies that can be integrated into classrooms to improve the quality of the teaching and learning process by conducting appropriate research and experiments. This paper has discussed blended learning, which is an educational program in which students learn at least a portion of the course materials via online delivery of instruction. While students continue to attend traditional brick-and-mortar classrooms, a portion of the course is covered through computer-mediated activities in blended learning. Students in such education programs have some control over the time, place, and pace of their learning. Whatever technology we incorporate into the learning process, the importance of the human element in the overall process is undeniable for its ultimate success.

It has been discussed in this paper how to implement a flipped classroom teaching learning program and what the prerequisites are for its successful implementation at ECs in Bangladesh. It has been discovered that blended learning cannot be successfully implemented in ECs in Bangladesh unless teachers are encouraged to rethink and redesign their courses in order to provide a better learning experience for diverse groups of students. Teachers must understand that the functions of classroom facilities and online tools in the teaching and learning process are very different. Teachers should use online portals to teach additional materials or share resources that, due to time constraints, may not be possible in formal classrooms. E-books, PowerPoint slides, lecture notes, and YouTube videos are some of the resources that teachers frequently share with their students online. Teachers can also create online discussion forums and blogs for their courses, where students can brainstorm and share ideas with their peers. Online quizzes, short exams, and other forms of assessment can also be conducted in virtual classrooms. Furthermore, it is critical for ECs in Bangladesh to create well-structured online learning portals so that students can easily navigate and find the appropriate content. Finally, the benefits of implementing a blended learning program and how innovative teachers can use technology to create "flipped classrooms" at ECs in Bangladesh have been discussed. As a result, integrating blended learning at ECs in Bangladesh is critical, as it incorporates both physical and online learning components to provide a higher quality education for all.

To summarize, the current study's main goal is to determine the feasibility of implementing a flipped classroom approach in ECs. After completing the data collection and computation, it can be stated that ECs have the necessary potential to benefit from the flipped classroom approach.

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### **Further Reading**

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# Appendix

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## Research Questionnaire for Students

<b>Availability/Accessibility Questions</b>	<b>Yes</b>	<b>No</b>
I have access to personal Laptop/Desktop		
I have access to Laptop/Desktop (Institutional)		
I have access to personal Smartphone		
I have access to Internet Connection of moderate speed		
<i>I have used following Apps/Internet Services:</i>		
Social media (WhatsApp/Facebook/Messenger/ etc.)		
Google/Microsoft Form		
Email Services (Gmail/Office 365/Yahoo)		
YouTube		
Google (or any search engine)		

<b>Perception/Opinion Questions (Technology enabled/ Flipped Classroom)</b>	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
I am confident in using Internet services (including Apps mentioned above)					
I am confident in using Internet as an aid to my study					
I am familiarized with blended learning concept					
I am familiarized with flipped classroom learning style					
I am familiarized with online learning management system					

<b>Scopes for the Teachers (Technology enabled/ Flipped Classroom)</b>	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Teachers can teach better when Learning resources are variety of types (e.g., video, simulation, eBooks, soft copy of lecture notes etc.) are used					
Teacher student engagement can be enhanced through online-based activity					
Online Interactive content can greatly enhance teaching capability for teachers in the technical subjects					



<b>Opportunities of Technology enabled/ Flipped Classroom</b>	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Learning resources are better when a variety of types (e.g., video, simulation, eBooks, soft copy of lecture notes etc.) are used					
Classroom engagement can be enhanced through online-based activity					
Online Interactive content can greatly enhance my learning in the technical subjects					
A common learning management system can greatly aid the technical education system					
I will feel more engaged in learning with Flipped classroom approach					

<b>Challenges of Technology enabled/ Flipped Classroom</b>	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Flipped classroom could require additional time and effort for my study.					
I may have to deal with technological challenges in a flipped classroom approach.					
I might overly focus on online technology than my study if Flipped classroom is implemented.					
I might find difficult to adapt a new way of learning other than traditional learning method.					
Online based learning can be a means of distraction to my usual learning style.					
I am concerned about getting sufficient support to adapt flipped classroom approach					

### Research Questionnaire for Students (2<sup>nd</sup> Phase)

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
<b>Availability of Resources</b>					
Learning resources are variety of types (e.g., video, simulation, eBooks, soft copy of lecture notes etc.) are Available					
<b>Scopes for Teachers for Technology enabled/ Flipped Classroom</b>					
Flipped classroom approach enhance technical knowledge for the teachers					
<b>Facilities of Technology enabled/ Flipped Classroom</b>					
Learning Management System is necessary to get the opportunities offered by the flipped classroom approach					
Hardware facilities are available (such as server, optical fiber etc.) in Bangladesh to implement FC approach					

Bangladesh has a large number of experts (such as Networking, web & App developer) with sufficient knowledge					
<b>Challenges of Technology enabled/ Flipped Classroom</b>					
I am concerned about paid educational resources to adapt flipped classroom approach					
I am concerned about updating and redesigning the contents to meet the demand of Flipped classroom approach					
I am concerned about choosing appropriate online tools to meet the demand of Flipped classroom approach					
I am concerned about proper utilization of time in class in Flipped classroom approach					
I am concerned about proper IT support to implement Flipped classroom approach					
I am concerned about proper monitoring of Flipped classroom approach					
I am concerned about proper monitoring of feedbacks of Flipped classroom approach					

### Research Questionnaire for Teachers

01	Do you know about Flipped Classroom approach? Do you tell me some words about Flipped Classroom approach?
02	What is your view to the affordance of flipped classroom in your teaching practice?
03	What are the opportunities of flipped classroom approach in your teaching practice?
04	How can you introduce Flipped classroom approach to your students?
05	What is your view to the affordance of flipped classroom in the perspective of students learning?
06	What are the opportunities of flipped classroom approach in the perspective of students learning?
07	What could be the required skills of flipped classroom approach in your teaching practice?
08	What could be the required skills of flipped classroom approach in students learning?
09	What technological resources are required to implement flipped classroom in your class?
10	What personal technological resources are required to implement flipped classroom for teachers?
11	What personal technological resources are required to implement flipped classroom for students?
12	What could be the Institutional facilities of flipped classroom approach in your teaching practice?
13	What support services (i.e., training, IT) are required to implement flipped classroom in your class?
14	What could be the pedagogical challenges for implementing a flipped classroom approach in your class?
15	What could be the content-based challenges for implementing a flipped classroom approach in your class?
16	What could be the technological challenges for implementing a flipped classroom approach in your class?

## **Focus Group Discussion with IT Experts**

### **FGD # 01**

Presentation and General Discussion on the project (including concepts of flipped classroom, its opportunities, and challenges).

### **FGD # 02**

Discussion on “Learning management system design and development”.

### **FGD # 03**

Discussion on “*IT Infrastructure requirements and available resources to implement flipped classroom in Engineering Colleges*”

### **FGD # 04**

Discussion on “*IT Support services requirements for Flipped Classroom*”.

### **FGD # 05**

Discussion on “*Budget requirements for IT infrastructure and support to implement Flipped Classroom*”.

## **Key Informant Interview**

### **Key Informant: Honorable Principal**

#### **Place: Mymensingh, Faridpur, Barisal & Sylhet Engineering Colleges**

Presentation and General Discussion on the project (including concepts of flipped classroom, its opportunities, and challenges).

Discussion on “Scopes and Opportunities for teachers and students *on implementing Flipped classroom in Engineering colleges*”.

Discussion on “*Technological challenges on implementing Flipped classroom in Engineering colleges*”

Discussion on “*Pedagogical challenges on implementing Flipped classroom in Engineering colleges*”

Discussion on “*Support services requirement for Flipped Classroom*”

Discussion on “*Administrative and Governance Challenges for Flipped Classroom*”