

Impact on Course Registration and SGPA of the Students of BSc in EEE Programme due to Online Teaching during the COVID-19 Pandemic

Muhibul Haque Bhuyan

Abstract—Most educational institutions were compelled to switch over to the online mode of teaching, learning, and assessment due to the lockdown when the corona pandemic started around the globe in the early part of the year 2020. However, they faced a unique set of challenges in delivering knowledge and skills to their students as well as formulating a proper assessment policy. This paper investigates whether there is an impact on the student Semester Grade Point Average (SGPA) due to the online mode of teaching and learning assessment at the Department of Electrical and Electronic Engineering (EEE) of Southeast University (SEU). Details of student assessments are discussed. Then students' grades were analyzed to find out the impact on SGPA based on the z-test by finding the standard deviation (σ). It also pointed out the challenges associated with the online classes and assessment strategies to be adopted during the online assessment. The student admission, course advising, and registration statistics were also presented in several tables and analyzed based on the change in percentage to observe the impact on it due to the pandemic. In summary, it was observed that the students' SGPA are not affected but student course advising and registration were affected slightly by the pandemic. Finally, the paper provides some recommendations to improve the online teaching, learning, assessment, and evaluation system.

Keywords—Electrical and electronic engineering students, impact on course grading and SGPA, online assessment, online teaching, student registration, semester result.

I. INTRODUCTION

THE novel coronavirus pandemic (COVID-2019) started in Wuhan, China in 2019 and then spread worldwide [1]. Since then the World Health Organization (WHO) issued several health guidelines to combat it by declaring it as a pandemic [2]. Most of the affected countries started lockdown. As such, all schools, colleges, and universities were closed down, and this novel coronavirus has inflicted disaster on the lives of university students, faculty members, and other staff in numerous ways and means. Therefore, the educationists started alternative avenues to continue the teaching-learning processes during this lockdown period considering the safety issues of the students. They have suggested an online mode of education. Then many academic institutions of higher learning have also switched to the online mode of classes, and stimulated their students to leave campus, and participate in the online classes staying at home. However, this has produced a flurry of misperception, uncertainty, vagueness, and anxiety among the students, parents, guardians as well as faculty members. The

students were mainly concerned about their results, grades, or academic outcomes. Hence, many university administrators decided to go with pass/fail options for their students during this emergency instant. However, in doing so, they were concerned about taking the students' consent before the classes begin, and they have decided that this wouldn't be counted toward Grade Point Averages (GPAs) thinking that the pass/fail options would provide the students a kind of lightheartedness during the pandemic time and could alleviate their stress and concern. Thus this approach would make it easier for the required changeovers into distant teaching-learning from on-campus education and promote strong engagement.

Bangladesh detected its first coronavirus case on 8 March 2020 and recorded the first death on 18 March 2020 [3] and therefore, since 18 March 2020, Bangladesh also started lockdown to slow down the virus infection rate. As such, the educationists of Bangladesh also tried to find out ways and means of continuing the educational activities from home. At first, some of the top private universities in Bangladesh switched to the online teaching platform as per the decision of their respective universities. Southeast University (SEU) was one of those that switched to online education on 22 March 2020 [4]. However, most of the universities didn't mention anything about the methods/processes of the teaching and student outcome evaluation though some institutions around the world chose to go for pass/fail to relieve their students from stresses when they are in online mode.

As a result, strong resistance came from the students of Bangladesh fearing being under graded or poorly evaluated. Since online education is based on a laptop, personal computer (PC), or smart mobile phone using the internet, and there is no physical communication process between the teachers and the learners, the students felt insecure about not being graded properly. Many students also said that the incapacity to contact the faculty members and other staff in person, the stress of traveling, and the challenges intrinsic in conducting online classes in diverse time zones have made their academic lives more problematic. As such, they were concerned about their grading of a particular course and the downfall of the Semester Grade Point Averages (SGPAs) and hence their Cumulative Grade Point Averages (CGPAs). Therefore, the faculty members had to take this challenge and convince their students that they will not be under-evaluated or their CGPAs would not

M. H. Bhuyan is with the Southeast University, Bangladesh (Corresponding author, phone: 88-01815-657346; e-mail: muhibulhb@gmail.com).

go down due to the online teaching-learning processes. This article explained how the teaching-learning methodologies, as well as evaluation processes, were developed to teach the students and to measure the students' learning outcomes properly, and how this method was refined gradually to ensure the proper evaluation of the students of the EEE Department of SEU. The SGPA of each student of the EEE Department was extracted from the online database of the university and then analyzed data through the z -test analysis whether the student grades were changed or not and if there is any change then at what rate it had occurred. The paper also presents how many students were registered/ dropped their education during the pandemic. This article also sets targets to reflect on the processes and practices of online education activities of the EEE Department of SEU by detailing all the policies adopted for online classes and recommended some suggestions on how to improve the online-based teaching, learning, assessment, and evaluation method.

II. LITERATURE REVIEW

In a recent study of 400 college and high school students in the USA, it was found that technological unreachability and academic fraudulence are threats for online programs in 2020. However, they have suggested that the learning tools and apps may assist the students to improve distant teaching-learning problems [5]. Their key findings are as follows:

- a) 71% of students expecting inferior grades due to the online method of learning, unpredictable internet connectivity, financial constraints of the families, remote residential locations, such as in rural areas, class-based academic performance gap.
- b) The high cost of distance learning is another issue. Students now don't need to buy notebooks, pens, pencils, etc. anymore rather they require to buy more computers (27%), internet services (23%), webcams (21%), and microphones (16%) during the pandemic.
- c) 95% of students used educational learning apps in the last year to complement their learning. E-learning apps are becoming popular as online education continues.
- d) Quizlet (45%) was found as the best widely used online learning tool among the students. They prefer Quizlet to Chegg (21%) or Grammarly (25%) also. Teaching professionals expressed their concerns that the students are prone to cheat on their assignments using such tools.

A group of researchers identified that there are effects on students grading when compared to the customary on-site classes. They used an instrumental variable approach to find that whether taking an online course could deteriorate the success and progress of the students. They found that the grades were lower for the courses taken online. As a result, the students refrain from being registered at the university. They inferred that these effects in grades are due to the problems of the students to have access to both online facilities and wide options available with the on-site classes [6].

Online courses are very popular and briskly rising in several countries in the world. Approximately 30% of college students are to take at least one online course during their academic life

and it is being augmented many times over the past few decades due to the cost-cutting policy of academic institutions all over the world [7], [8].

Online course offering was also observed in the K-12 sector. In Florida, USA, it is a requirement that each high school student is to take at least one online course before their graduation. The Florida Virtual School offered above 150 courses online to its students across the Florida state [9]. Around 1.5 million K-12 students joined online courses in the year 2010 [10], educators have projected that such online-based course offering, registration, teaching, and learning would grow further in the upcoming years [11].

In an article, the researchers emphasize grading issues and learning outcomes in online writing courses as equaled to on-site classes. They provided some suggestions on developing the knowledge on remote teaching and learning to avoid the grading differences in online writing courses as well as to retain the students in their classes to combat revenue losses by the universities in the wake of the pandemic [12].

In another analysis based on a large administrative dataset and an instrumental variable technique, the impact of online versus face-to-face knowledge transfer on student success was evaluated. It was found that the main reasons for enrolling in the online courses are the travel time saving and course choice options. It was also learned that there are some negative motives behind online courses due to getting the lower course grades in the online class though it was also learned that there are insignificant learning differences between the online and face-to-face student outcomes. Therefore, the researchers have suggested focusing on appraising and refining the quality of online courses before promoting online education further [13].

In another study, it was found that the Grade Point Average (GPA) and prior online course experience affected the online Science, Technology, Engineering, and Management (STEM) course outcomes. It was identified that the students who could complete their prior online courses successfully with higher GPAs, could also attain their STEM online course outcomes. Students who had dropped or earned lower grades in one or more prior online courses had also failed to attain their online STEM course outcomes. The results obtained from this study give us an indication that the online courses are beneficial for delivering knowledge to the students in the fields of Science, Technology, Engineering, and Management [14].

Another survey data of the US Education Department's National Center for Education Statistics (NCES) printed in November 2018 that the online enrollment of all students raised to 15.4% in 2017 from 14.7% in 2016. However, this ratio raised a little quicker, to 17.6% in 2017 from 16.4% in 2016 for all students who took both online and on-site courses simultaneously. But if we consider this for all students who took at least one online course then this ratio raised to 33.1% in 2017 from 31.1% in 2016 [15].

Even to teach a foreign language, the use of the online method was found to be applied. To employ this online method of training foreign language courses, both special programs for training a language and examining knowledge of the students in terms of their vocabulary and grammar, as well as modern

authentic materials for teaching reading and listening, were developed. The students performed various tasks, such as translating foreign texts and articles, preparing reports, doing creative-type project works, and giving presentations on any topic. The authors found that there are numerous strengths and weaknesses of online teaching, learning, and assessment. On the whole, it was found that the use of these modern and interactive tools of online teaching and learning has some positive impacts to acquire new knowledge and skills on foreign languages because most of the young generation pass most of their time in the virtual and digital environment [16].

III. PREPARATION FOR THE ONLINE CLASSES

The number of online courses is increasing promptly and becoming popular day by day. It has the prospects to spread more as a blessing to many students, mainly those who failed to attend traditional educational organizations. However, in the current situation, online education is challenging, particularly for under-prepared students. Their course learning outcomes are not so good if they take online courses, they could rather become more successful if they take on-site physical courses [17]. Therefore, we need to take steps for the continuous enhancement of online curricula and instruction methodologies that may strengthen the teaching quality of these courses through motivation and as such can enhance the prospects of it for the most demanding students [18].

In Bangladesh, the countrywide lockdown started on 17 March 2020 after the first case was detected on 8 March 2020. At first, the lockdown was imposed until 31 March 2020. Since the number of infections was increasing day by day, the government extended it further several times. Consequently, it was obvious to everyone that it may continue for a longer period and the educationists opined that education can't be stopped and should be continued somehow. As a result, Southeast University management also switched to the online mode of education on 29 March 2020 [4] and asked the departmental academic committees to formulate plans for the proper execution of this new mode of educational activities. As such, the EEE Department convened an online meeting of its academic committee where all the faculty members participated through the Google Meet platform and discussed various aspects of the online teaching, learning, assessment, and evaluation methods. A policy was formulated and passed to the Southeast University management for approval. University arranged an online training session for all its full-time faculty members regarding this issue [4].

The EEE Department also prepared comprehensive guidelines for the online assessment and evaluation of the students who took several theory courses. However, laboratory courses were stopped at the initial stage. The EEE Department started implementing its Outcome Based Curriculum (OBC) in the Spring 2019 semester [19]. As such, it was a daunting task for all to create a novel assessment plan to assess and evaluate the course outcomes and hence the program outcomes for the students under the OBE curriculum [20], [21]. Besides, in teaching online mode, it is very easy to assess the students' knowledge of the cognitive domain that was found very

effective in various courses [22]-[25], but it is very difficult to assess the students' skills in the psychomotor domain from the online courses.

There is also another concern regarding the grade inflation during the online classes, that is whether the students are being assigned higher grades for the same courses and same learning outcome expectations, that is for an equivalent amount of assigned tasks. If such phenomena of giving higher grades to the students for a particular course and particular learning outcomes occur then it is termed as the "Grade Inflation" by the academicians [26], [27]. Many researchers think that this is an unethical issue of providing higher grades to students [28]. In the United States, this issue was a great concern and they tried to find out the real facts [27]-[29]. However, this issue is a growing concern among the educationists and was studied by several researchers in the past whether the grades are being inflated or not around the world before the pandemic. It was found that the grades are being inflated to some extent over the past dated back from the 1960s to 1990s [30] and then again from the 1980s up to 2001 [27]. Even during this pandemic period, this issue was again raised and studied and found that grade inflation is happening around the world [31]. As a result, the EEE Department becomes very cautious right from the beginning of the online classes so that grade inflation can be minimized.

A survey should be conducted among the faculty members and the students to identify problems and possible solutions of online classes for further improvement at the end of each semester. Besides, course outcome assessment and evaluation are also necessary to continue program outcome assessment and evaluation for a 4-year cycle.

IV. COLLECTION OF FACTUAL DATA

To collect the factual data of our assessment and evaluation regarding the analysis of the influence on course advising, registration, and SGPA of the students of BSc in EEE program due to the online teaching during the COVID-2019 pandemic, we mainly relied on the central databased of the EEE Department. In the University Management System (UMS), all students' data are preserved. This data can be fetched in a Microsoft EXCEL file through report generation. We generated all the data for the students of our three programs of the EEE Department, viz. Day, Evening, and Friday programs for three different academic semesters. These three semesters are Fall 2019, Spring 2020, and Summer 2020 semesters. We selected these three semesters because Fall 2019 is the last semester that was fully unaffected by the pandemic, Spring 2020 is the semester that was partially affected by the pandemic (as admission, registration, midterm was completed by this time), and Summer 2020 is the semester that was completely affected by the pandemic.

After gathering all data, we computed its average, standard deviation, the percentage change of student number from one semester to another in terms of admission, course advising, and registration, performed z -tests, etc. to conclude.

To perform the z -test, we maintained the following steps:

A. Statement of Null (H_0) and Alternative (H_1) Hypothesis

- H_0 : The average grade of a program has not changed significantly due to the pandemic.
- H_1 : The average grade of a program has changed significantly due to the pandemic.

As the options were kept for a significant increase or decrease in average so the 2-tailed test is done.

B. Choosing the Level of Significance and Finding the Critical Value

Several levels of significance (α) were used to observe the changes.

C. Finding Test Statistics

The following formula was used to find the z score:

$$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$$

Here μ is the population average and Spring 2020 and Summer 2020 grades are samples.

\bar{x} = the average SGPA of a student in a particular semester

μ = the average SGPA in the last semester that was fully unaffected by the pandemic

σ = standard deviation of all SGPA of a particular semester

n = total student registered in a particular semester.

V. EVALUATION OF FACTUAL DATA

After getting all the data, we have grouped them into several parts and presented them in various tables to analyze them from various perspectives to assist our evaluation objectives. In the next two sub-sections, we tried to evaluate our factual data to

understand the consequences of SGPA as well as course advising and registration of the students due to ongoing online educational activities.

A. Effect of Grading and Semester GPA

After looking at the percentages of different letter grades assigned by all faculty members before and during the pandemic, it was observed that in the Fall 2019 Semester (before the pandemic) the percentages of A+, A, and A- grades collectively were 40% in BSc in EEE (Day) program but later this number went above 44% and 48% in Spring and Summer 2020 Semesters respectively as highlighted in Table I. As per highlighted data in Tables III and IV, the percentages of A+, A, and A- grades collectively were less than 35% and 27% in BSc in EEE (Evening) and BSc in EEE (Friday) programs respectively but later this number went above 40% and 38% as well as 36% and 34% in Spring and Summer 2020 Semesters respectively for these two programs. That means the overall grading increases due to the pandemic effect. On the other hand, the percentages of lower level grades, like C, D, and F were reduced dramatically as highlighted in Tables I-III. This may be due to switch over to the online examinations through assignments and online viva-voce only. Thus the students got enough time to think over their assigned problems and also they got the chance to discuss with their friends or could take help from their seniors. Hence, the students got a larger number of higher grades and fewer lower grades. However, this may be due to another reason that an 'F' grade was not awarded to many students, instead, they were awarded an 'I' grade as they went to their villages and couldn't participate in the online classes or examinations. It is expected that they would come back after a few months.

TABLE I
STATISTICAL DATA OF VARIOUS GRADES OBTAINED BY THE STUDENTS OF BSC IN EEE (DAY) PROGRAM IN THREE CONSECUTIVE SEMESTERS

Semester	A+	A	A-	B+	B	B-	C+	C	D	F	Total Grades
Fall 2019 (Number)	209	109	122	108	108	88	80	74	105	96	1099
Fall 2019 (%)	19.0	9.9	11.1	9.8	9.8	8.0	7.3	6.7	9.6	8.7	100.0
Spring 2020 (Number)	132	108	151	131	109	88	70	39	34	25	887
Spring 2020 (%)	14.9	12.2	17.0	14.8	12.3	9.9	7.9	4.4	3.8	2.8	100.0
Summer 2020 (Number)	115	92	103	96	85	56	43	11	13	27	641
Summer 2020 (%)	17.9	14.4	16.1	15.0	13.3	8.7	6.7	1.7	2.0	4.2	100.0

TABLE II
STATISTICAL DATA OF VARIOUS GRADES OBTAINED BY THE STUDENTS OF BSC IN EEE (EVENING) PROGRAM IN THREE CONSECUTIVE SEMESTERS

Semester	A+	A	A-	B+	B	B-	C+	C	D	F	Total Grades
Fall 2019 (Number)	284	129	202	224	227	198	150	108	143	133	1798
Fall 2019 (%)	15.8	7.2	11.2	12.5	12.6	11.0	8.3	6.0	8.0	7.4	100.0
Spring 2020 (Number)	252	188	217	228	213	153	129	50	92	12	1534
Spring 2020 (%)	16.4	12.3	14.1	14.9	13.9	10.0	8.4	3.3	6.0	0.8	100.0
Summer 2020 (Number)	167	137	185	202	191	136	105	62	43	27	1255
Summer 2020 (%)	13.3	10.9	14.7	16.1	15.2	10.8	8.4	4.9	3.4	2.2	100.0

TABLE III
STATISTICAL DATA OF VARIOUS GRADES OBTAINED BY THE STUDENTS OF BSC IN EEE (FRIDAY) PROGRAM IN THREE CONSECUTIVE SEMESTERS

Semester	A+	A	A-	B+	B	B-	C+	C	D	F	Total Grades
Fall 2019 (Number)	142	75	95	116	118	130	125	115	137	124	1177
Fall 2019 (%)	12.1	6.4	8.1	9.9	10.0	11.0	10.6	9.8	11.6	10.5	100.0
Spring 2020 (Number)	136	133	243	222	202	143	111	103	88	16	1397
Spring 2020 (%)	9.7	9.5	17.4	15.9	14.5	10.2	7.9	7.4	6.3	1.1	100.0
Summer 2020 (Number)	109	119	159	186	199	170	101	30	26	37	1136
Summer 2020 (%)	9.6	10.5	14.0	16.4	17.5	15.0	8.9	2.6	2.3	3.3	100.0

TABLE IV
STATISTICAL DATA OF AVERAGE SEMESTER GPA AND CREDITS TAKEN BY THE STUDENTS OF BSC IN EEE (DAY) PROGRAM

Semester	GPA	σ_{GPA}	ΣRS	ΣCR	ΔTCR (%)	CR
Fall 2019	2.82	0.91	225	2,691	-	11.96
Spring 2020	3.09	0.63	213	2,487	-7.58	11.68
Summer 2020	3.09	0.87	163	1,915	-23.00	11.75

TABLE V
STATISTICAL DATA OF AVERAGE SEMESTER GPA AND CREDITS TAKEN BY THE STUDENTS OF BSC IN EEE (EVENING) PROGRAM

Semester	GPA	σ_{GPA}	ΣRS	ΣCR	ΔTCR (%)	CR
Fall 2019	2.80	0.84	331	4,516	-	13.64
Spring 2020	3.12	0.55	346	4,264	-5.58	12.32
Summer 2020	3.06	0.68	302	3,765	-11.70	12.47

TABLE VI
STATISTICAL DATA OF AVERAGE SEMESTER GPA AND CREDITS TAKEN BY THE STUDENTS OF BSC IN EEE (FRIDAY) PROGRAM

Semester	GPA	σ_{GPA}	ΣRS	ΣCR	ΔTCR (%)	CR
Fall 2019	2.59	0.8	266	3,245	-	12.20
Spring 2020	2.99	0.58	368	4,073	-25.52	11.07
Summer 2020	2.97	0.81	313	3,615	-11.24	11.55

\overline{GPA} = Average GPA of all registered students; σ_{GPA} = Standard Deviation of average GPA of all registered students; ΣRS = Total registered students; ΣCR = Total credits taken by all students; ΔTCR = Percentage change of the total credits taken; \overline{CR} = Average credits taken by the students.

From Tables IV-VI, it is observed that in three programs of the EEE Department, the total number of registered students count decreases and the average credits taken by them also go down from over 5% to over 25%. The table also shows that the average GPA obtained by the students also increases slightly in Spring and Summer 2020 semesters than that in the Fall 2019 semester and the standard deviation of the average GPA of the students also decreases. It happens due to the increment of the lower-order grades than that in the higher-order grades as shown in Tables I-III for all three programs.

Based on these observations, we also performed the z-test on obtained grades.

Several levels of significance (α) were used to observe the changes. Table VII shows such parameter values.

To find the z value, in the following formula

$$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$$

The student grades of Fall 2019 semester have been used as the population average μ , the student grades of Spring 2020 and Summer 2020 semesters as the samples, the average of the Semester Grade Point Average (SGPA) of a student in Spring

2020 or Summer 2020 semester as the mean \bar{x} . We used the data of either the Spring or Summer semester to find the impact on grades of the two semesters separately. Besides, to find the impact on grades, the average SGPA in the Fall 2019 semester was used as mean SGPA μ , the standard deviation of all SGPA's of the Fall 2019 semester as σ , and the total student registered in the Spring 2020 or Summer 2020 Semester as the number of population, n . The data of either the Spring or Summer semester was used to find the impact on SGPA's of two semesters separately. The main purpose of finding such impact was to check the grade inflation issue and to take appropriate measures to curb the grade inflation excessive rate because already in some other countries the issue of higher grade inflation rate due to online teaching was reported [31]

Tables VIII-X show the outcome of the z-test on grades of the three programs of the EEE department, viz. Day, Evening, and Friday for two different semesters, Spring 2020 and Summer 2020 based on the Fall 2019 semester, which was completely unaffected by the COVID-2019 pandemic. The corresponding critical values are shown in the tables below each value of alpha (α). Here TRUE means the alternative hypothesis H_1 can be accepted (the average grade has significantly changed) and FALSE means H_0 can be accepted so the grade average hasn't changed significantly.

TABLE VII
VARIOUS VALUES OF STATISTICAL PARAMETERS

α	0.2	0.1	0.05	0.01
Level of confidence	80%	90%	95%	99%
z-score (Critical value)	1.282	1.645	1.96	2.576

TABLE VIII

STATISTICAL ANALYSIS OF Z-TEST ON THE AVERAGE SEMESTER GPA BASED ON VARIOUS VALUES OF α FOR THE STUDENTS OF BSc IN EEE (DAY) PROGRAM

Semester	\overline{GPA}	σ_{GPA}	ΣRS	ΣCR	\overline{CR}	z	α			
							0.2	0.1	0.05	0.01
							1.282	1.645	1.96	2.576
Fall 2019	2.82	0.91	225	2,691	11.96					
Spring 2020	3.09	0.63	213	2,487	11.68	4.33	True	True	True	True
Summer 2020	3.09	0.87	163	1,915	11.75	3.79	True	True	True	True

TABLE IX

STATISTICAL ANALYSIS OF Z-TEST ON THE AVERAGE SEMESTER GPA BASED ON VARIOUS VALUES OF α FOR THE STUDENTS OF BSc IN EEE (EVENING) PROGRAM

Semester	\overline{GPA}	σ_{GPA}	ΣRS	ΣCR	\overline{CR}	z	α			
							0.2	0.1	0.05	0.01
							1.282	1.645	1.96	2.576
Fall 2019	2.80	0.84	331	4,516	13.64					
Spring 2020	3.12	0.55	346	4,264	12.32	7.09	True	True	True	True
Summer 2020	3.06	0.68	302	3,765	12.47	5.38	True	True	True	True

TABLE X

STATISTICAL ANALYSIS OF Z-TEST ON THE AVERAGE SEMESTER GPA BASED ON VARIOUS VALUES OF α FOR THE STUDENTS OF BSc IN EEE (FRIDAY) PROGRAM

Semester	\overline{GPA}	σ_{GPA}	ΣRS	ΣCR	\overline{CR}	z	α			
							0.2	0.1	0.05	0.01
							1.282	1.645	1.96	2.576
Fall 2019	2.59	0.8	266	3,245	12.20					
Spring 2020	2.99	0.58	368	4,073	11.07	9.59	True	True	True	True
Summer 2020	2.97	0.81	313	3,615	11.55	8.40	True	True	True	True

Therefore, from Tables VIII-X, we can infer that-
(1) the Grade Point Average or GPA of all the programs of the EEE Department changed significantly.

(2) the percentages of 'F' grades have dropped dramatically due to the online assessment processes. So, the grades of the programs which gave many 'F's in on-campus examinations have been affected the most.

B. Effect of Course Advising and Registration

Table XI shows the effect on the number of advised and registered students in various semesters of the years 2019 and 2020. Semester-wise percentage changes of the advised to the

registered students are shown here. It is observed that as the semesters approach the pandemic period, the number of registered students concerning the advised students declines. This is attributed to the uncertainty gripped into the minds of the students, parents, and guardians as well as the financial crisis that diminished their income level.

Table XII shows the same comparative results between the two years 2019 and 2020 as a whole. It is observed that the drop rate was only 4.8% in 2019 but it goes above 20% in 2020 due to the pandemic effect. Hence, it can be inferred that the pandemic has caused a huge impact on student decline in the registration process at various semesters of the year 2020.

TABLE XI
EFFECT ON THE NUMBER OF ADVISED AND REGISTERED STUDENTS FROM ONE SEMESTER TO THE NEXT SEMESTER

Program	Spring 2019			Summer 2019			Fall 2019			Spring 2020			Summer 2020			Fall 2020		
	N_A	N_R	N_P	N_A	N_R	N_P	N_A	N_R	N_P	N_A	N_R	N_P	N_A	N_R	N_P	N_A	N_R	N_P
BSc in EEE (Day)	277	268	-3.3%	233	222	-4.7%	233	225	-3.4%	242	230	-4.9%	197	173	-12.2%	191	122	-36.8%
BSc in EEE (Evening)	348	338	-2.9%	336	333	-0.9%	341	332	-2.6%	351	350	-0.3%	352	309	-12.2%	368	275	-25.5%
BSc in EEE (Friday)	108	107	-0.9%	200	175	-12.5%	305	266	-12.8%	381	381	0.0%	377	320	-15.1%	430	327	-24.8%

N_A = Number of Advised Students; N_R = Number of Registered Students; N_P = Percentage of students registered students in %.

TABLE XII
EFFECT ON THE NUMBER OF REGISTERED STUDENTS AND ADVISED STUDENTS AS WELL AS DROP RATE IN 2019 AND 2020

Program	2019			2020		
	N_A	N_R	N_P	N_A	N_R	N_P
BSc in EEE (Day)	743	715	-3.8%	632	525	-16.9%
BSc in EEE (Evening)	1025	1003	-2.2%	1072	934	-12.9%
BSc in EEE (Friday)	613	548	-10.6%	1193	1028	-13.8%

TABLE XIII
PERCENTAGE CHANGE OF THE NUMBER OF ADVISED STUDENTS FROM ONE SEMESTER TO THE NEXT SEMESTER IN 2019

Program	Number of Advised Students			N_{PSS19}	N_{PSF19}
	Spring 2019	Summer 2019	Fall 2019		
BSc in EEE (Day)	277	233	233	-15.9%	-15.9%
BSc in EEE (Evening)	348	336	341	-3.5%	-2.0%
BSc in EEE (Friday)	108	200	305	85.2%	182.4%
Total	733	769	879	4.9%	19.9%

N_{PSS19} = Percentage Change of Advised Student Count from Spring 2019 to Summer 2019 Semester; N_{PSF19} = Percentage Change of Advised Student Count from Spring 2019 to Fall 2019 Semester.

TABLE XIV
PERCENTAGE CHANGE OF THE NUMBER OF ADVISED STUDENTS FROM ONE SEMESTER TO THE NEXT SEMESTER IN 2020

Program	Number of Advised Students			N_{PSS20}	N_{PSF20}
	Spring 2020	Summer 2020	Fall 2020		
BSc in EEE (Day)	242	197	193	-18.6%	-20.3%
BSc in EEE (Evening)	351	352	369	0.3%	+5.1%
BSc in EEE (Friday)	381	377	435	-1.1%	+14.2%
Total	974	926	997	-4.9%	+2.4%

N_{PSS20} = Percentage Change of Advised Student Count from Spring 2020 to Summer 2020 Semester; N_{PSF20} = Percentage Change of Advised Student Count from Spring 2020 to Fall 2020 Semester

Tables XIII and XIV show how this impact grows from the Spring to the Summer and then to the Fall semesters in two different years of 2019 and 2020. The whole year 2019 was completely unaffected by the COVID-2019 pandemic and the whole year 2020 was completely affected by the COVID-2019 pandemic situation.

As the admission is highest in Spring, there is always a downwards tendency for the number of advised students from Spring to Fall of any year. In 2019, this drop was around -4.8%. In Table XIV, it has been shown the percentage of advised student-count drops from -18.6% to -20.3% from Spring 2020 to Fall 2020 Semester, and this is much higher than that in 2019 as shown in Table XIII. If the data is adjusted with the change by deducting -15.9% from the -20.3% then it is found that only a 4.4% drop occurs due to the pandemic. However, the same issue is not found in the Evening and Friday programs as these programs are new and no students have passed out yet. Therefore, the pandemic shock is not so severe in this department's various programs.

VI. RECOMMENDATION FOR FURTHER IMPROVEMENT

Based on the faculty and students' feedback and survey data analysis, we have found that there are numerous advantages and disadvantages of the online classes that were published in a previous article, and accordingly, some suggestions were also given [17]. In this work, we analyzed the Semester Grade Point Averages obtained by the students, student registration, and

then some more requirements are provided as provided in the following sub-sections.

A. Capacity Level Requirements

The first thing that we identified is to build the capacity of the faculty members so that they become capable of teaching online. That is why they need extensive training on it. They need not only teaching but also motivation in this regard. Through a focus group discussion, we have found that the faculty members have little idea about online teaching-learning and assessment-evaluation mode. They fear that through online teaching-learning-assessment processes the students might be over-graded. However, through our analysis, it was proved negative in the EEE Department because right from the switching to the online teaching mode, the EEE Department was very cautious about the students being over-graded or under-graded. As such, the EEE Department provided clear guidelines and training regarding the online teaching mode to its faculty members as well as students. Based on the discussions with the faculty members of the EEE Department, it was recommended some suggestions for them as well. It was suggested that the faculty members of the EEE Department should be capable to-

- Produce contents of the courses that allow the students to interact with the teachers during online class and helps to increase their learning experiences
- Prepare and distribute the online teaching-learning materials reliably so that the learning experiences of the students are enough and satisfactory

- c) Prepare the online learning outcome assessment strategy
 - d) Attract students to the virtual or online platform
 - e) Make sure that he/she is keeping all students engaged in the learning process
 - f) Utilize the online classes to build the teacher-student rapport and peer communal practices
 - g) Share vital ideologies of online instructions in the classes
 - h) Circumvent estranging or turning off their students from the online paradigm
 - i) Share classroom videos and lecture slides with the students so that they can download them later if they miss any class or need to listen to the lecture again.
- b) If there is any evidence found against any student then specific university rules are to be applied so that the same types of things don't happen repeatedly.
 - c) The students need to be brought under confidence level because due to the online examination anxieties and pains students may get even lower grades, too. In such cases, grading may be lower and students may be reluctant to take part in the online examination system. That is why, proper counseling and guidance must be given at the beginning of the class in a particular semester, that is, course objectives, course learning outcomes, teaching-learning strategies, assessment and evaluation policies, tools, and techniques, etc. must be explained to the students clearly.

B. Equipment Requirements

To deliver online courses effectively, a faculty member must require equipment and software tools. After the focus group discussion with them the following equipment and software tools were suggested-

- a) A web conferencing platform, such as Zoom, Google Meet, etc. Besides, Google classroom should be used.
- b) A computer (tabs or cell phones do not allow full involvement in the online classes)
- c) Reliable high-speed internet access (with minimum 5 Mbps of upload/download speed)
- d) A microphone
- e) A set of speakers (built-in, headset, or from webcam)
- f) A web-based high-resolution camera, during the online class. It is suggested that the faculty members should keep their cameras turned on.

C. Assessment and Evaluation Requirements

To assess and evaluate the students of online classes properly, a faculty member must need to know the process to avoid unexpected and exaggerated grades awarded to the students for the same course and the same amount of assessment tasks provided before and during the pandemic period in the on-site and online classes respectively. For this purpose, the faculty members need extensive training. It is recommended that such training should be provided by expert educationists in this field and written training materials must be provided. Otherwise, grade inflation is supposed to occur as such phenomenon has already been reported in the literature in several countries around the world. These are supposed to occur because now students might get some help during the examination via WhatsApp, Facebook Messenger, Viber, etc. groups, with their classmates, or even their parents, guardians, seniors may help or someone may be asked to take part their examinations on their behalf. Apprehending such issues, some of the recommendations are given in this regard:

- a) At first, faculty members should keep good faith in their students, they must not assume that their students are doing cheating unless there is any concrete evidence to them. However, they should keep track of their students so that they are not able to cheat. In this regard, proper motivation should be given to the ethical responsibility to be demonstrated by the students.

- d) It is suggested already that the cognitive domain of teaching-learning is to be adopted for the online class. However, some lower levels of the affective and psychomotor domains may be used. Accordingly, assessment plans and tools must be selected.
- e) Open Book Examination (OBE) should be adopted. The questions of the examination (that is, the assessment tools) should be designed in such a way so that creative, analytical, and critical thinking processes are required by the students to answer the questions. Besides, for quantitative questions, data or parameter values may be changed from one student to another. Moreover, it must be ensured that the answers have no single or unique solutions. Besides, the faculty members should design their questions, it should not be copied from the textbook or internet sources, otherwise, there is a chance to find it from the internet sources. However, it should also be kept in mind that no method is 100% reliable and error-free. As such, the faculty members should apply their judgment to make an effective qualitative and quantitative assessment and evaluation of their students to tackle the issue of grade inflation.

D. Admission and Promotion Requirements

Since the admission and registration to the program slightly so this should be taken care of seriously. After the focus group discussion with the faculty members, the following points and tasks were advised for the faculty members of the EEE Department to be performed properly-

- a) Since the education of the EEE Department has switched to the online mode, therefore, the faculty members should try to increase their online visibility. To ensure this they must open online accounts on various online social platforms, like Facebook, LinkedIn, Google Scholar, ResearchGate, etc. and thus they should communicate with the learned people as well as prospective students who may take admission.
- b) To engage the existing students, the faculty members must arrange some online programs, like a webinar, online workshop, online quiz contest, online Olympiad, virtual conference, online career talk, etc.
- c) Sincerity and diligence should be demonstrated by the faculty members regarding taking classes, departmental

extra- and co-curricular activities, student advising, and counseling, research supervision, etc.

- d) The faculty members of the EEE department should talk regularly with the college teachers and share their departmental activities and progresses through frequent online discussion programs with them.
- e) To arrange the online focus group discussion programs with the alumni and employers.
- f) The faculty members and staff of the EEE Department should resolve any problems of the students as early as possible through email or over phone communication.
- g) The faculty members of the EEE Department or any renowned faculty member from other universities at home or abroad should be invited for short talks regularly to fill up knowledge gaps of the students.
- h) Industry leaders should be invited very often to give an online presentation to the students so that they get some practical experiences and ideas about their future jobs. In this way, they can reduce the skill-set gap mismatch.
- i) The department should showcase their research works through an online project fest or virtual conference.
- j) All research publications of the faculty members and students should be made online and accessible through the university's website.
- k) All the study materials should be made available to the students through Google classroom.

VII. CONCLUSION

This paper discussed the online teaching, learning, assessment, and evaluation processes and tries to address the grading problem issues faced by both faculty members and students. Based on student grade-related data analysis, we have concluded that the grading is neither scaled up nor scaled down due to online assessment and evaluation, but the problems associated with the grading issues may be resolved if proper teaching, learning, evaluation processes are followed. However, the modified policies must be circulated among the faculty members and students so that they are aware of them.

On the other hand, the overall impact on course advising and registration is not so affected at the three programs of the EEE Department of Southeast University. But the number of student admission goes down as the nationwide Higher Secondary Certificate (HSC) examination was not held in Bangladesh. But it is expected that the student admission would rise at the EEE Department once the entrance examination of the public engineering or science and technology universities is over.

In some cases, to build up the capacity, training should be provided to the faculty members regularly, feedback should be taken from the faculty members and students, the regular meeting should be arranged with the faculty members and students to build their confidence in new policies, etc. After all, students should know all the policies and practices adopted for their betterment whatever be the mode of teaching, learning, assessment, and evaluation.

REFERENCES

- [1] D. Vlachopoulos, "COVID-19: Threat or opportunity for online education?" Higher Learning Research Communication, vol. 10, no. 1, 2020, pp. 16-19, doi: 10.18870/hlrc.v10i1.1179.
- [2] WHO: Considerations in adjusting public health and social measures in the context of COVID-19, (Interim Guidance, 16 April 2020) (WHO 2020). <https://www.who.int/publications-detail/considerations-in-adjusting-public-health-and-social-measures-in-the-context-of-covid-19-interim-guidance>, accessed on 10 December 2020.
- [3] WHO1: WHO Bangladesh COVID-2019 Situation Reports, [https://www.who.int/bangladesh/emergencies/coronavirus-disease-\(covid-19\)-update/coronavirus-disease-\(covid-19\)-bangladesh-situation-reports](https://www.who.int/bangladesh/emergencies/coronavirus-disease-(covid-19)-update/coronavirus-disease-(covid-19)-bangladesh-situation-reports), accessed on 12 December 2020.
- [4] M. H. Bhuyan, "Practices of Online Teaching, Learning, and Assessment of the BSc in EEE Programme during the COVID-2019 Pandemic," Contemporary Educational Researches Journal (CERJ), ISSN: 2301-2552, vol. 11, no. 2, May 2021, pp. 14-28, <https://doi.org/10.18844/cerj.v11i2.5899>.
- [5] MF: <https://themanifest.com/app-development/how-do-online-classes-work-2020>, accessed on 12 January 2021.
- [6] E. P. Bettinger, L. Fox, S. Loeb, and E. S. Taylor, "Virtual Classrooms: How Online College Courses Affect Student Success," American Economic Review, vol. 107, no. 9, 2017, pp. 2855-2875, <https://doi.org/10.1257/aer.20151193>.
- [7] I. Allen, Elaine, and J. Seaman, "Changing Course: Ten Years of Tracking Online Education in the United States," Sloan Consortium, 2013, Newburyport, MA, USA.
- [8] D. J. Deming, C. Goldin, L. F. Katz, and N. Yuchtman, "Can Online Learning Bend the Higher Education Cost Curve?" American Economic Review, Papers and Proceedings, vol. 105, no. 5, 2015, pp. 496-501.
- [9] B. Jacob, D. Berger, C. Hart, and S. Loeb, (Forthcoming), "Can Technology Help Promote Equality of Educational Opportunities?," In K. Alexander and S. Morgan (Editors), The Coleman Report and Educational Inequality Fifty Years Later. Russell Sage Foundation and William T. Grant Foundation, New York, USA.
- [10] M. Wicks, "A National Primer on K-12 Online Learning. Version 2," International Association for K-12 Online Learning, 2010, Vienna, VA, Austria.
- [11] A. G. Picciano, J. Seaman, P. Shea, and K. Swan, "Examining the Extent and Nature of Online Learning in American K-12 Education: The Research Initiatives of the Alfred P. Sloan Foundation," The Internet and Higher Education Journal, vol. 15, no. 2, 2012, pp. 127-35.
- [12] D. Sapp and J. Simon, "Comparing grades in online and face-to-face writing courses: Interpersonal accountability and institutional commitment." Journal of Computers and Composition, Elsevier, vol. 22, no. 4, 2005, pp. 471-489, doi: 10.1016/j.compcom.2005.08.005.
- [13] D. Xu and S. S. Jaggars, "The impact of online learning on students' course outcomes: Evidence from a large community and technical college system," Economics of Education Review, vol. 37, August 2013, pp. 46-57, doi: <http://dx.doi.org/10.1016/j.econedurev.2013.08.001>.
- [14] A. C. Hachey, C. Wladis, and K. Conway, "Prior Online Course Experience and G.P.A. as Predictors of Subsequent Online STEM Course Outcomes," The Internet and Higher Education, Elsevier, ISSN 1096-7516, vol. 25, April 2015, pp. 11-17, doi: <https://doi.org/10.1016/j.iheduc.2014.10.003>.
- [15] Inside Higher Education, IHE: <https://www.insidehighered.com/digital-learning/article/2018/11/07/new-data-online-enrollments-grow-and-share-overall-enrollment>, retrieved on 20 February 2021.
- [16] A. Lebedev, N. Shamina, and I. Pinkovetskaia, "Language Education in Russian Universities: Advantages, Vulnerabilities and Risks of Online Teaching," Universal Journal of Educational Research, vol. 8, no. 12B, 2020, pp. 8159-8168, doi: 10.13189/ujer.2020.082619.
- [17] E. Bettinger and S. Loeb, "Promises and pitfalls of online education," Economic Studies B (at Brookings), Evidence Speaks Reports, vol. 2, no. 15, June 2017, pp. 1-4.
- [18] M. H. Bhuyan and S. S. A. Khan, "Motivating Students in Electrical Circuit Course," International Journal of Learning and Teaching (IJLT), ISSN: 1986-4558, vol. 10, issue 2, April 2018, pp. 137-147.
- [19] EEE (2020). BSc in EEE Course Curriculum as per Outcome-Based Education (OBE). Revised BSc in EEE course curriculum as per the 3rd Curriculum Committee Meeting of EEE Department, Southeast University, Dhaka, Bangladesh, held on 30 January 2019: http://www.seu.edu.bd/dept/eee/downloads/Course_Curriculum_of_EEE_Department_3.pdf, retrieved on 10 July 2020.

- [20] M. H. Bhuyan, and S. S. A. Khan, "Assessing and Evaluating the Course Outcomes of Electrical Circuit Course for Bachelor of Science in Electrical and Electronic Engineering Program," International Journal of Educational and Pedagogical Sciences, vol. 14, no. 12, 2020, World Academy of Science, Engineering and Technology, pp. 1163-1171.
- [21] M. H. Bhuyan and A. Tamir, "Evaluating COs of Computer Programming Course for OBE-based BSc in EEE Program," International Journal of Learning and Teaching, ISSN: 1986-4558, vol. 12, no. 2, 2020, pp. 86-99.
- [22] M. H. Bhuyan, "Teaching Electrical Circuits Course for Electrical Engineering Students in Cognitive Domain," Journal of Bangladesh Electronics Society, vol. 14, no. 1-2, pp. 83-91, 2014.
- [23] M. H. Bhuyan and S. S. A. Khan, "Teaching a Numerical Analysis Course for Electrical Engineering Students in the Cognitive Domain," International Journal of Electrical Engineering Education, Manchester University Press, UK, ISSN e: 2050-4578, p: 0020-7209, vol. 51, no. 1, pp. 82-92, 2014.
- [24] M. H. Bhuyan, S. S. A. Khan and M. Z. Rahman, "Teaching Analog Electronics Course for Electrical Engineering Students in Cognitive Domain," Journal of Electrical Engineering (JEE), the Institution of Engineers Bangladesh (IEB), Dhaka, Bangladesh, vol. EE 40, no. I-II, pp. 52-58, 2014.
- [25] M. H. Bhuyan, S. S. A. Khan and M. Z. Rahman, "Teaching Digital Electronics Course for Electrical Engineering Students in Cognitive Domain," International Journal of Learning and Teaching (IJLT), ISSN: 1986-4558, vol. 10, issue 1, January 2018, pp. 1-12.
- [26] E. Pattison, E. Grodsky, and C. Muller, "Is the Sky Falling? Grade Inflation and the Signaling Power of Grades," Journal of Educational Research, vol. 42, no. 5, 2013, pp. 259-265, PMID: 25288826, doi: <https://journals.sagepub.com/doi/abs/10.3102/0013189X13481382>.
- [27] R. Hernandez-Julia'n and A. Looney, "Measuring inflation in grades: An application of price indexing to undergraduate grades," Economics of Education Review, vol. 55, December 2016, pp. 220-232, online: <https://www.sciencedirect.com/science/article/pii/S0272775716303806>.
- [28] D. L. Crumbley, R. Flinn, and K. J. Reichelt, "Unethical and Deadly Symbiosis in Higher Education. Account," Journal of Information, vol. 21, no. 3, June 2012, ISSN: p-0963-9284, e-1468-4489, pp. 307-318, <https://www.tandfonline.com/action/journalInformation?journalCode=raed20>.
- [29] H. Rosovsky and M. Hartley, "Evaluation and the academy: Are we doing the right thing?" Cambridge, MA AmAcad Arts Sci (Internet). 2002, online: www.amacad.org.
- [30] A. W. "Astin The changing American college student: Thirty-year trends, 1966-1996," Reviews in Higher Education, vol. 21, no. 2, 1998, pp. 115-135.
- [31] E. Karadag, "Effect of COVID-19 pandemic on grade inflation in higher education in Turkey," vol. 16, no. 8, ISSN: e-0256688, online: <https://doi.org/10.1371/journal.pone.0256688>.

of the Board of Accreditation of Engineering and Technical Education (BAETE), Dhaka, Bangladesh under IEB.
Prof. Bhuyan is a Member of IEEE, USA, Executive Member of Bangladesh Electronics and Informatics Society (BEIS), and Fellow of the Institution of Engineers Bangladesh (IEB). He is a regular reviewer and technical/editorial/organizing committee member of several national and international journals and conferences. He was the Organizing Chair of the IEEE 22nd International Conference on Computer and Information Technology (ICCIT) held at Southeast University, Dhaka, Bangladesh during 18-20 December 2019. He is the recipient of the Bangladesh Education Leadership Awards (Best Professor in Electrical Engineering) in 2017 from the South Asian Partnership Awards, Mumbai, India.



Muhibil Haque Bhuyan (MIEEE'07-) became a Member (M) of the World Academy of Science, Engineering and Technology in 2005, born in Dhaka, Bangladesh on 25 July 1972. He did his BSc, MSc, and PhD degrees in Electrical and Electronic Engineering (EEE) from Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh in 1998, 2002, and 2011 respectively.

Currently, he is working as a Professor of the Department of Electrical and Electronic Engineering of Southeast University, Dhaka, Bangladesh. He led this department as the Departmental Chairman from 1st March 2016 to 10th March 2021. Previously, he worked at the Green University of Bangladesh, Dhaka as a Professor and Chairman of the EEE Department; Daffodil International University, Dhaka, Bangladesh as an Assistant Professor and Head of ETE Department; Presidency University, Dhaka, Bangladesh as an Assistant Professor and American International University Bangladesh (AIUB), Dhaka as a Faculty Member since June 1999. He also worked as a Researcher in the Center of Excellence Program of Hiroshima University, Japan from July 2003 to March 2004. He has served as an Adjunct Faculty at AUST, IIUC, EWU, DIU, PU, etc. So far, he has published over 60 research papers in national and international journals and presented over 50 research works at national and international conferences.

His research interests include MOS device modeling, biomedical engineering, control system design, online practices of teaching and learning, outcome-based engineering education, assessment, and evaluation. He is a program evaluator