



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Islamic University of Technology (IUT)



Engineering students' perception and practice on social distancing and its impact on learning satisfaction amid COVID-19 pandemic

BY

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Dedication

This work is dedicated to my lovely parents, family, all my relatives and friends for their support and courage in terms of guidance towards my studies.

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All praise is due to Almighty Allah Ta'ala for providing me the opportunity and ability for completing this study which demanded keen concentration, prolonged patience and mental effort. First and foremost, I just feel grateful to and wish to acknowledge my profound indebtedness to **Dr. Md Abdullah Al Mamun**, Professor of Department of Technical and Vocational Education (TVE), Islamic University of Technology (IUT). His deep knowledge in the field of research influenced me to carry out this thesis up to this point. His endless patience, scholarly guidance, continual encouragement, constant supervision, constructive criticism, valuable advice, reading many inferior drafts and correcting them at all circumstances have made it possible to come to this stage.

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Declaration

I am hereby declaring that this thesis document which is submitted to the partial fulfillment of the degree of Master of Science in Technical Education (Specialization in Electrical and Electronic Engineering) is an original work of me, Md. Md. Hamid Uddin Bhuiya, a student of Department of Technical and Vocational Education (TVE), Islamic University of Technology (IUT), and has not or never been submitted for any other degree to any university or institution.

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Abstract

It would be interesting to look at how students are thinking about the concept of social distancing and how they practice on it during the pandemic. In this regard, this research attempts to investigate students' perception and practice of social distancing and how it affects their learning satisfaction. Data were collected through quantitative survey method. 243 responses have been collected by using survey through Google Forms from three Engineering Universities of Bangladesh. These three engineering universities have been chosen from the category of International, Public and Private universities of Bangladesh. Convenient sampling technique was used for selecting the participants.

This study reveals how the engineering students' perceptions and practices about social distance affect their learning experiences and satisfaction in Covid-19 situations. The perceptions of engineering university students towards online learning during the ongoing COVID-19 epidemic can provide insights into the usefulness, self-efficacy, ease of use, and students' behavior related to online learning. The results can potentially show whether students adhere to social distancing in pandemic situations and whether there has been any change in their protective behavior and whether this led to the learning satisfaction.

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Chapter 1 Introduction

1.1 Background of the study

The COVID-19 pandemic presents a great challenge to all societies. Governments have implemented policies aimed at controlling human behavior and social habits to prevent the spread of the virus. Citizens all throughout the world are urged to practice "social distance" often known as "physical distance" to limit the spread of COVID-19 virus (Pedersen & Favero et al., 2020).

Before the outbreak of COVID-19 we learned that social distance is an important way to prevent the spread of the virus. Most experts refer to it as "social distance", but it is better to call as "physical distance". People are isolated from a social gathering. People infected with the virus are less likely to spread it if they keep their distance from others (Jonathan M. Miller & Elana Pearl Ben-Joseph, 2021).

Maintaining a social distance of 1.5 meters between humans can help prevent the spread of most respiratory infectious diseases. One of the most effective ways to slow down the spread of the virus by airborne droplets is to maintain social distance. By maintaining this distance, we can prevent the spread of the virus. Wearing a mask, washing your hands frequently, and disinfecting your hands with alcohol will all help prevent the spread of the virus. The World Health Organization (WHO) recommends that governments improve case detection, tracking and communication, practice isolation from close friends and control the disease, enforce traffic control and suspend public gatherings (El-Guebaly et al., 2020).

According to health authorities and experts, maintaining physical distance from others and avoiding crowds are important to reduce the spread of COVID-19 (WHO, 2020). It has affected every aspect of life including education. As a result, educational institutions and universities are being forced to close. The shutdown has placed a heavy burden on academic institutions to deal with the dramatic changes in online education from conventional learning setup (Al Mamun, Hossain, et al., 2022). During this time, outbreaks tend to be more common. Most governments have restricted the use of synchronous or asynchronous methods of education. More than 190 countries around the world have suffered the worst educational catastrophe in history (Almahasees et al., 2021).

Bangladesh was no exception, as the Bangladesh government imposed a nationwide lockdown and closed all educational institutions and universities. The government has decided to study online instead of face-to-face classes so that students do not lag in learning activities (Al Mamun, Hossain, et al., 2022).

Online education is a strategy to prevent outbreaks and maintain social distance. Online learning provides essential learning tools and students can access online platforms at their convenience. It also offers flexibility, regardless of place and time. It also gives students questions, answers freely, and provides feedback on the assigned courses' content (Rosell, 2020).

In many countries, online education has become the norm for higher education institutions during the COVID-19 epidemic. Bangladesh has responded to the constraints presented by the worldwide epidemic by putting in place a comprehensive online education system. Different higher education institutions have different policies for online learning, which may include synchronous lectures or asynchronous, delayed activities to aid students' learning (Navarro et al., 2021). An online learning platform called, in higher education, the Learning Management System (LMS) is widely used to manage and improve learning activities in different countries. Online learning management system (LMS) has many benefits for students, teachers and academic staff. For example, they can review lectures, give feedback, answer exams, do assignments, discuss, and socialize. There are available options for higher education in situations in terms of using LMS, such as ANGEL, BBlearn, Canvas, Desire2Learn, Moodle, Sakai, Google Classroom and others. These LMS are widely used, especially in engineering universities and institutes of Bangladesh.

In general, these services have some key features, such as organizing different types of learning content, providing different communication options, and restricting access to authorized persons.

1.2 Problem statement

The recent outbreak of the COVID-19 pandemic imposed a countrywide lockdown and forced education institutes of Bangladesh to shift to an internet-based distance learning mode (Al Mamun, Hossain, et al., 2022). The Bangladesh government has suspended all types of face-to-face classes to reduce COVID-19 and maintain social distance across the country. As a result, all physical classes are transferred to online-based classes. All the engineering

universities conduct classes through an online platform such as Google Meet, Zoom, LMS etc. Therefore, engineering students can continue their educational activities while maintaining social distance.

Social distancing means physical distance from one person to another person to reduce virus or any type of epidemic like COVID-19 (CDC, 2020). In Bangladesh, we are familiar with traditional teaching methods. From elementary school to higher education, all classes are conducted face to face although our education system follows the conventional method. Therefore, the abrupt shifting of the classes from face-to-face to a distance online mode creates complexities in students learning as well as to their life. Students are now missing from their daily routine the vibrant university campus life that provides various group recreation activities, interaction, and a feeling of social bonding (Munawara et al., 2020).

Due to social distancing, students are struggling in several aspects of their life. First, it hampers normal learning process of the students. Social distancing inherently creates a sense of isolation. This leads students to struggle to keep their motivation towards learning. Research shows that social distancing not only part students from the physical interaction, but it also deprived them to get immediate feedback from peers and teachers that makes learning extremely difficult (Fidalgo et al., 2020). Also, it is not possible to conduct all engineering lab courses on the Internet.

The second issue is more sensitive that relates to the physical and psychological wellbeing of the students (Al Mamun, Hossain, et al., 2022). Research shows that the absence of social and physical interaction has adverse effects on students' wellbeing (Twenge, Spitzberg, & Campbell, 2019). Also, COVID-19 pandemic generates fear among people which leads to depression, stress, anxiety, and other psychological and mental health issues due to social distancing (Sakib et al., 2020).

The third issue is more common in the developing countries which is having a poor internet connection and inadequate digital technology (Agarwal & Kaushik, 2020). Altogether, social distancing brings a lot of complexities into students' educational and personal life. Thus, it would be interesting to look at how students are thinking about the concept of social distancing and how they practice on it during the pandemic.

1.3 Research Objectives and research questions

The purpose of this research is to study the engineering students' perceptions and practice of social distancing and how it influences their learning satisfaction. Specific objectives of this study are:

1. To assess students' perceptions of social distancing during COVID-19 pandemic.
2. To assess students' practice on social distancing during COVID-19 pandemic
3. To study the effects of social distancing on student learning satisfaction.

To address the above research objectives, the following research questions have been investigated-

RQ1: What perception do the students hold about the social distancing?

RQ2: To what level do the students demonstrate the social distance practice?

RQ3: How well do the perception and the practice of social distance predict student learning satisfaction? How much variance in learning satisfaction scores can be explained by the perception and the practice of social distance?

RQ4: Which is the best predictor of student satisfaction: perception of social distance or practice of social distance?

1.4 Significance of the study

The purpose of this research is to study the engineering students' perceptions and practice of social distancing and how it influences their learning satisfaction. In this regard, this research attempts to investigate students' perception and practice of social distancing and how it affects their online learning satisfaction. This study might reveal how the engineering students' perceptions and practices about social distance affect their learning experiences and satisfaction in Covid-19 situations.

1.5 Conclusion

The perceptions of engineering university students towards online learning during the ongoing COVID-19 epidemic can provide insights into the usefulness, self-efficacy, ease of use, and students' behavior related to online learning. The results can potentially show whether students adhere to social distancing in pandemic situations and whether there has been any change in their protective behavior. Finally, the relationship between social distance perception, behavior

and online learning satisfaction of engineering students may help administrators and teachers to tailor the online learning instruction effectively amid COVID-19 pandemic.

Chapter 2 Literature Review

2.1 Introduction

This chapter relates the study to engineering students' perception and practice of social distance and how it affects learning satisfaction during COVID-19 epidemic situations in the study area with related literature to identify existing gaps based on various related topics to study and fill in the gaps identified.

2.2 Perception on social distancing

The Covid-19 outbreak, which appeared in 2020 and affected millions of people in 2021, is a case in point. One of the most effective ways to limit COVID-19 transmission in these situations is to keep more interpersonal, social distance than usual, including wearing a mask. While the situation is improving due to vaccination options, it is strongly recommended to maintain a great interpersonal distance and to wear a mask to manage the Covid-19 outbreak. So far, we do not have enough vaccines to protect everyone, and we do not know how many vaccinated people are at risk of infection. Therefore, it is important to understand what factors drive individuals to control interpersonal distances. As a result, it's crucial to figure out what influences people's interpersonal distance regulation (Iachini et al., 2021).

Non-pharmaceutical remedies such as social distancing and lockdown, which are specifically intended by local governments to limit the danger of virus transmission, are being implemented. They minimized physical contact, which was especially important during the ongoing pandemic, and are therefore capable of lowering risk factors. The social isolation and lockdown that occurred in many countries, on the other hand, had a negative impact on the daily life activities (De Vos, 2020). Despite effective precautions, the outbreak continues to necessitate significant additional work to contain and eliminate it (Ahmad, 2020).

The Bangladesh government, like many other countries, opted to impose limitations on numerous parts of life in attempt to flatten the infection curve. Universities were unexpectedly closed in March 2020, and classroom instruction was switched to distance learning. Students and lecturers, in particular, in higher education, are unable to join in the classrooms, and they must respond to changing conditions by developing alternate tactics, such as using online learning (Simamora, 2020). Teachers were asked to supply learning materials online so that

students may study at home on their own. Strict norms for social distancing were developed, resulting in a significant decrease in social engagement in general.

Researchers alluded to the possible influence of social distancing techniques and distance learning students' emotional reactions and wellbeing, particularly among younger students, as a result of these abrupt and unprecedented shifts (Flack et al., 2020).

Indeed, studies conducted among educational stakeholders prior to the first lockdown revealed neither students, teachers, nor guardians were prepared to cope with this unforeseen event and deal with such new obstacles (Letzel et al., 2020).

According to Huber & Helm et al., (2020), the majority of the student's report feeling stressed as a result of distant learning. Despite their stress, most students do not mention specific obstacles and simply take learning challenges into account, leaving out the problem of social separation.

Flack et al., (2020) identified risk factors for students' psychological and educational well-being during eLearning from the perspective of a teacher. Other studies may be able to validate these findings of unpleasant emotional experiences as a result of remote learning. Mælan et al., (2021) show that students are more likely face-to-face education, and that distance learning reduces their well-being. Specifically distance learning imposes high mobile connectivity rate among the students which can influence students' mental health (Nishat et al., 2021).

2.3 Compliance and practice on social distance

According to Yanti et al., (2020) health behavior is influenced by internal factors, including knowledge, perception, emotions, and motivation, and external factors (the physical and non-physical environment). Cognitive knowledge is a very important domain for the formation of an individual's behavior. Knowledge of social distancing will underline attitudes towards taking preventive actions and influence behavior

Socioeconomic distancing is one non-pharmaceutical intervention that can be used to prevent the virus from spreading from an infected case to a susceptible case by arguing for physical distance between people or decreasing the amount of time people congregate in public places such as universities and workplaces (Ahmed et al., 2018).

A comparison of student experiences about social distancing finds significant differences. Their experiences are typically categorized into two categories: positive and negative. Some

students, for example, emphasized the advantages of online learning (saving, easy access to free educational materials, and good lectures), while others raised concerns about lesson administration as well as socioeconomic challenges of the student population's characteristics. COVID-19 arrived abruptly, and some students were simply unable to study from home due to a lack of private space or suitable computer equipment. This suggests that throughout the COVID-19 outbreak, education did not appear to be homogeneous (Rotar-Pavlic et al., 2022).

During the COVID-19 outbreak, anxiety and despair tended to rise among the students. Mental distress caused by epidemics is very well documented. Self-isolation and staying at home can result in less social interaction, inadvertent changes in daily routines, sleep problems, as well as mental discomfort symptoms. The quarantine system was linked to higher levels of stress, despair, disorientation, loneliness, and anxiety (Brooks et al., 2020). Policymakers and healthcare practitioners have been concerned about how to find a compromise between epidemics reduction and other damage limitations in the public health system.

Compliance with severe social distancing restrictions may raise psychological suffering, according to a prior study into the SARS-CoV-2 pandemic, which revealed that quarantine compliance increased psychological anguish (Chevance et al., 2020). However, it is unclear how adherence to social distance will cause mental health problems in this contagious disease pandemic, where disease prevention mainly relies on non-pharmaceutical treatments and social distance, as these measures will dramatically affect the population's behavior and daily functioning (Zhao et al., 2020).

2.4 Online Learning Satisfaction

During the current pandemic period of COVID-19, the latent motive of maintaining social distancing is leading to be one of the prime reasons for the students to get enrolled in online courses. However, it is also important to understand the quality of e-learning and the satisfaction level of learners during this forceful shift toward e-learning amid the pandemic of COVID-19 (Saxena et al., 2021).

Students' perceived learning and satisfaction together can represent a better understanding of online learning success (Gray & DiLoreto, 2016). There is a correlation between students' overall perception and satisfaction in online learning. Online learning increases students' motivation and satisfaction levels. Students' motivation is an important element of a successful learning outcome in both offline and online learning (Baber, 2020).

In the context of the COVID-19 pandemic, adopting e-learning has become the only way of transmitting knowledge worldwide, as social distancing is the only way to reduce the spread of the disease. In this regard, a plethora of research has been done to formulate a successful online learning which can be blended with face-to-face learning, such as flipped learning (Al Mamun, Azad, et al., 2022). This type of pedagogical approach can help students adhere to social distancing and self-defense behavior in pandemic situations (Prachthauser et al., 2020).

Direct lectures, teacher-learner interactions, internet self-efficacy, and online learning motivation influences online learning and its can improve student satisfaction and performance (Rahman et al., 2021). Student learning outcomes are positively contributing to student satisfaction in the online environment (Ikhsan et al., 2019).

The changes in the participants' attitudes toward online learning and the relationships between their self-regulated learning capability, online interactions, attitudes, and online learning intention fostering students' ability to control their learning (Al Mamun et al., 2020; Al Mamun, Lawrie, et al., 2022; Mamun, 2022). Such practice may lead to students' positive online learning experiences, improve their attitudes toward online learning, and increase their willingness to undertake online learning in the future (Zhu et al., 2020).

The ease of access and favorable outcomes are driving an increase in online learning adaptation (Saidu & Al Mamun, 2022). Online technology improves learning for both teachers and students by providing more opportunities to learn new topics (Ali, 2018).

According's to Alhumaid et al., (2020) educational institutions prefer digital platforms for information sharing. For universities, knowledge is a property, and they want to transmit it through all modes of communication. In today's worldwide world, using technology for information, knowledge, and learning became a must. Academic management at both the graduate and undergraduate levels prefer online platforms for a variety of educational goals. With the advent of Learning Management Platforms, educational institutions are given special emphasis to online systems in order to allow knowledge transfer in the best way feasible.

Although traditional communication tools are more important, one-third of the worldwide population chooses to communicate over digital platforms in order to improve communication and engagement experiences. The presence and significance of networking sites are indisputable in entering into a new age of communications (Alghizzawi et al., 2020).

Assar (2015) argued that the acceptance by learners and instructors is a main factor of integrating ICT into the learning process. When individuals view online learning to be simple to use and accessible, they use digital technology to their advantage in order to improve the whole educational experience (Saidu & Al Mamun, 2022). Because of the perceived simplicity of use and accessibility, they are able to keep up with digital learning, resulting in higher outcomes. With the growth of internet technology, web-based systems are facilitating engagement and communication. Users' impressions of online communication are favorable, boosting their reliance on web-based communication. For this reason, social media platforms such as Facebook, WhatsApp, Skype, Zoom, and others, which provide convenience of use and benefit communication in general, are used (Huang et al., 2019).

Digital media greatly simplifies the communication, engagement, and information-gathering processes. Researchers routinely debate and emphasize the usage and integration of multiple technologies in education, which helps the learning process even further. It is an efficient method of building metacognitive skills that can help both teachers and students and enhance their relevant experiences (Alhumaid et al., 2020). Because mobile devices are commonly accessible and simple to use, the majority of the students access eLearning sites through them. Students also perceive the mobile hardware and software components of their devices to be major determinants of eLearning access. Almost all undergraduate and postgraduate-level institutes choose mobile-based eLearning. These devices are simple to operate and improve accessibility. Today, every student owns a personal mobile phone, tablet, laptop, or desktop computer, and they prefer eLearning as a major part of an educational routine. This was also confirmed by Zachos et al., (2018), as they examined eLearning usage among learners and lecturers in order to improve their educational experiences.

According to Salloum et al., (2020), the perceived utility of technology is a significant predictor of its integration and adoption, Adopting and integrating technology improves the pedagogical education and learning process.

In recent years, eLearning has emerged as a revolutionary model of current education that has transformed the process of acquiring and disseminating knowledge between students and teachers. As a result, information and communications technology (ICT) transformed the learning system from a traditional classroom to an e-learning environment, which improves the availability of information, accountability, self-pacing, and the transfer of better consistent content, including a variety of learning resources, among other things (Aldowah et al., 2019).

However, according to the findings of the case study Flavell et al. (2019) state that the potential of academic development to enable adaptive reactions to ongoing technological changes is dependent on the ability of academic progress.

2.5 Conclusion

This chapter reviews the literature related to students' perception and compliance with social distancing and learning experience with online learning during COVID-19. It begins with an explanation of the social distance perception and practices of the findings related to students' satisfaction with online learning. Relevant studies on how students are experiencing learning face-face and online environments are also reviewed.

Chapter 3 Methodology

3.1 Introduction

This study used a cross-sectional survey instrument to examine the relationship between students' perception of social distancing, how they are obeying the social distancing rules and how the perception and practice impact their online learning satisfaction. Quantitative research methods used in this study because it is effective in gathering population data and the results can be generalized to a larger population. The study conducted in three engineering universities of Bangladesh as the information obtained from them can be used to represent other universities in Bangladesh.

3.2 Research Model and Hypothesis Development

This study conceptualize the following research model to investigate engineering students' perception and behavior about social distancing and how it affects their online learning approaches.

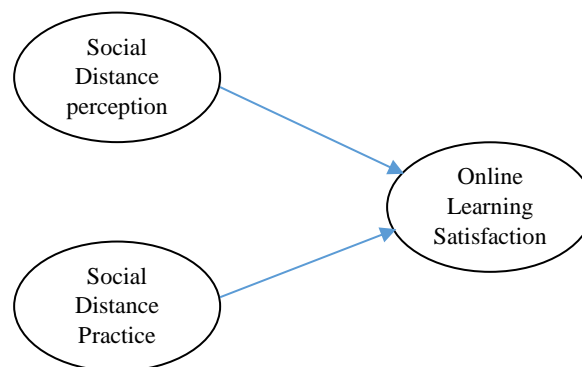


Figure 1: Research Model

The following research questions will be investigated to achieve the objective of this study-

RQ1: What perception do the students hold about the social distancing?

RQ2: To what level do the students demonstrate the social distance practice?

RQ3: How well do the perception and the practice of social distance predict student learning satisfaction? How much variance in learning satisfaction scores can be explained by the perception and the practice of social distance?

RQ4: Which is the best predictor of student satisfaction: perception of social distance or practice of social distance?

3.3 Research Context and Sampling

Due to the COVID-19 epidemic, numerous higher education institutions were forced to shift from traditional face-to-face education to an online model. Planning that is both prompt and comprehensive is necessary if there is to be any hope of mitigating the potentially devastating effects of epidemics on the education system, which has historically been student-centered, project-based, and design-focused. We chose students from three Bangladeshi engineering universities to help improve online engineering education throughout the outbreak. The three engineering universities of Bangladesh are-

1. Islamic University of Technology (International)
2. Rajshahi University of Engineering and Technology (Public)
3. North South University (Private)

These universities included both male and female students irrespective of the year of their studies and specialization. In order to accomplish the sample procedure, stratified sampling has been used. Some of the characteristics that are shared by the population are used in the construction of the strata. The researcher will first stratify the population before selecting a random sample that is proportional to the population. The most essential advantage of using a basic random sampling method is that it ensures a significant portion of the research population is represented in the sample. This sampling approach gives sample characteristics that are proportionate to the whole population. Stratified sampling used based on three types of universities (e.g., International, Public and Private universities) in Bangladesh.

A type of non-probability sampling strategy known as convenience sampling has been used to select the participants on the basis of how "convenient" they are to be accessible. Convenience sampling is straight forward sampling and research, ideal for pilot testing and hypothesis development; data obtained can be simplified quickly and affordably. The convenient sampling strategy was applied to select 300 students as a sample to study perception, behavior, satisfaction about social distancing of engineering students. Out of 300 participants, 100 students from Islamic University of Technology (International University) and 200 students from Rajshahi University of Engineering and Technology (Public University) and North South University (Private University) have been selected.

3.4 Survey Instrument Development

The survey questionnaire will be made up of three sections based on the research model. The questionnaire used a Likert scale with five points that range from strongly agree to strongly disagree (McLeod, 2008). We are developing a Social Distance Perception scale (SDP) and adopted 9 items from Khan et al., (2021). This study is also developing a Social Distance Compliance scale (SDC) and adopted 10 items from Prachthauser et al., (2020). Lastly, this study is developing an Online Learning Satisfaction scale (OLS) that adopted 2 items from Udo et al., (2011) and 7 items from Rahman et al., (2021).

3.5 Data Collection

This study only able to collect from 243 students out of 300 students the research reached. Due to the outbreak, the survey questionnaire has provided online in Google Form. The researcher had contacted some volunteers who assist to deliver the survey on behalf of the researcher. Some of the teachers and students of the selected three universities were volunteered to distribute the survey questionnaires on behalf of the researcher.

3.6 Data Analysis

This study used three different types of statistical analysis such as descriptive analysis, Regression analysis and MANOVA. Descriptive statistics are necessary since it would be difficult to observe whatever the data was showing if we simply presented it as raw data, especially if the dataset is too big. As a consequence of this, descriptive statistics enable us to present the data in a meaningful manner, which in turn makes the understanding of the data much simpler.

A statistical approach called regression analysis is used to examine the predictive power of the independent variables to explain the dependent variables of the theoretical constructs. The use of regression analysis is a useful method for determining whether variables have an impact on a specific subject. Using regression analysis, a researcher can determine which aspects are the most important, which components can be ignored, and the reasons why these variables interact with one another.

Multivariate analysis of variance, also known as MANOVA, is a method of statistical analysis that analyzes the means of many variables simultaneously. It is referred to be a multivariate

procedure when there are multiple dependent variables, and it is generally followed by statistical significance of each dependent variable on its own.

The Statistical Package for the Social Sciences (SPSS) software will be utilized in order to carry out the data analysis. Regression analysis will be used to determine the correlations between the Social Distance Perception (SDP), Social Distance Compliance (SDC) and online learning satisfaction (OLS). Multivariate analysis of variance (MANOVA) will be used to compare between the different demographic variables on different components of the research model.

3.7 Ethical Declaration

The consent has taken from the participant before collecting the data. The identities and opinions of the participants will be protected and kept anonymous during and after the research. This research does not collect any personal data nor intentionally engage in any harmful activities. The collected data will not be available for public access. At any point during the course of the investigation, the participants were allowed to terminate their involvement in the study.

Chapter 4 Data Analysis and Results

4.1 Introduction

The data collected in this study has been analyzed quantitatively. The data was analyzed by Statistical Package for Social Sciences (SPSS), a popular software in social science for statistical analysis. For general understanding, the output of this research was interpreted by using descriptive statistics (frequency and percentages, normality test, histograms, normal Q-Q plots and box plots). Reliability coefficient has been measured to understand the internal consistency of the items. Finally, multiple regression and MANOVA has been utilized to address the research questions mentioned in the Method chapter.

4.2 Descriptive statistics

4.2.1 Description of the demographic information

Table 1: Summary of the participants' demographics

Demographic	Category	Frequency n=243	Percentage
Gender	Male	203	83.5
	Female	40	16.5
University	Islamic University of Technology (International)	110	45.3
	Rajshahi University of Engineering Technology (Public)	77	31.7
	North South University (Private)	56	23
Place	Urban	185	76.1
	Rural	58	23.9
Age	Below 20	29	11.9
	21-25 Years	188	77.4
	26-30 Years	16	6.6
	Above 30 Years	10	4.1
Educational Level	Undergraduate 1st Year	84	34.6
	Undergraduate 2nd Year	72	29.6
	Undergraduate 3rd Year	25	10.3
	Undergraduate 4th Year	40	16.5
	Postgraduate	22	9.1

Table 1 shows the summary of the demographics of the participants. In the case of Gender, male participants (83.5%) are far higher than the female participants (16.5%). In the case of university, 45.3% undergraduate students responded from IUT, 31.7% undergraduate students responded from RUET and 23% undergraduate students responded from NSU. Most of the students are living in Urban area (76.1%) compared to rural area (23.9%). In case of Age, most of participants are aged between 21-25 years (77.4%). In terms of the educational level, highest

participants are the 1st year students (34.6%) whereas the least participants are the postgraduate students (9.1%).

4.2.2 Percentage and frequency of the individual items

Following Table 2 shows the percentage and frequency of the individual items.

Table 2: Percentage and frequency of the individual item

Social Distance Perception (SDP)		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
		Percentage (Frequency)				
SDP1	I believe social distancing will help protect me from getting the novel coronavirus	27.2% (66)	50.2% (122)	16.5% (40)	4.9% (12)	1.2% (3)
SDP2	I believe social distancing will help protect the vulnerable and medically weak people from getting coronavirus	35% (85)	54.7% (133)	6.2% (15)	3.7% (9)	0.4% (1)
SDP3	I believe that social distancing will protect my place from having too many cases of COVID-19 in hospital at once	29.6% (72)	55.1% (134)	11.1% (27)	2.5% (6)	1.6% (4)
SDP4	I think I should skip/miss to meet up with my family and friends if they are at a different location	19.8% (48)	44% (107)	18.1% (44)	15.6% (38)	2.5% (6)
SDP5	I think I will get too bored during the time of social distancing*	21% (51)	38.3% (93)	24.3% (59)	11.5% (28)	4.9% (12)
SDP6	I think the authorities should restrict personal liberty rights and free movement of the people to restrict the spread of novel coronavirus	14% (34)	39.9% (97)	23.5% (57)	18.9% (46)	3.7% (9)
SDP7	I think the decisions that have been made by the Government to reduce the spread of the novel coronavirus are fair	9.1% (22)	33.7% (82)	28.4% (69)	23.5% (57)	5.3% (13)
SDP8	I think the authorities should relax the restrictions even if there are still many new cases of COVID-19 emerging*	10.7% (26)	18.9% (46)	17.7% (43)	39.9% (97)	12.8% (31)
SDP9	I think 14 days quarantine is an effective way to stop spreading the novel corona virus	24.7% (60)	47.7% (116)	17.3% (42)	7.4% (18)	2.9% (7)
SDC1	During pandemic, I have stayed at least 3 feet away from other people when outside of my home.	15.6% (38)	32.1% (78)	24.3% (59)	16.5% (40)	11.5% (28)
SDC2	During pandemic, I stop shaking hands with other people like friends, relatives, and neighbors.	32.9% (80)	29.2% (71)	18.5% (45)	9.5% (23)	9.9% (24)
SDC3	During pandemic, I have taken the online delivery service without going to the grocery store/restaurant.	23.9% (58)	26.3% (64)	24.7% (60)	11.5% (28)	13.6% (33)
SDC4	During pandemic, if guests/relatives come to our house, I rarely meet with them.	13.2% (32)	17.7% (43)	21.4% (52)	22.6% (55)	25.1% (61)
SDC5	I practice social distancing and follow the social distance guidelines at all situations	27.2% (66)	37.9% (92)	22.2% (54)	9.1% (22)	3.7% (9)
SDC6	I stay at home when sick or have a cold (or intending to stay if situation occurs)	40.3% (98)	39.9% (97)	11.1% (27)	4.1% (10)	4.5% (11)
SDC7	I Isolate myself at home (or intending to isolate if situation occurs) when I have high temperature or continuous cough until symptoms stop	39.1% (95)	32.9% (80)	15.6% (38)	8.2% (20)	4.1% (10)

SDC8	I isolate myself for 14 days (or intending to isolate if situation occurs) when I have the symptoms or get affected by the corona virus	37% (90)	31.7% (77)	17.3% (42)	6.6% (16)	7.4% (18)
SDC9	I shop only for basic necessities as infrequently as possible when necessary	35.8% (87)	37.9% (92)	16% (39)	4.9% (12)	5.3% (13)
SDC10	I stay at home except for essential shopping, exercise, medical need, study or work where I cannot do these from home	34.2% (83)	39.9% (97)	11.9% (29)	7% (17)	7% (17)
OLS1	I am satisfied with my participation in online learning due to pandemic	9.9% (24)	32.1% (78)	19.8% (48)	25.9% (63)	12.3% (30)
OLS2	I feel that my experience with online learning has been enjoyable	10.7% (26)	24.7% (60)	22.2% (64)	26.3% (64)	16.1% (39)
OLS3	I am satisfied with the online instructional/teaching styles of the teachers during Covid-19 pandemic.	12.8% (31)	25.1% (61)	25.9% (63)	19.3% (47)	16.9% (41)
OLS4	I am satisfied with the learning contents and course content designed for online classes during Covid-19 pandemic	8.6% (21)	30.5% (74)	23.9% (58)	22.6% (55)	14.4% (35)
OLS5	I am satisfied with the teachers and online platform (LMS, Google Classroom, Moodle, Google Meet, Zoom Meeting etc.).	11.1% (27)	36.2% (88)	20.6% (50)	17.3% (42)	14.8% (36)
OLS6	I am satisfied to interact with the teachers and students in online during the pandemic.	11.1% (27)	29.2% (71)	21% (51)	21.8% (53)	16.9% (41)
OLS7	I am satisfied with the exams conducted online during Covid-19	14.4% (35)	23.9% (58)	18.9% (46)	19.8% (48)	23% (56)
OLS8	I am satisfied with the lab classes conducted online.	4.9% (12)	12.3% (30)	15.2% (37)	24.3% (59)	43.2% (105)
OLS9	Overall, I am satisfied with online classes during Covid-19.	11.5% (28)	27.6% (67)	18.9% (46)	19.8% (48)	22.2% (54)

Table 2 shows percentage and the frequency of the individual items. The first construct is Social Distance Perception (SDP). In this construct only in item SDP8, more than 50% of students do not agree that the authority's restrictions should be relaxed, despite the fact that there are currently several new cases of Covid-19. The second construct is Social Distance Compliance (SDC), in this construct the notable findings coming from item SDC4, which showed only fewer students (13.2%) strongly agree that they don't prefer guests/relatives to come to their homes; and if come they rarely meet with them. The third construct is Online Learning Satisfaction (OLS), in which students strongly disagree regarding the satisfaction with the lab classes conducted online. Thus in item OLS8, 43.2% students showed their dissatisfaction regarding the online lab classes.

4.2.3 Descriptive Statistics of the individual item

Table 3: Descriptive statistics of the individual items

Items		Mean	Mode	Std. Deviation	Skewness	Kurtosis
Social	SDP1	3.97	4	.864	-.873	.943
Distance	SDP2	4.20	4	.747	-1.126	2.161
Perception	SDP3	4.09	4	.806	-1.209	2.603
(SDP)	SDP4	3.63	4	1.046	-.567	-.441
	SDP5	3.59	4	1.093	-.583	-.275
	SDP6	3.42	4	1.062	-.372	-.647
	SDP7	3.18	4	1.059	-.170	-.740
	SDP8	2.75	2	1.212	.423	-.879

	SDP9	3.84	4	.976	-.908	.648
Social	SDC1	3.24	4	1.233	-.331	-.860
Distance	SDC2	3.66	5	1.293	-.718	-.551
Compliance	SDC3	3.35	4	1.326	-.405	-.921
(SDC)	SDC4	2.71	1	1.363	.248	-1.157
	SDC5	3.76	4	1.065	-.701	-.060
	SDC6	4.07	5	1.042	-1.343	1.548
	SDC7	3.95	5	1.118	-.968	.188
	SDC8	3.84	5	1.206	-.950	.053
	SDC9	3.94	4	1.095	-1.096	.734
	SDC10	3.87	4	1.166	-1.089	.439
Online	OLS1	3.01	4	1.215	-.107	-1.077
Learning	OLS2	2.88	2	1.254	.070	-1.072
Satisfaction	OLS3	2.98	3	1.279	-.073	-1.051
(OLS)	OLS4	2.96	4	1.207	-.127	-1.015
	OLS5	3.12	4	1.251	-.335	-.997
	OLS6	2.96	4	1.279	-.090	-1.134
	OLS7	2.87	4	1.387	.041	-1.291
	OLS8	2.12	1	1.231	.824	-.466
	OLS9	2.86	4	1.346	-.017	-1.266

Table 3 shows that in item SDP8, less students ($M= 2.75$, $SD= 1.212$) agreed on the statement that authority's restrictions about the social distance policy should be relaxed . Similarly, Social Distance Compliance item SDC4 shows that fewer students (Mean = 2.71, $SD =1.363$) meet the guests/relatives when they come to their homes. Further, all the items in table 3 shows that no item has been violated the normality of the data as all the items have acceptable Skewness and Kurtosis values ranged from -3 to +3 and -10 to +10, respectively.

4.2.4 Reliability, outliers and normality of the data

Table 4: Reliability and descriptive statistics of the theoretical constructs

Constructs	Mean	5% Trimmed mean	Min	Max	Std. Deviation	Skewness	kurtosis	Reliability
Social Distance Perception	32.658	32.745	16	45	4.410	-.360	.986	.704
Social Distance Compliance	36.395	36.793	10	50	7.556	-.871	.971	.833
Online Learning Satisfaction	25.749	25.698	9	45	9.516	-.062	-.897	.944

Table 4 shows reliability and descriptive statistics of the theoretical constructs of the research model. Initially, first construct violates the alpha value, the result was below the 0.7. However, removing the items SDP5 and SDP8, the alpha value becomes 0.704. The other two constructs show alpha value 0.833 and 0.944 respectively. Thus, all the items of the three constructs are showing a very good internal consistency. Alpha value more than 0.7 is considered as good

internal consistency of the items. The range of skewness values was between -0.871 and -0.62, indicating that the data was normally distributed. Alternatively, the result for kurtosis ranged between -0.897 and 0.986 also showed the normality of the data.

Table 5: Assessing the normality of the data

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Social Distance Perception	.091	243	.000	.984	243	.007
Social Distance Compliance	.101	243	.000	.953	243	.000
Online Learning Satisfaction	.069	243	.006	.971	243	.000

a. Lilliefors Significance Correction

Table 5 further shows the normality of the data as Kolmogorov- Smirnov test and Shapiro-Willk test both are below 0.05 ($p < 0.05$). Therefore, the data is normally distributed.

Social Distance Perception:

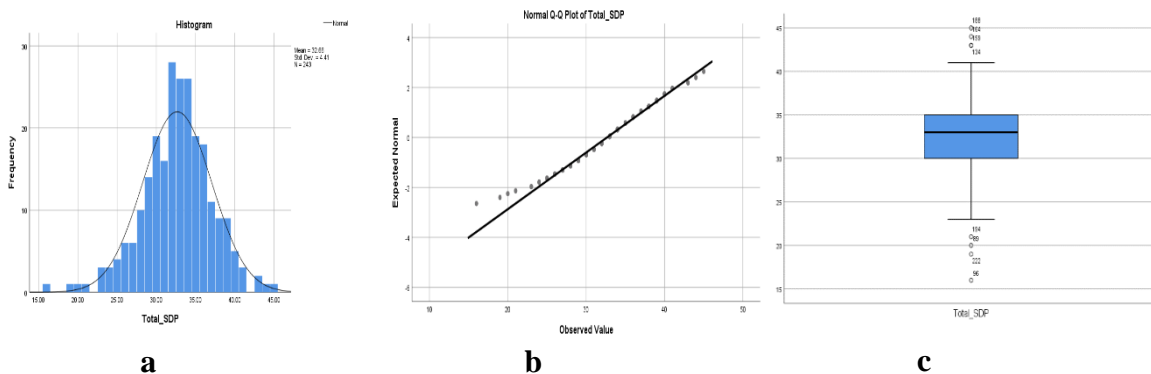


Figure 2: (a) Histogram (b) Normal Q-Q plot (c) Boxplot about Social distance perception (SDP)

Figure 2 shows (a) Histogram (b) Normal Q-Q plot (c) Boxplot about Social distance perception (SDP). The actual shape of the Histograms approaches a pretty normal distribution. The examination of the normal probability plots lends additional support to this statement (labelled Normal Q-Q Plot). This graph compares the actual value of each score to the value that would be predicted by a normal distribution given the observed values. A normal distribution is suggested by a line that is generally straight. There are eight outliers, ID numbers: 89,96,134,159,164,188,194,222. By analyzing the trimmed mean (32.745) and mean (32.658), it has been revealed that both values are very similar. Thus, it is not required to remove the outliers from the data set.

Social Distance Compliance:

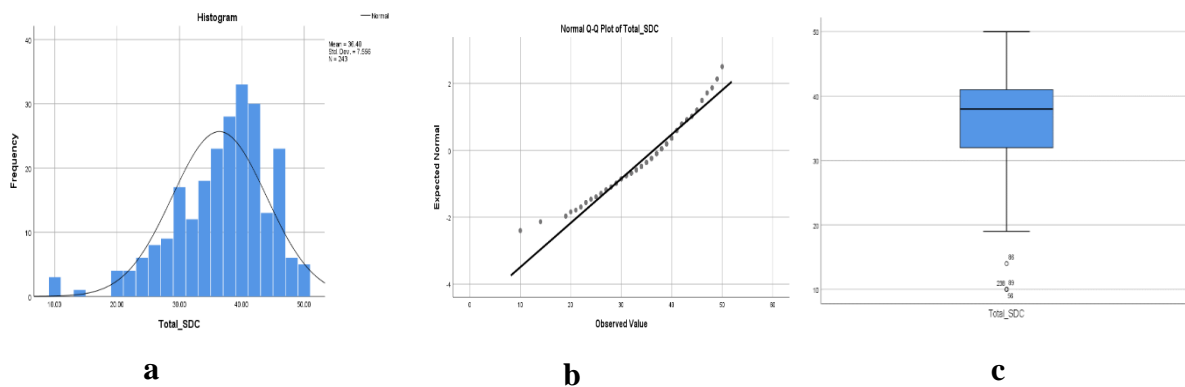


Figure 3: (a) Histograms, (b) Normal Q-Q plot, (c) Boxplot about Social Distance Compliance (SDC)

Figure 3 also shows a pretty good normal distribution of the data in the histogram and Normal Q-Q Plot. The Q-Q Plot compares the actual value of each score to the value that would be predicted by a normal distribution given the observed values. The assumption of a normal distribution is made when the line is sufficiently straight. There are eight outliers, ID numbers: 56,86,89,238. By analyzing the trimmed mean (36.793) and mean (36.395), it has been revealed that both values are very similar. Thus, it is not required to remove the outliers from the data set.

Online Learning satisfaction:

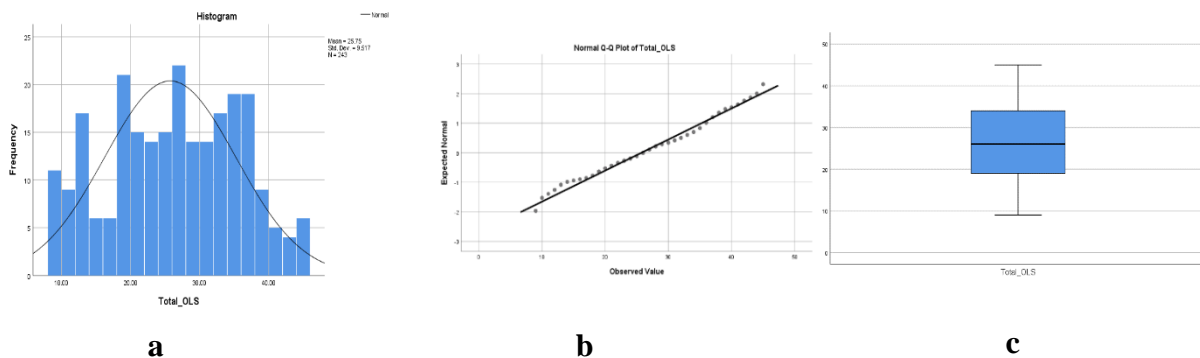


Figure 4: (a) Histograms, (b) Normal Q-Q plot, (C) Boxplot about online learning satisfaction (OLS)

Figure 4 shows (a) Histogram (b) Normal Q-Q plot (c) Boxplot about online learning satisfaction (OLS). The examination of the Histogram and Normal Q-Q plot show that the data are normally distributed. There is no outlier identified in the boxplot.

4.3 Correlations and Regressions

Table 6: Correlation between two independent and one dependent variable

		Correlations		
		Total_OLS	Total_SDP	Total_SDC
Pearson Correlation	Total_OLS	1.000	.086	.179
	Total_SDP	.086	1.000	.446
	Total_SDC	.179	.446	1.000
Sig. (1-tailed)	Total_OLS	.	.090	.003
	Total_SDP	.090	.	.000
	Total_SDC	.003	.000	.
N	Total_OLS	243	243	243
	Total_SDP	243	243	243
	Total_SDC	243	243	243

Table 6 shows Correlation between two independent and one dependent variable. Multiple collinearities between the two predicted variables (social distance perception and social distance compliance) is 0.446 <0.7, this indicates that there was no deviation from the assumptions of normality, linearity, multicollinearity, and homoscedasticity.

Table 7: Model Summary

Model Summary ^b				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.179 ^a	.032	.024	9.40144

a. Predictors: (Constant), Total_SDC, Total_SDP
b. Dependent Variable: Total_OLS

Table 8: Summary of ANOVA

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	704.805	2	352.403	3.987	.020 ^b
	Residual	21212.882	240	88.387		
	Total	21917.687	242			

a. Dependent Variable: Total_OLS
b. Predictors: (Constant), Total_SDC, Total_SDP

Table 9: Coefficients value

Model	Standardized Coefficients				95.0% Confidence Interval for B		Collinearity Statistics		
		Std. Error	Beta	t	Sig	Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	4.630		3.702	.000	8.020	26.261		
	Total_SDP	.153	.008	.111	.912	-.285	.319	.801	1.249
	Total_SDC	.089	.176	2.476	.014	.045	.397	.801	1.249

Table 7, Table 8, and Table 9 shows the impact of Social Distance Perception (SDP) and Social Distance Compliance (SDC) on online learning satisfaction (OLS). The R^2 value of .032 revealed that the predictor explained 3.2% variance in the outcome variable with $F(2,240) = 3.987, p > .001$. The findings revealed that social distance perception could not explain the student online learning satisfaction ($\beta = 0.008, p > .05$) whereas social distance compliance has significant effect on online learning satisfaction ($\beta = .176, p < .05$). Also Table 9 in collinearity statistics shows that the tolerance $.801 > 0.01$ and $VIF 1.249 < 10$, therefore no violation of the assumptions of multicollinearity reported in the analysis.

Table 10: Collinearity Diagnostics

Collinearity Diagnostics ^a							
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	Total_SDP	Total_SDC	
1	1	2.969	1.000	.00	.00	.00	
	2	.023	11.414	.19	.06	.95	
	3	.009	18.480	.81	.94	.05	

a. Dependent Variable: Total_OLS

Table 11: Residuals Statistics

Residuals Statistics ^a					
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	19.6935	28.9011	25.7490	1.70658	243
Std. Predicted Value	-3.548	1.847	.000	1.000	243
Standard Error of Predicted Value	.606	2.696	.986	.344	243
Adjusted Predicted Value	19.4253	29.3584	25.7446	1.71216	243
Residual	-18.90113	18.84733	.00000	9.36251	243
Std. Residual	-2.010	2.005	.000	.996	243
Stud. Residual	-2.035	2.018	.000	1.002	243
Deleted Residual	-19.35840	19.09371	.00434	9.47983	243
Stud. Deleted Residual	-2.048	2.031	.000	1.004	243
Mahal. Distance	.009	18.902	1.992	2.502	243
Cook's Distance	.000	.033	.004	.005	243
Centered Leverage Value	.000	.078	.008	.010	243

a. Dependent Variable: Total_OLS

Table 11 shows the Residuals Statistics, here maximum Cook's distance value is 0.033 ($p < 0.05$), two independent variables such as Social Distance Perception (SDP) and Social Distance Compliance (SDC) significantly impact on dependent variable of Online Learning Satisfaction (OLS).

The value of Mahalanobis distance is $18.902 > 13.82$ (whereas $df = 2$, the critical value is 13.82) which means that some of its outlier presence is noticed, but above analysis indicates that outliers will not affect this study because previous results found that trimmed mean and mean values are very similar, there is no need to exclude outsiders from the data set.

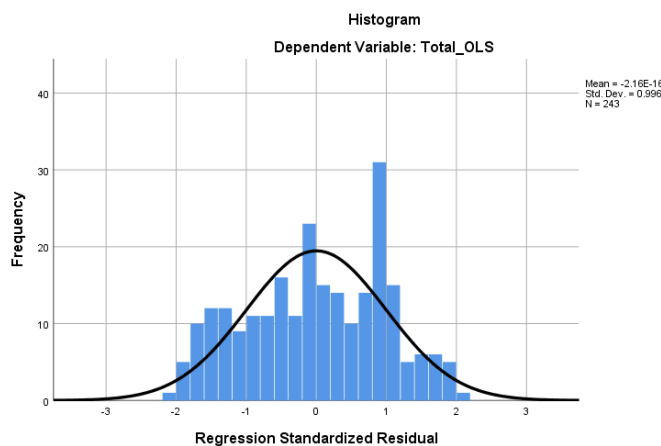


Figure 5: Histogram of Regression standardized residual

An examination based on the regression standard deviation of the residual histogram (Figure 5) demonstrated that the data follows a normal distribution. In addition to this, it was discovered that the regression standardized residual (shown in Figure 6) followed a normal distribution. This means that the observed values and expected values were located along the line, and there were no significant deviations from the line. Examining the skewness and kurtosis values is another method that can be utilized to validate the normality of the distribution. The skewness statistic is used to determine whether or not a distribution is symmetric, whereas the kurtosis statistic determines whether or not a distribution reached to peak or flat condition (Tabachnick & Fidell et al., 2017). According to the findings, the skewness and kurtosis values demonstrated that the data followed a normal distribution, with the skewness values falling within the ranges of -0.871 to -0.62 respectively. On the other hand, the value for kurtosis fell within the ranges of -0.897 to 0.986, which is significantly below the cutoff of ± 10 .

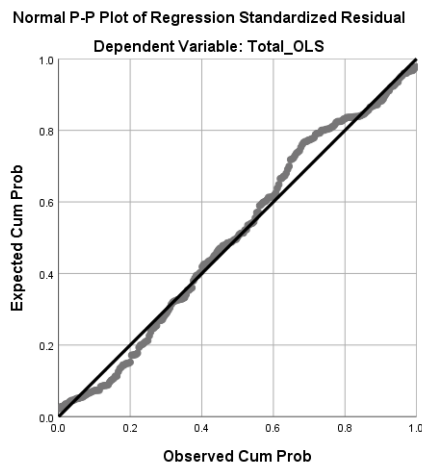


Figure 6: Normal P-P plot of Regression standardized Residual

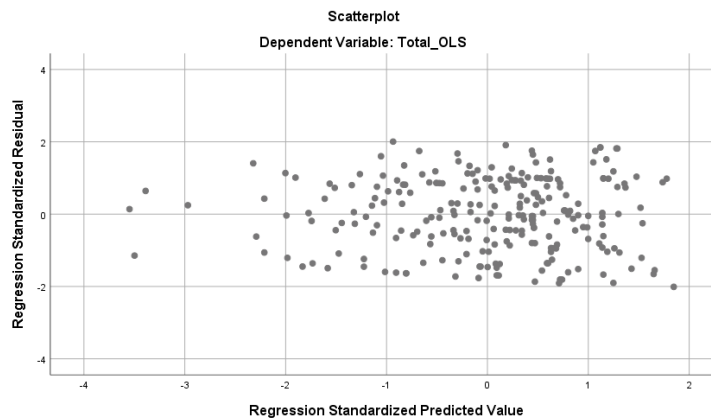


Figure 7: Scatter plot for linearity and homoscedasticity.

According to the normal probability plot of standardized residuals and the scatterplot of standardized residuals against standardized predicted values, the assumptions of normality, linearity, and homoscedasticity of residuals were all satisfied. This was determined by comparing the residuals to the predicted values in standardized form. In addition, the variance of the residuals is thought to be the same or equal for all of the projected values of the dependent variable, which provided support for the assumptions of homoscedasticity. As a result, the multivariate analyses have confirmed that the assumptions of linearity and homoscedasticity have been successfully addressed.

4.4 MANOVA results

This study employed multivariate analysis of variance (MANOVA) to assess the impact of university type, study level, age, gender, and residence on students' satisfaction with online learning (i.e., Social Distance Perception, Social Distance Compliance and Online Learning Satisfaction). This study examined all of the MANOVA assumptions to confirm distribution of the sample, linearity, normality, multicollinearity, multivariate and univariate outliers, and variance-covariance homogeneity. This investigation found no significant violations of any assumptions. Table 12 shows the MANOVA results for the effect of demographic variables.

Table 12 MANOVA analysis of student Online Learning Satisfaction.

Demographic variables	Wilk's (λ)	lambda	F	Hypothesis df	Error df	P	Partial eta squared
University	.892		4.669	6.0	476.0	.000*	.056
Study Level	.886		3.264	9.0	576.946	.001*	.039
Age	.827		5.200	9.0	576.946	.000*	.061
Gender	.976		1.923	3.0	239.0	.126	.024
Place of living	.987		1.054	3.0	239.0	.369	.013

*significant at $p < .05$

Table 12 shows the results of the MANOVA analysis suggesting that all the demographic variables are significant at $p < .05$ value. But Gender and Place of Leaving variables are statistically not significant, these demographic variables do not have any effect on the level of satisfaction that students have with online learning. A separate analysis of variance (ANOVA) tests was conducted for each of the dependent variables to determine which demographic variables has the significant impact on Online Learning Satisfaction (OLS) (details in Table 13).

Table 13: Results of the F test for demographic variables on theoretical constructs.

Demographic variables	Constructs	Category	M	SD	df	Error	F	P	Partial eta squared
Age	SDP	Below 20 years	31.62	4.33	3	239	4.939	.002	.058
		21-25 Years	32.425	4.34					
		26-30 Years	34.75	4.33					
		Above 30 years	36.70	3.465					
	SDC	Below 20 years	36.86	7.09	3	239	.579	.629	.007
		21-25 Years	36.29	7.65					
		26-30 Years	35.187	6.77					
		Above 30 years	39.00	8.70					
	OLS	Below 20 years	27.379	7.218	3	239	9.153	.000	.103
		21-25 Years	24.356	9.617					
		26-30 Years	32.937	6.104					
		Above 30 years	35.70	6.201					
University	SDP	1. International (IUT)	32.209	4.00	2	240	2.23	.110	.018
		2. Public (RUET)	32.53	4.86					
		3. Private (NSU)	33.714	4.421					
	SDC	1. International (IUT)	36.48	7.49	2	240	4.94	.008	.040

		2. Public (RUET)	34.59	8.256					
		3. Private (NSU)	38.69	5.981					
	OLS	1. International (IUT)	14.09	3.73	2	240	9.57	.000	.074
		2. Public (RUET)	13.82	3.83					
		3. Private (NSU)	12.93	3.83					
Study Level	SDP	1. Undergraduate Year 1	31.595	4.693	4	238	3.374	.010	.054
		2. Undergraduate Year 2	32.888	3.709					
		3. Undergraduate Year 3	32.36	4.759					
		4. Undergraduate Year 4	33.30	4.176					
		5. Postgraduate	35.136	4.496					
	SDC	1. Undergraduate Year 1	36.166	7.629	4	238	.106	.980	.002
		2. Undergraduate Year 2	36.625	7.734					
		3. Undergraduate Year 3	36.68	6.249					
		4. Undergraduate Year 4	36.675	7.279					
		5. Postgraduate	35.68	9.02					
	OLS	1. Undergraduate Year 1	13.22	3.83	4	238	6.318	.000	.096
		2. Undergraduate Year 2	13.27	4.03					
		3. Undergraduate Year 3	13.47	3.95					
		4. Undergraduate Year 4	13.83	3.57					
		5. Postgraduate	15.22	3.78					
		2. Rural Area	25.448	9.067					

The findings reveal the following statistically significant influences on student satisfaction with online learning:

Students had a statistically significant relationship with university type on social distance perception, $F(2, 240) = 2.23$, $p = .110$, partial eta square = .018, with private university ($M = 33.714$) higher score than international university ($M = 32.209$), and public university ($M = 32.53$).

Likewise, $F(2, 240) = 4.94$, $p = .008$, partial eta square = .040, with private university ($M = 38.69$) higher score than international university ($M = 36.48$), and public university ($M = 34.59$) in social distance compliance.

Likewise, $F(2, 240) = 9.57$, $p = .000$, partial eta square = .074, with international university ($M = 14.09$) higher score than private university ($M = 12.93$), and public university ($M = 13.82$) in online leaning satisfaction.

Study level had a statistically significant effect on students' satisfaction with online learning, $F(4, 238) = 3.374$, $p = .010$, partial eta square = .054, with postgraduate students ($M = 35.136$)

higher score than undergraduate 1st year (M= 31.595), 2nd year (M= 32.888), 3rd year (M=32.36), 4th year (33.30) students in social distance perception; and $F(4, 238) = .106$, $p = .980$, partial eta square = .002, with Undergraduate 3rd year students (M= 36.68) higher score than 1st year (M= 36.166), 2nd year (M= 36.625), 4th year (M= 36.675) and postgraduate (M=35.68); and $F(4, 238) = 6.318$, $p = .000$, partial eta square = .096, with postgraduate (M= 15.22) higher score than 1st year (M= 13.22), 2nd year (M= 13.27), 3rd year (M= 13.47), 4th year (M= 13.83) students in online leaning satisfaction.

No statistically significant differences were found for age in social distance perception, social distance compliance and online leaning satisfaction.

4.5 Conclusion

According to the findings of this research, the questionnaire used to conduct the survey was both reliable and valid, despite having just 243 participants. The data analysis showed that Cronbach's alpha values suggested good assessment of consistency with all variables, and that these values are above 0.7. The data were found to have a normal distribution after being put through a normality test that utilized a histogram and a regression standardized residual (normal P-P plot). Analysis of the data using skewness and kurtosis revealed further evidence that it was acceptable. The linearity and homoscedasticity assumptions of multivariate analysis were shown to be valid through the use of scatter plots as supporting evidence. The demographic profile of the respondents, along with their descriptive statistics, were tabulated and examined.

Chapter 5 Discussion and Conclusion

5.1 Introduction

This chapter provided discussions for the findings as well as the implications of those findings. It also depicts and compares the similarities and dissimilarities of earlier studies which are directly or indirectly related to this study. Limitations surrounding this study are highlighted with some recommendations for the improvement of online learning and also to inform and give directions for future research.

5.2 Discussions

5.2.1 Assessing students' perceptions of social distancing during COVID-19 pandemic

According to the findings, the majority of students in this study had a good opinion toward social distancing. Learners perceived understanding about the social distancing seems to be advantageous due to the fact that it provided them to efficiently join the online classes. Students found the online materials are logically organized and featured recorded videos that were accessible via the respective university websites. Muthuprasad et al., (2021) found that, due to the lockdown in the midst of the COVID-19 epidemic, the majority of responders chose classes online to adapt to the restriction of social distancing.

Adoption may be inadequate and confused if students are not well informed about it. Also with pedagogical techniques, students were encouraged for the active and deep learning. This will result in a good participation for both students and teachers. Because research has shown that active learning is essential for education, teachers need to be aware of the ways in which the structure of their classes and the instructional methods they employ can either boost student accomplishment and engagement in the material or hinder it (La Lopa et al., 2018).

According to the findings of this research, the students' knowledge of COVID-19 and their perspectives of the challenges help students whether or not they intend to practice social distancing. These results are similar to Raza et al., (2021), who also said that students positive perception about the social distancing increase their readiness to use online education in the future.

Furthermore, the results of the structure analysis revealed that being aware of the COVID-19 condition may have an impact on the usability of e-learning systems. Students may regard e-learning platforms as a safer and better option to traditional on-campus education in light of

the widespread demand for safety through social distancing and online learning. Nikou & Maslov et al., (2021) found that, students are left with little choice but to adapt to a constantly changing environment and accept the usage of e-learning systems in order to adapt to the social distancing norm.

5.2.2 Assessing students' practice on social distancing during COVID-19 pandemic

As a result of this study, students agreed to practice social distancing during epidemics. Students received extensive education regarding the significance of maintaining personal hygiene and maintaining social distance in order to reduce the risk of COVID-19 transmission throughout the epidemic. Despite the fact that a significant proportion of individuals admitted to participating in socially isolating activities, but it was difficult to execute. Specifically, hand hygiene behaviors were more complex, with some actions, such as disinfecting before touching the face or after using public equipment, being more modest. According to Sen-Crowe et al., (2020), individual activities include working at a distance, avoiding public transportation, and remaining in contact with suspects or staying at home if symptoms arise, transitioning to online education, company closure, and increased telecommunications involvement are among the most practiced measures.

Due to the necessity of this online education to prevent the spread of COVID-19 on university campuses, it is crucial to comprehend how students see the benefits of maintaining the social distancing and how this perception effects the numerous facets of eLearning quality. It has been demonstrated that aspects such as safety, validity, accessibility, and website content have a higher significant impact on the quality of eLearning, leading to embrace the social distancing among the students (Uppal et al., 2018), and consequently it has a substantial correlation with learner satisfaction.

5.2.3 The effects of social distancing on student learning satisfaction

The finding of this research revealed the the level of satisfaction student experience in their online programs while maintaining the social distancing. The present study is beneficial to educators since it assists them in distinguishing the many components necessary for online learning.

To begin with, university students were unfamiliar with online learning and were more receptive and content with their traditional learning approach. Second, while online teaching produced positive results in the 2 months of social distancing, there have been several limitations resulting from the institutes' inability to begin preparing an information technology

and computer that could immediately meet the demand for online learning and teaching. However, neither the instructors nor the students had the appropriate training to correctly use the learning management system which may impact the learning satisfaction (Mohammadi et al., 2021; Vo et al., 2020).

According to the findings of the study, students reported the lowest levels of satisfaction with lab class practice and with interactions between themselves and other students. On the other hand, students reported the highest levels of satisfaction with pedagogy and interactions between teachers and students. In spite of the fact that it had been their first experience with online classes during the Covid-19 pandemic, the majority of the students believed that they benefited from participating in online educational opportunities (Agarwal & Kaushik et al., 2020; Rajabalee & Santally et al., 2021).

5.3 Implications of the study

5.3.1 Theoretical implications

This is a thorough investigation of the social distance perceptions and practice of Bangladeshi students regarding online education. It helps bridge the gap in the research by examining a wide range of essential themes, including the function of universities and teacher assistance during online education, favorable and unfavorable influencing elements during online classes, and the effect of residential academic setting and resource capability. In a developing nation with inadequate resources, infrastructure, and other facilities, online education faces challenges.

In order to decrease the negative effects of lockdown, educational institutions had to develop new approaches to teaching engineering students. eLearning, which utilizes new electronic learning, has emerged as the preeminent mode of instruction in the midst of the COVID-19 pandemic. eLearning refers to the process of enhancing classroom instruction and student instruction through the utilization of various forms of digital technology. At this time, online education is widely employed in undergraduate classes; however, it is not used as the main form of instruction; rather, it is used in conjunction with the more conventional method of instruction provided by a teacher.

Accessibility, appropriate methodology, appropriate course material, and appropriate evaluation criteria are some of the factors that determine the success of online learning. Online learning, just like any other form of academic instruction, comes with its share of advantages

as well as disadvantages, and those are valid for both the instructors and the students. In addition to the epidemiological benefits of eLearning during the COVID-19 pandemic, additional noteworthy benefits include better convenience, availability irrespective of locations and times, and savings in cost and air pollution, also including greenhouse gas emissions from reduced driving.

Online classes come with their own unique set of drawbacks, the most notable of which being problems regarding internet connection, poor internet started building up, and students' lack of digital capabilities. Some benefits, including the ability to create one's own timetable, can also be seen as drawbacks, especially for students who have trouble maintaining their own sense of self-discipline.

5.3.2 Practical implications

The perceptions of seriousness, sensitivity, self-efficacy, and reaction efficacy can help university students engage in social distancing behavior. For this issue and intended audience, there are several practical implications this study have. Universities and institutions, for example, might concentrate on how the COVID-19 infection affects university students physically, intellectually, socially, financially, and academically. Alternatively, they could concentrate on the consequences of failing to stop COVID-19 from spreading to one's students, families, or community as a whole.

The vast majority of participants agreed that the following components are necessary for successfully teaching online classes, according to the survey questions: nature of the contents, infrastructure, instructor competency, student readiness, and follow up, as well as other subcomponents. The majority of respondents believed that the contents and administration were the most important factors in ensuring that online classes ran smoothly.

According to the findings of the report, the two most significant benefits of social distancing are its flexibility and accessibility of online education. Online education permits students to learn in different ways and on their own schedules. Because of this, there has been a rise in demand for online education due to the adaptability and convenience of the medium. This improved technical skills, and increased concentration and self-discipline in a more comfortable atmosphere.

5.4 Recommendations

The current study found that students were satisfied with the amount of engagement and flexibility that was provided through online learning. According to feedback given by students, the most challenging components of online education were interaction with other students and the use of technologies, and also involvement in collaborative learning. The instructors have positive feedback on the various communication technologies that were used during the online learning. In addition, the government should offer assistance to providers of online education in an effort to enhance student services at prices that are affordable. It is vital to keep in mind that students with special needs are required to participate in synchronous sessions, and that professionals must be present to assist with the learners' various processes.

5.5 Limitations

It may be difficult to identify whether a specific outcome is a genuine discovery if there is a small sample size, and in some instances, a type II error may arise. This occurs when the null hypothesis is wrongly accepted and there is stated to be no differences between the study groups. Consequently, larger sample sizes produce more accurate results with a higher amount of accuracy and efficiency, but they also require more effort and more funds to conduct. Sample size has a big impact in this study because the larger the sample size, the more results can be generalized. Stratified sampling was used as a sampling technique and validated questionnaire served as an instrument for collecting the data. The limitation of stratified sampling is also the limitation of this study. One of the biggest drawbacks of stratified sampling is that it might be difficult to choose the right strata for a given sample. A second disadvantage is that the outcomes are much harder to determine and assess than those obtained from a simple random sampling. In addition, it is not possible to generalize all universities by examining 3 universities (IUT, RUET, NSU) because Bangladesh has a total of 43 public universities, 103 private universities, and three international universities. The R^2 value is .032 revealed that the predictor variables explained 3.2% variance in the outcome variable with $F(2,240) = 3.987, p > .001$. The findings revealed that social distance perception not positively predicted online learning satisfaction ($\beta = 0.008, p > .001$) whereas social distance compliance has significant effect on online learning ($\beta = .176, p < .05$). This is why further development of the model is needed for future research in this area.

5.6 Conclusion

The students' perspectives on online education were investigated in this study. According to the results, traditional classroom settings are preferable to online learning because of their higher level of effectiveness. Students enrolled in online learning programs faced a number of challenges, including the fact that it can be challenging to adapt to online courses and a lack of interaction with other students and lecturers. Throughout the course of COVID-19, it became clear that online learning is a valuable and effective tool for the delivery of curriculum. There is a correlation between students' levels of satisfaction and their capacity for productive communication as well as the flexibility offered by online education. Students faced difficulties due to the length of class time and the use of technology. Technical help and students' excitement, on the other hand, increased teacher satisfaction with online instruction. Faculty reported higher workloads, lengthier preparation times, and technical issues as challenges.

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Appendix A

Letter to the respondents

Department of Technical and Vocational Education,
Islamic University of Technology (IUT),
Board Bazar, Gazipur-1704, Bangladesh

LETTER TO THE RESPONDENT

I am MSc TE Electrical and Electronics Engineering student of the aforementioned university, conducting a research on *Engineering students' perception and practice about social distancing and its impact on learning satisfaction amid COVID-19 pandemic*. This Google form has been sent to you for data collection. Your participation will be kept anonymous as NO personal data has been collected. Your feedback will only be used for research purposes. This survey will take 7-10 minutes to complete. I will be glad for your participation.

I am requesting you to respond to my questionnaire as possible you can, your response will be highly confidential and also helped to improve the content of this research.

Yours faithfully,
Md. Hamid Uddin Bhuiya
Email: hamidbhuiya@iut-dhaka.edu
Contact No: +8801685541202
Department of Technical and Vocational Education,
Islamic University of Technology (IUT).

Appendix B

Questionnaire A

1. Mention the name of your university-
 - Islamic University of Technology
 - Rajshahi University of Engineering and Technology
 - North South University
 - None of them

2. Academic Level of your study
 - Postgraduate
 - Undergraduate

3. In which year of the postgraduate/ undergraduate study you are in-
 - 1st Year
 - 2nd Year
 - 3rd Year
 - 4th Year

4. Your place of living
 - Rural area
 - Urban area

5. Gender
 - Male
 - Female

6. Your age range
 - Below 20 years
 - 21-25 Years
 - 26-30 Years
 - 31-35 Years
 - above 35 Years

Questionnaire B

The rating scales of the seven (5) Likert scale goes thus:

Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5

Social Distance Perception (SDP)		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
SDP1	I believe social distancing will help protect me from getting the novel coronavirus					
SDP2	I believe social distancing will help protect the vulnerable and medically weak people from getting coronavirus					
SDP3	I believe that social distancing will protect my place from having too many cases of COVID-19 in hospital at once					
SDP4	I think I should skip/miss to meet up with my family and friends if they are at a different location					
SDP5	I think I will get too bored during the time of social distancing*					
SDP6	I think the authorities should restrict personal liberty rights and free movement of the people to restrict the spread of novel coronavirus					
SDP7	I think the decisions that have been made by the Government to reduce the spread of the novel coronavirus are fair					
SDP8	I think the authorities should relax the restrictions even if there are still many new cases of COVID-19 emerging*					
SDP9	I think 14 days quarantine is an effective way to stop spreading the novel corona virus					
Social Distance Compliance (SDC)						

SDC1	During pandemic, I have stayed at least 3 feet away from other people when outside of my home.					
SDC2	During pandemic, I stop shaking hands with other people like friends, relatives, and neighbors.					
SDC3	During pandemic, I have taken the online delivery service without going to the grocery store/restaurant.					
SDC4	During pandemic, if guests/relatives come to our house, I rarely meet with them.					
SDC5	I practice social distancing and follow the social distance guidelines at all situations					
SDC6	I stay at home when sick or have a cold (or intending to stay if situation occurs)					
SDC7	I Isolate myself at home (or intending to isolate if situation occurs) when I have high temperature or continuous cough until symptoms stop					
SDC8	I isolate myself for 14 days (or intending to isolate if situation occurs) when I have the symptoms or get affected by the corona virus					
SDC9	I shop only for basic necessities as infrequently as possible when necessary					
SDC10	I stay at home except for essential shopping, exercise, medical need, study or work where I cannot do these from home					
Online Learning Satisfaction (OLS)						
OLS1	I am satisfied with my participation in online learning due to pandemic					
OLS2	I feel that my experience with online learning has been enjoyable					

OLS3	I am satisfied with the online instructional/ teaching styles of the teachers during Covid-19 pandemic.					
OLS4	I am satisfied with the learning contents and course content designed for online classes during Covid-19 pandemic					
OLS5	I am satisfied with the teachers and online platform (LMS, Google Classroom, Moodle, Google Meet, Zoom Meeting etc.).					
OLS6	I am satisfied to interact with the teachers and students in online during the pandemic.					
OLS7	I am satisfied with the exams conducted online during Covid-19					
OLS8	I am satisfied with the lab classes conducted online.					
OLS9	Overall, I am satisfied with online classes during Covid-19.					