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Assessment of Student Satisfaction with Online Learning: *A Case of Undergraduate Engineering Students*

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Abstract

The long-lasting and complicated pandemic situation has forced educational institutions to shift online. However, assessing learner satisfaction is extremely important for the effective implementation of online learning. This study examines factors that influence satisfaction regarding online classes during the pandemic period of COVID – 19. For this quantitative study, data were collected from 99 undergraduate engineering students of Tribhuvan University. A standardized structured questionnaire was designed to evaluate student satisfaction covering two significant predictors of students' satisfaction; Instructor Performance and Interaction, and dissimilated through google forms. The research design embraced in the study consists of descriptive, relational, and casual research designs. And data were analyzed using SPSS using various tools such as mean, median, standard deviation, independent sample t-test, correlation, regression, etc. The findings revealed that instructor performance and interaction have a significant positive relationship and impact students' satisfaction in an online learning environment. The study further revealed that students are not satisfied with present online learning tools and techniques. Additionally, they recommend using a new learning and problem-solving approach compared to traditional methods to make online learning less complex and more effective.

Keywords: COVID-19, instructor performance, interaction, student satisfaction

1. Background of the problem

Advances in the field of information and communication technology (ICT) are permitting substantial improvements in educational practices (Flecknoe, 2002). It has opened up new educational possibilities, particularly in higher education, making e-learning the

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new paradigm of modern education. Distance education is a learning environment in which learners are not physically present, and education resources are put together by means of information technology (Cakir, 2014). Online education is the most rapidly growing type of distance education, and it is appreciated at both traditional and non-traditional schools and universities (Kentnor, 2015). Online learning can be defined as instruction delivered on a digital device intended to support learning (Clark & Mayer, 2011). Online learning has enabled educational institutions to forego the conventional paradigm of face-to-face lectures in favor of content delivery via electronic means (Flecknoe, 2002). Evidence suggests that online learning can be a catalyst for active learning, boost creativity, motivate students to study, and update their current knowledge base communication.

The recent COVID 19 pandemic further illustrates the importance of online learning in today's education system. It has proven to be a boon to both students and teachers who were unable to attend school because of the danger of disease spreading (Allo , 2020). In the context of Nepal also, major universities, including Tribhuvan University (TU), have recently accepted the concept of online classes formally, along with a guideline, and disseminated a notice to their constituent colleges. The associated institutions are also currently developing specific directions to implement online classes (Kunwar, Kumar, & Shrestha, 2020). But this shift from traditional face-to-face learning to web-based learning poses several difficulties for instructors and students, which can affect the knowledge transfer processes and further reduce the efficiency of teaching and learning processes.

Therefore, it is critical to understand students' satisfaction with online learning for effective implementation of the program. As it is one of the important factors to evaluate quality of online learning and student performance. Although several previous studies have looked at various aspects of students' perceptions and student satisfaction in online learning environments, ut these researches were conducted at a time when e-learning platforms were used as supplements to traditional learning methods. However, online learning has become the only choice in the present setting of a long-term and complicated pandemic. And just a limited amount of study on student satisfaction in online classrooms can be found, considering the fact that it occurred during a time when universities and other educational institutions were forced to utilize online learning as the primary tool to continue educational programs due to the Covid-19 pandemic (Rajabalee & Santally, 2020). So, the research problem focuses on the area of concern where there is a gap in the existing literature. And to fill the gap, this study is conducted. The research is directed at answering the following question;

- Is there any significant difference in the perception of instructor performance, interaction, and students' satisfaction across male and female undergraduate engineering students?
- How do instructor performance and interaction impact student satisfaction in an online learning environment among undergraduate engineering students?

2. Objectives of the study

Due to the complicated and long-term pandemic situation, educational institutions shifted to online learning from traditional learning. Therefore, an assessment of students' satisfaction is a must to know whether the students are satisfied or not with such drastic changes in the teaching and learning process. However, numerous earlier studies have been conducted relating to online learning and student satisfaction. These studies were carried out at a time when online learning was only a supplement to traditional learning. However, now the scenario is entirely different. Therefore, the major purpose of this study is to assess student satisfaction with online learning introduced due to pandemic situations. And other specific purposes of the study are listed below:

- To analyze the difference in the perception of instructor performance, interaction, and student satisfaction across male and female undergraduate engineering students;
- To investigate the relationship between instructor performance and interaction with student satisfaction in an online learning environment among the undergraduate engineering students;
- To identify the impact of instructor performance and interaction on student satisfaction in an online learning environment among undergraduate engineering students; and
- To investigate whether online learning requires a new approach to learning and problem solving or not.

3. Literature survey

A literature survey is an examination of scholarly sources on a particular subject. It gives an overview of current knowledge that aids in identifying useful ideas, methodologies, and research gaps. The transformative learning theory was developed by (Mezirow, 1991). This theoretical framework fits well for this research, as it examines learners' perception and satisfaction with online learning, which was adopted suddenly due to the COVID-19 pandemic. And the theory also gives us knowledge on how to increase students' confidence and engagement in performing internet-related tasks required by the course and successively enhance student satisfaction.

Likewise, the theory of transactional distance established by Moore (1997) is also relevant to the current study. The approach contributed significantly to the legitimization and growth of distance learning and teaching online. This theory proposes that physical and temporal distance between the student and the instructor causes pedagogical difficulties that must be mitigated through the course structure and learner-teacher interaction to minimize miscommunication and misunderstanding. Therefore, the theory of transactional distance focuses on reducing the pedagogical distance between learner and instructor in online classes and can help legitimize and grow distance learning and teaching online.

Most of the previous studies supported that student satisfaction with e-learning depends on the numerous factors such as instructor characteristics, technological characteristics, internet self-efficacy, interaction, course design, quality of internet, learner dimension,

cognitive factors, prompt feedback, alternative assessment methods, training workshops online technical support and various other factors.

Kuo, Walker, Belland, and Schroder (2013) conducted a study at College of Education at a Western University to determine how interaction and other predictors contributed to student satisfaction in online learning settings. The study identifies learner instructor interaction, learner content interaction, and internet self-efficacy are critical to student satisfaction. Furthermore, learner content interaction was the strongest predictor of student satisfaction, while interaction among students and self-regulated learning did not contribute to student satisfaction. Thus, the study confirmed the link between interaction and student satisfaction.

Based on the above, the following hypotheses are formulated;

$H_{01:}$ *There is no significant relationship between interaction and students' satisfaction in an online learning environment among undergraduate engineering students.*

$H_{02:}$ *There is no significant impact of interaction on students' satisfaction in an online learning environment among undergraduate engineering students.*

Gopal, Singh, and Aggarwal (2021) surveyed 544 students enrolled in business management (BBA & MBA) or hotel management courses in universities in India. The result of the study identified instructor quality, course design, prompt feedback, and expectation of students as crucial factors that impact student satisfaction in online classes. According to this study, instructor quality positively correlates with student satisfaction and positively impacts students' performance and satisfaction.

Based on the above, the following hypothesis are formulated;

$H_{03:}$ *There is no significant relationship between instructor performance and students' satisfaction in an online learning environment among undergraduate engineering students*.

$H_{04:}$ *There is no significant impact of instructor performance on students' satisfaction in an online learning environment among undergraduate engineering students.*

Sharma et al. (2020) also carried out research at Chitwan Medical College, Bharatpur, intending to assess the students' satisfaction with online learning and provide insights on steps necessary for further improvement. The study's findings concluded that learner dimension, technological characteristics, instructor characteristics, course management, and coordination positively correlate with student satisfaction in online classes. Another survey by Harsasi and Sutawijaya (2018) analyzed factors influencing students' satisfaction with online tutorials. The study's primary objective was to investigate factors determining student satisfaction in online tutorials and identify the factors that need improvement. The results showed that the course structure, online tutorial flexibility, and technology quality affect student satisfaction. In contrast, the quality of online tutorials has almost no influence on student satisfaction. This study further implies that the institutions should emphasize the quality of online tutorials, particularly in terms of presentation, the convenience of use, and tutor-student engagement. Improving these aspects of online

instructional quality is anticipated to enhance student learning outcomes. The students are also found to be satisfied with the university staff and faculty members who agreed on a specific online platform, grading system, assessment options, training workshops, online technical support, and more (Almusharraf & Khahro, 2020).

Some studies also tried to investigate whether student satisfaction differs according to some demographic variables. For instance, Bai, Srivastava, and Singh (2021) studied on impact of online learning on students taking the significant variables in research as the application used (provided material), gender and locality. The study's findings showed that rural students are more engaged in online learning when compared to urban students and female students have more positive perceptions of online learning compared to those males. And in the case of applications, the google platform followed by zoom meet is the most preferred platform for online learning. Cakir (2014) investigated the link between online student satisfaction and demographic variables with a similar aim. The findings of the study concluded that while online students' satisfaction levels did not significantly differ in terms of age, computer literacy levels, and internet accessibility, it substantially differs in terms of internet experience.

Based on the above previous literature, which acknowledged the link between demographic variables and student satisfaction, the following hypothesis is formulated;

$H_{05:}$ *There is no significant mean difference in the perception of instructor performance across male and female undergraduate engineering students.*

$H_{06:}$ *There is no significant mean difference in the perception of interaction across male and female undergraduate engineering students.*

$H_{07:}$ *There is no significant mean difference in the perception of students' satisfaction across male and female undergraduate engineering students.*

Allo (2020) surveyed to find out how learners feel about online learning in the middle of a COVID-19 outbreak and shed light on the availability of internet connection, financial issues, and the implementation of online learning. Students expect that professors would use facilities such as free online messaging applications in economic terms. They claimed that individual activities are preferable to keep the gap physically due to the pandemic. Still, they require group tasks to support friends who do not have an online pulse and access because of the availability of internet access.

The conceptual framework of the study is depicted in Figure 1. This research framework describes the impact of online learning on student satisfaction. Moreover, this study has taken student satisfaction as a dependent variable, whereas instructor performance and interaction influence as an independent variable. Here, instructor performance refers to the capacity of an instructor/teacher to offer appropriate teaching that fits students' learning requirements, learning styles, interests, and expectations, as well as being linked to standards that contribute to overall student satisfaction. Similarly, interaction consists of three major types of interaction (a) student-content, (b) student-instructor and (c) student-student interaction. And finally, student satisfaction is a short-term attitude coming from assessing students' educational experience, services, and facilities based on

student interactions and teacher quality in online classes. The moderating variable under the study is gender (male and female).

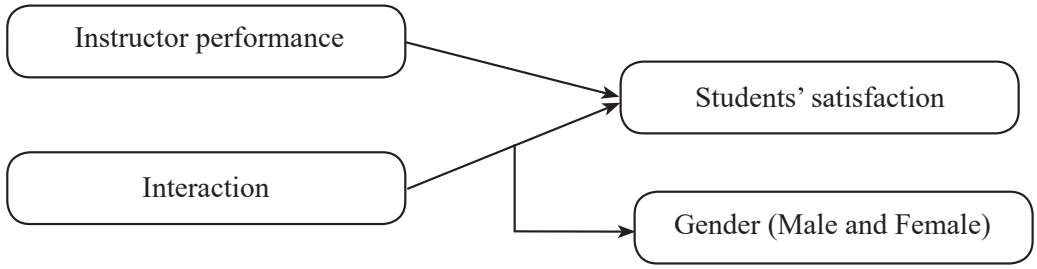

Figure 1. Research framework of the study

Instructor performance refers to professional behavior in which the instructor knows the educational needs of the students, possesses distinctive teaching abilities, and understands how to satisfy the students' learning needs (Luekens, Lyter, & Fox, 2008). In online learning, the role and responsibilities of the instructors have shifted from being the primary source of students' knowledge to being the manager of the students' knowledge resources (Romiszowski, 2004). Therefore, an instructor plays an integral part in ensuring the success of the online learning environment. This study uses the definition of instructor performance as the capacity of an instructor to offer appropriate teaching that fits students' learning requirements, learning styles, interests, and expectations and is linked to standards that contribute to overall student satisfaction. In the present study, instructor performance in e-learning is analyzed in terms of the instructor's ability to engage the students, provide a distraction-free class, supportiveness, responsiveness, punctuality, etc. In addition, the instructor's knowledge and commitment to developing various new skills to succeed because new technologies bring as much the change to instructors as they do to learners.

Interaction has been regarded as one of the most curial components in online education due to the isolation of instructors and students. Moore (1989) developed a theoretical framework for remote education interactions before this exponential rise of online learning. The framework specifies three types of interaction schemes: student-student interaction, student-content interaction, and student-teacher interaction. Moore and Kearsley (1996) defined student-to-student interactions as two-way reciprocal communication between or among students who exchange information, knowledge, opinions, or ideas regarding course content, with or without the presence of an instructor. The interaction of students with textbooks, instructional videos, and other learning materials is referred to as student-content interaction. As information flows to the learner from the subject matter, this interaction tends to be one-sided. At the same time, student-teacher interaction involves two-way communication between teacher and student. Asynchronous communication information exchange via discussion boards and email and synchronous (Real-time) communication via chat and video conferencing are examples of student-teacher interaction (Anderson, 2003). The requirement and type of interaction will vary in online learning based on the type of learner, the personality and attitude of the instructor, and the course design.

Lo (2010) described student satisfaction as the students' subjective views of how effectively a learning environment supports academic performance. Measuring the student's satisfaction is a complicated task in any learning environment however it's essential to assess as it is one of the critical factors to evaluate the quality of online learning and student performance additionally, students spend a considerable amount of time, effort, and money to get a quality education; therefore, they should perceive their online learning experience as being high value. Bangert (2006) outlined four factors influencing student satisfaction in online courses: student and faculty interaction and communication, amount of time on task, active and engaged learning, and cooperation among classmates. Likewise, Marsh and Roche (1997) also developed a complex model for measuring students' satisfaction, including learning value, teacher enthusiasm, rapport, organization, interaction, coverage, and evaluation. In the present study, student satisfaction is defined as the short-term attitude coming from assessing students' educational experience, services, facilities in the online learning environment, how they perceive online learning, and measured in terms of student interactions and teacher quality in online classes.

4. Research methodology

Research methodology refers to the various sequential steps taken for identifying, selecting, processing, and analyzing subject material. In addition, it covers issues related to the type of data collected and analyzed. The first part explains the research design. The research's population and sample are discussed in the second section, and the third section describes the research's nature and data sources.

Research design is a master plan specifying the methods and procedures for collecting and analyzing the needed information. The descriptive, relational, and causal research design was adopted in the study considering the fact that it will address the overall research objectives and hypothesis better. The primary goal of using descriptive research was to learn about the respondents' opinions, behaviors, and traits and describe the current situation and events. The relational research design was employed to see the relationship and degree of relationship between the various variables under this study. This study also used a causal research design to administer the impact of independent variables (instructor performance and interaction) on the dependent variable (student satisfaction).

The target population of this study is Tribhuvan University's engineering colleges in Kathmandu Valley, which offer a variety of B.E (Bachelor in Engineering) courses and have recently adopted online classes as an alternative to face-to-face classes due to the COVID-19 pandemic. Out of the total 12 engineering colleges of TU in Kathmandu Valley, three colleges, namely Pulchowk Campus, Thapathali Campus, and Janakpur Engineering College, were chosen on a convenience basis representing the defined population

Additionally, the population of the respondents consists of undergraduate engineering students of sampled colleges. The study has used the convenience sampling method to determine the required sample size of 94 respondents from the population of 3500

students, which follows the rule that requires sampling it at a 95 percent confidence level with a ±10 percent margin error (Yamane, 1967). However, 99 valid samples were gathered at last and used in the study. It has covered the students pursuing different undergraduate engineering courses at IOE, such as Civil Engineering, Mechanical Engineering, Electronics Engineering, Architecture, Electrical Engineering, and so on at the sampled colleges.

Due to the ongoing IOE examination and also the pandemic situation at the time of data collection it was inconvenient to collect data by physically distributing questionnaires; therefore, the required data for the study was obtained by conducting an online-based survey study between September 22 to September 27, 2021. A google form questionnaire link was sent to the students of sampled colleges through social media channels, student groups, and emails. Answers were made compulsory in such a way that without completing all question it cannot be submitted, to ensure the no issue of missing data.

This study relied heavily on primary sources of data. The research instrument utilized for the study was a questionnaire. A structured questionnaire, including the 5-point Likert scale (ranging from strongly disagree to strongly agree) was developed and distributed to students using Google Forms. The attributes or items for the Likert scale were adapted from prior studies with slight language modifications. Five items were extracted from a scale developed by Sharma et al. (2020) to evaluate the instructor's performance. The interaction was measured using three items adopted by Fedynich, Bradley, and Bradley (2015); Jhonson, Aragon, Shaik, and Nilda (2000), and student satisfaction was assessed using four items taken from the study work of Harsasi and Sutawijaya (2018).

The questionnaire starts with a brief summary of the study's purpose and confidentiality. Respondents were asked about their age, gender, and online learning experience in the general background part. Similarly, the primary and variables-related information section included yes/no questions, multiple-choice questions, rank order questions, and a Likert scale question to assess the students' overall perception of the usefulness of online classes in the context of the learning process, as well as their overall satisfaction with online learning. In addition, secondary data from textbooks, academic journals, and published articles were used in the current study to review the existing literature and develop the questionnaire.

5. Presentation and analysis of the data

For the data analysis, the survey data was initially entered into MS Excel and then evaluated using several statistical techniques. SPPS 20.0 software was used to do the necessary coding, recording, and data processing. Median, pie-chart, bar diagrams, tables, frequency and figures, independent sample t-test, and descriptive statistics were used in the analysis. Descriptive analyses were conducted to present the student's basic information and average independent and dependent variables score. Correlation analysis was performed to understand the relationship between independent and dependent variables. Multiple regression analysis was performed to investigate whether the two predictors i.e., instructor performance and interaction, significantly predict student satisfaction.

The responses received from the respondents have been arranged, tabulated, and analyzed in order to facilitate the various descriptive statistics, t-test, correlation and regression tests. In the survey questionnaire, the respondents were requested to respond in multiple ways: Yes or No, ranking, multiple, and likert scale options. In order to collect the perceived importance of determinants, a 5-point Likert scale has been used, where five being the most important as strongly agree and one being the least important as strongly disagree. The respondent's profile is extracted from those who participated in the survey on the strata of gender, age group and previous online learning experience. The calculation of primary data was made by IBM SPSS software version 20. The sources of the table presented below are the output of SPSS software which is edited in excel.

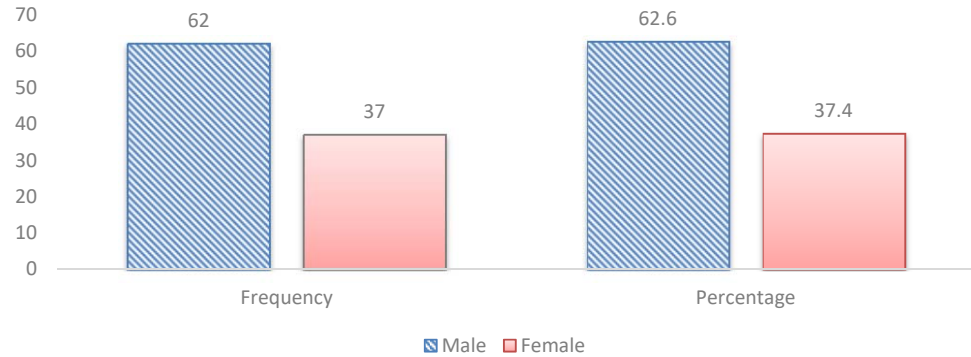

Figure 2. Gender of the respondents

Figure 2 presents the profile of responders based on their gender category strata. In terms of gender, as evident from *Figure 2*, there is no equal participation. The majority of responses (62.6 percent) were male, followed by 37.4 percent female respondents. Among the 99 people who responded, there were 62 males and 37 females.

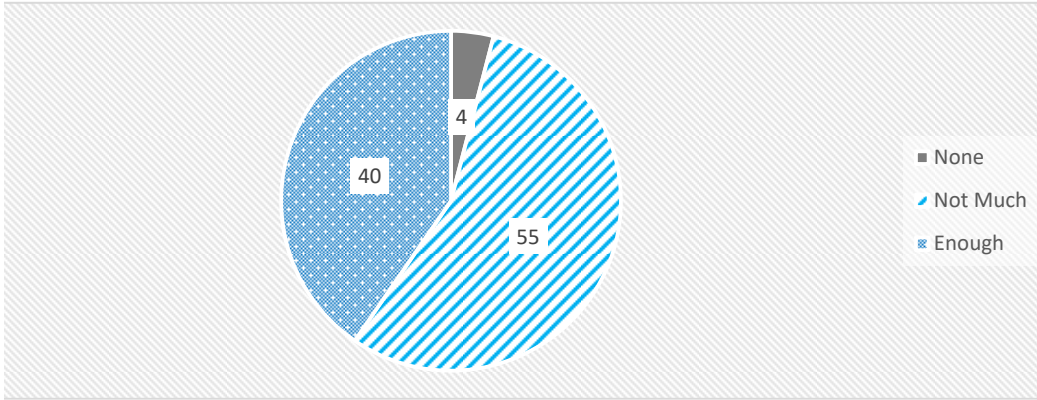

Figure 3. Age group of the respondents

Figure 3 reveals the age group of the respondents. The respondents' age ranged from 20 or below and up to 25 years old, as the study is particularly based on bachelor

lever students of similar age patterns. Participants who reported their age from 20-25 years are 73.7 per cent in total. Whereas the students who reported their age of 20 or below were at smaller percentages, i.e., 26.3 *Figure 3* shows the respondent age group categorization. Out of the 99 total respondents, 26 are below 20, and 73 are between 20 to 25 years.

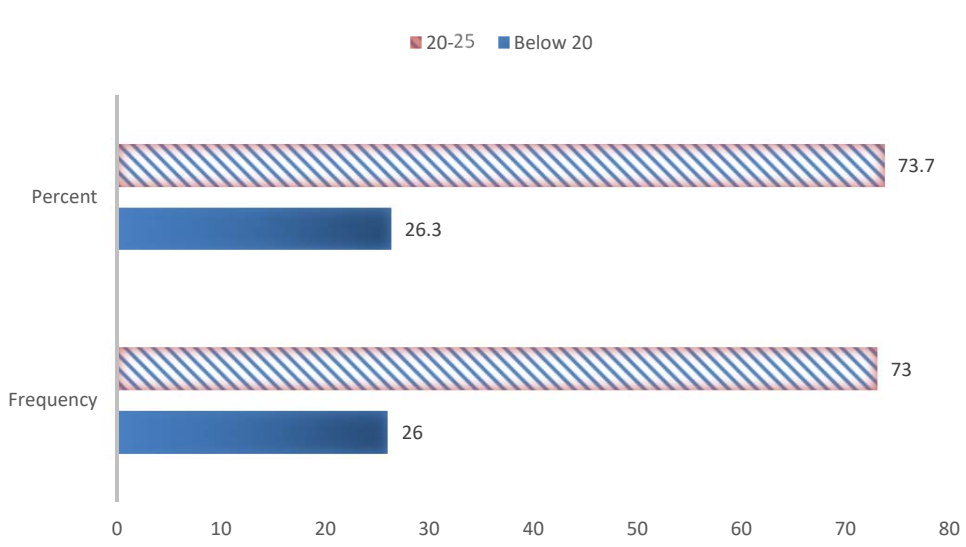

Figure 4. E-learning experience of the respondents

Figure 4 summarizes the respondents' previous e-learning experience revealing that out of 99 students, 55 students (55.6%) did not have much e-learning experience, 40 students (40.4%) had enough e-learning experience, and four students (4%) did not have any experience with online learning. This suggests that the vast majority of students have prior experience with e-learning. The table for this is presented in *Appendix 5*.

Table 1
Descriptive statistics for all samples

Variable/Statistics	N	Mean	Median	SD
Instructor performance	99	3.28	3.40	0.81
Interaction	99	3.21	3.33	0.83
Student's satisfaction	99	3.11	3.25	0.86

Table 1 reveals the descriptive status for the whole sample. The mean and median value of the independent variable, instructor performance, is the highest among all the variables, with a mean value of 3.28 and median value of 3.40, followed by another independent variable of our study, i.e., interaction having the mean value 3.21 median value 3.33. For our dependent variable, the student satisfaction means

the value is 3.11, and the median value is 3.25. Student satisfaction has the highest value in standard deviation, i.e., 0.86, followed by the interaction with a standard deviation value of 0.83. And the variable instructor performance has the lowest standard deviation with a value of 0.81. As an explanatory variable, instructor performance has the highest mean value and lowest standard deviation; it deviated the least. The most impact on the student satisfaction.

Table 2
Independent sample t-test for equality of means across gender

Variables / Statistics	Equal variance	Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Instructor performance	Equal variances assumed	2.07	0.153	-1.629	97	0.106	-0.271
	Equal variances not assumed			-1.730	89.665	0.087	-0.271
Interaction	Equal variances assumed	0.001	0.981	-2.555	97	0.120	-0.428
	Equal variances not assumed			-2.556	75.863	0.130	-0.428
Student's satisfaction	Equal variances assumed	0.874	0.352	-0.791	97	0.431	-0.142
	Equal variances not assumed			-0.816	83.238	0.417	-0.142

Table 2 assumes equal variance in instructor performance (*p-value = 0.153),* the mean difference across male and female students is – 0.271, and *p-value is 0.106,* which is greater than 0.05. Thus, the null hypothesis is accepted, i.e., the mean difference is insignificant. However, in the case of the interaction, while assuming the equal variance (*p-value = 0.981),* the mean difference across male and female students is – 0.428, and the *p-value* is more significant than 0.05, i.e., *p-value is 0.120.* Thus, the null hypothesis is accepted, and it can be concluded the mean difference is not substantial. Likewise, for the student satisfaction assuming the equal variance (*p-value = 0.352),* the mean difference across male and female respondents is – 0.142 (*p-value =0.431).* Thus, the null hypothesis is accepted, i.e., the mean difference is insignificant.

In order to explore if there are any significant differences between the moderating variable of the study i.e., sex, an independent sample t-test was conducted. Independent sample t-test made it easier to explore whether there is any difference in the impact of instructor performance and interaction on student satisfaction in an online learning environment across males or females or if they have an equal effect on both males and females. The results concluded no such difference exists. Since the independent sample t-test is one of the parametric tests, this study has assumed that the sample was drawn from a normally distributed population.

Table 3
Relationship between variables for all samples

Variables		Instructor performance	Interaction	Student's satisfaction
Instructor performance	Pearson Correlation	1		
	Sig. (2-tailed)			
Interaction	Pearson Correlation	.458**	1	
	Sig. (2-tailed)	(0.001)		
Student's satisfaction	Pearson Correlation	.472**	.522**	1
	Sig. (2-tailed)	(0.001)	(0.001)	

** Correlation is significant at the 0.01 level (2-tailed). The value in parentheses is the p-value.

Table 3 characterizes the correlation analysis of the variables under a study conducted for the whole sample. As shown in the table, the correlation for all samples between student satisfaction and instructor performance is observed to be positive and significant (as the p-value is less than 0.01) at a 99 percent confidence level with a correlation coefficient of 0.472. Likewise, the table also depicts the positive and significant relationship between student satisfaction and interaction at a 99 percent confidence level with a correlation coefficient of 0.522, which means both the instructor performance and interaction positively influence student satisfaction in online classes. So, in a nutshell, the correlation analysis of the current study shows both independent variables: instructor performance and interaction, have a positive and significant relationship with students' satisfaction in an online learning environment.

Table 4
Model summary for regression analysis

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
1	.584[a]	0.341	0.327	0.70883

[a] Predictors: (Constant), Interaction, Instructor performance

Table 4 presents the model summary of regression analysis. The adjusted R^2 result from regression analysis is 0.327, showing that instructor performance and interaction account for 32.70 per cent of the variability in student satisfaction. And the remaining variability in students' satisfaction is caused due to other variables that are not included in the current study.

Table 5 reveals the results of regression analysis for student satisfaction. It is evident from the result that the model fits the data well, as $p < 0.01$. The null hypothesis is rejected, and we can conclude there is a significant impact of interaction and instructor performance on student satisfaction.

Table 5
ANOVA for regression analysis

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24.925	2	12.463	24.804	.0001
	Residual	48.234	96	0.502		
	Total	73.159	98			

Dependent Variable: Student's satisfaction
Predictors: (Constant), Interaction, Instructor performance

Table 6
Impact of variables for all samples

Coefficients[a]	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.788	0.34		2.315	0.023
Instructor performance	0.315	0.001	0.294	3.159	0.002
Interaction	0.403	0.097	0.387	4.151	0.001

[a] Dependent Variable: Student's satisfaction

The variables, when compared on an individual basis, all variables are significant ($p < 0.01$), which indicates the impact of both independent variables (instructor performance and interaction) on the dependent variable (student satisfaction) is shown to be positive and significant at the 99 percent confidence level. The regression coefficient for instructor performance is 0.315, which suggests that student satisfaction is considerably sensitive to instructor performance, indicating instructor performance influence's a 31% change in student satisfaction in an online learning environment. The regression coefficient of interaction is 0.403, which means interaction enhances student satisfaction by 40%. Therefore, an increase in the level of interaction which can be student-student, student-instructor, or student-content, increases student satisfaction in online classes. The regression analysis results suggest that both instructor performance and interaction substantially impact student satisfaction, although exchange has a greater impact than instructor performance.

Table 7
Opinion on the use of a new approach of learning and problem solving among respondents

Responses	Frequency	Percentage
Yes	89	89.9
No	10	10.1
Total	99	100.0

Table 7 represents the result of the responses on opinions regarding the requirement to use a new approach of learning and problem-solving in online learning. The majority, i.e., 89 respondents (89.9 per cent) believe that online learning requires a new approach to learning and problem solving than that is used in traditional learning. On the other hand, only ten respondents (10.1 per cent) believe that online learning does not require a new learning and problem-solving approach.

6. Findings and discussion

The study's primary goal is to examine the relationship and impact of independent variables, instructor performance, interaction, and dependent variable student satisfaction in an online class during a pandemic and evaluate differences in perception about these independent and dependent variables across the gender. Based on data analysis, the significant findings of the study are as follows:

- There is no significant difference in the perception of instructor performance across gender among undergraduate engineering students of TU, as the p-value is 0.106, which is greater than 0.05.
- The p-value is 0.120, which is greater than 0.05, indicating no significant difference in perception of interaction across gender among TU undergraduate engineering students.
- Perception of student satisfaction has no significant difference across gender among undergraduate engineering students of TU as the p-value is 0.43, which is more significant than 0.05.
- The relationship between instructor performance and student satisfaction is positive and significant at a 99 percent confidence level with a correlation coefficient of 0.472. Likewise, the association of interaction with student satisfaction is positive and statically substantial at the 99 percent confidence level with a correlation coefficient of 0.522, indicating both instructor performance and interaction have a positive relationship with student satisfaction.
- The impact of instructor performance is found to be positive and significant at a 99 percent confidence level. The regression coefficient of 0.315 indicates that improved instructor performance leads to increased student satisfaction in online classes. The impact of interaction on students' satisfaction is positive and significant at a 99 percent confidence level. A regression coefficient of 0.403 indicates that an increase in interaction increases student satisfaction in online classes.

The present research evaluates different factors directly linked to students' satisfaction with online classes during the Covid-19 pandemic. Although the students, teachers, and educational institution were forced to shift from traditional learning to online learning within a short period and not much preparation due to the long-lasting pandemic, the findings of the current study shows that students are somehow satisfied with the online learning, which is consistent with Allo (2020) results that the learners have positive perception towards online learning midst COVID 19 pandemics.

In the current research to assess the student's satisfaction with online learning, different variables have been used concerning the literature review. The opinions of 99 undergraduate engineering students of TU investigated the link and impact between the independent variables' instructor performance, interaction, and the dependent variable, student satisfaction, with gender serving as the moderating variable in this study. The result obtained from the data analysis for instructor performance showed a positive and statically significant relationship with, and impact on student satisfaction among the undergraduate engineering students indicating instructor performance has a significant influence on student satisfaction and improvement in instructor performance can help to boost students' perceived satisfaction with online learning. These findings are consistent with Gopal, Singh, and Aggarwal (2021), who observed the positive relationship between instructor performance and student satisfaction. Further, supported by another study by Zaheer, Babar, Gondal, and Qadri (2015) concluded, instructor support is positively correlated with student satisfaction.

The study also indicates the positive and significant relationship of interaction with student satisfaction in an e-learning environment. The results show that the impact is also positive and significant on student satisfaction. Interaction is found to be the major factor that can boost students' satisfaction in online classes. These results are supported by Sharma et al. (2020) which showed interaction had a positive and significant relationship with student satisfaction, and impact is also found to be positive and significant. And further consistent with the study by Kuo, Walker, Belland, and Schroder (2013) which claimed that all three types of interaction are significantly correlated with student satisfaction.

7. Conclusion

The current study was undertaken with the aim to find out whether the students are satisfied or not with the online learning that is introduced not as a supplement to traditional learning but as a necessity due to COVID 19 pandemic. For the assessment of student satisfaction, instructor performance and interaction are taken as the significant variable of the study. The result of the present study identified the interaction as one of the prominent factors for the student satisfaction in online classes, which means an increase in the level of interaction which can be student-student, student-instructor, or student-content increases student satisfaction with online classes, and student's participation in online classes which further can help them to improve their learning quality. The importance of interaction in online learning was also confirmed. Likewise, instructor performance was identified as another significant determinant of students' satisfaction in online classes, which means the instructor needs to be very efficient during lectures, understand the student's psychology, encourage them to be involved, present course content appropriately, and so on.

Further, it was found out that students think that the use of a new approach of learning and problem solving and instructor ability to engage students are two major factors that increase students' satisfaction in online classes. As per the result of the ranking question, the most crucial reason behind the effectiveness of online classes is that every student can hear the lectures clearly. The study also spotted the light on issues such that both male and female students are not satisfied with prevailing online learning tools and techniques

and perceive online learning as more difficult than traditional learning. Likewise, students with less or no prior e-learning experience perceive online learning as more complex than conventional learning than respondents with enough previous e-learning experience. So, the link between prior e-learning experience and perception of the difficulty of online learning is also identified.

Overall, the study concluded that students are somehow satisfied with online learning, which they had to adopt compulsorily as it was the only way to carry forward their education during a long and ongoing pandemic with no idea when it would end. And they agree to keep learning through online system in future also. However, they recommend that there should be continuous improvement, an ongoing process of assessment, activities, and feedback along with the formative evaluation to make online learning less complex and more effective.

8. Implication of the study

This study's findings have a wide range of practical implications for instructors. It's findings have a wide range of practical consequences such as for instructors, students, researchers, educational institutions and so on. The study further adds to the existing body of knowledge by assessing student satisfaction in the context of online education during the COVID-19 pandemic. The study's findings are believed to be more helpful to those educational institutions that have recently shifted to online learning systems due to pandemic situations and had little experience in this process before the pandemic. The study's outcomes will also provide useful information for institutions looking to replace ineffective online learning systems with more effective ones to improve and strengthen the e-learning system. The study will guide teachers to understand student behaviour better, handle online difficulties, and enhance student participation in online classrooms. With the help of the findings of the research, educational institutions can develop practices that will enhance student satisfaction in online classes.

The study highlighted instructor performance as one of the significant determinants of student satisfaction in the online learning environment. Considering this, instructors who are teaching online can polish their technical skill, pay attention to the students, provide them feedback in a timely manner, encourage the student to be engaged in class more and more through different mechanisms, etc. Furthermore, interaction is also identified as the major determinant in the current study so instructors, course designers, and students can work together to increase the level of interaction in online classes.

9. Delimitations and direction for future research

The study is primarily based on the questionnaire method of data collection, and only a scant amount of secondary data was used. If both primary and secondary sources were proportionately included in this research, the final result will be beneficial for the next researcher and will be more informative. The study was conducted under limited time and sample size, so given the small sample size of this study, future research is recommended to use large and diverse students as a sample to verify and generalize the findings among diverse students. Further, the study's validity depends on the accuracy of the

information provided by the respondents to be covered in the survey. Because of ongoing IOE examination, physical collection of data by the distribution of questionnaire was not possible, so the data collection was done through an online questionnaire survey which has its limitation. And the data for the study was only taken from engineering students; future research can include students from various faculties, so the result will have broad generality. Future researchers can also include teachers' perspectives and administrators to generalize results. Apart from instructor performance and interaction, other features of online learning, such as learner dimension and technological characteristics of course management, also had a positive relationship with customer satisfaction. Hence, the study should be made, taking them as independent variables.

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Appendices

Appendix 1
List of engineering colleges of Tribhuvan University in Kathmandu Valley

SN	Name of college	Address
1	Sagarmatha Engineering College	Sanepa, Lalitpur
2	Kantipur Engineering College	Dhapakhel, Lalitpur
3	Kathmandu Engineering College	Kalimati, Kathmandu
4	Lalitpur Engineering College	Patandhoka, Lalitpur
5	National College of Engineering	Talchhikhel, Lalitpur
6	Kathford International College of Engineering and Management	Balkumari, Lalitpur
7	Himalaya College of Engineering	Chyasal, Lalitpur
8	Khwopa College of Engineering	Libali, Lalitpur
9	Pulchowk Campus, Institute of Engineering	Pulchowk, Lalitpur
10	Thapathali Campus, Institute of engineering	Thapathali, Kathmandu
11	Advanced College of Engineering and Management	Kupondole, Lalitpur
12	Janakpur Engineering College	Tathali, Bhaktapur

Appendix 2
List of sample colleges

SN	Name of College	Address
1	Thapathali Campus, Institute of engineering	Thapathali, Kathmandu
2	Pulchowk Campus, Institute of Engineering	Pulchowk, Lalitpur
3	Janakpur Engineering College	Tathali, Bhaktapur