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The Satisfaction Level of Undergraduate Engineering Students on Distance Learning Amidst COVID-19

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ABSTRACT

Distance learning is the primary solution of the educational system in the entire world. Online mode also led the undergraduate engineering students. This study was a prospective, cross-sectional, and observational study. There were 20 questions, each of which was scored using the Likert scale. The data collection was done on an electronic platform. The data are presented in frequencies and percentages using Jamovi to analyze the data and the outcomes of the hypotheses. A total of 170 engineering students participated in the study and 2 of them disagreed with consent and were excluded. A total of 64 (37.76%) participants gave students positive responses (Very satisfied and Satisfied). A total of 71 (42%) participants gave a negative response to online learning (Very dissatisfied and Dissatisfied). A t-test provided evidence of no statistically significant difference in the student's satisfaction regarding distance learning between male and female

students. ANOVA test shows no statistically significant difference in the student's satisfaction relating to distance learning between BSCE, BSEE, and BSME. Large engineering students were dissatisfied with the online mode of teaching due to various reasons. They are generally satisfied with the support and response from the teaching faculties and dissatisfied with the communication/technology issues and lack of practical or clinical learning.

***Keywords* —** Education, Distance Learning, Online Learning, Engineering Students, Satisfaction, Philippines

INTRODUCTION

The Coronavirus Disease 2019 (COVID-19) had carried the world to a stop. To contain the spread of the infection states guaranteed lockdown, which additionally incorporated the conclusion of instructive organizations (World Health Organization, 2019). With the inaccessibility of authoritative treatment and vulnerability for the finish of the pandemic, preventive measures are vital in saving oneself from getting contaminated from this infection. The conventional method of homeroom education was unimaginable as it would disregard social removal standards and would chance educators and the understudies. This contrarily affected the training framework. Along these lines, internet instructing was the primary choice passed on to show undergrad designing understudies to proceed with their expert educational program.

Distance learning is certainly not another adaption model yet has its foundations as correspondence (postal conveyance) learning since the eighteenth century (Kentnor, 2015; Pant, 2014). On the web/e-learning has been a discretionary and important apparatus for a significant stretch. However, with the advances in innovation and simpler ways of interfacing with telecom, the schooling framework has changed radically, and there was a colossal ascent in web-based learning using different computerized stages which have demonstrated that distance learning is a practical choice at present occasions (Agapito et al., 2021; Alkhowailed et al., 2020; Tabatabai, 2020; Walker & Fraser, 2005).

Internet learning enjoys its upper hands over traditional showing techniques, such as accessibility to a more extensive populace, particularly in troublesome regions where up close and personal education is not plausible, time-productivity, adaptability to understudies, and comfort (Panchabakesan, 2011; Tabatabai, 2020). Considering the pandemic circumstance, web-based educating is legitimate, yet its handiness in instructing engineering programs is

questionable as assessing student satisfaction with web-based learning systems has been a critical issue for researchers and academia (Chiu et al., 2005; Guy & Lownes-Jackson, 2015; Knapper, 1988; Roach & Lemasters, 2006; Sweet, 1986; Strong et al., 2012). The writing shows fluctuated results regarding the general inclination of understudies with on the web or online learning (Chiu et al., 2005; Sweet, 1986).

A couple of studies detailed instabilities among the understudies and dropouts from the courses with internet learning. Aside from this, different issues looked at by the understudies were specialized issues, web issues, helpless general media transmission, and so forth (Knapper, 1988; Panchabakesan, 2011; Sweet, 1986). In proficient courses like designing projects involve commonsense learning, experimentation, lab, and hardware application later in the educational program assume an essential part in acquiring abilities. However, the current condition does not warrant regular face-to-face addresses. As of now, because of COVID-19, we do not have numerous choices for showing the understudies, and henceforth online intelligent instructing is the ideal choice we have in the current situation. Considering such a situation, this review was planned to survey the fulfillment level of undergrad designing understudies and break down the related issues looked at by the understudies during web-based instructing. There are many studies about the shift from a face-to-face learning environment to an online learning environment but only a few studies were undertaken in the Philippines about the satisfaction level of the students' vis-à-vis to distance learning.

The challenges of establishing online learning from the government's perspective the lecturers'/facilitators' perspectives include the following: Online learning development, which takes a long period, both time and money are required (Bahian et al., 2020; Bacow et al., 2012). Furthermore, online education is cost-effective. Believed to be a reduction in the fundamental values of face-to-face instruction Innovative teaching approaches allow lecturers and students to collaborate indirect interaction with one another. However, some lecturers also feel afraid that online classes will be used as an assessment in determining their expertise and assessing their advancement in career paths. This is in line with the review results which states that the two big problems faced by lecturers in implementing online learning include increasing workload and time to design, implement, and assess online learning, and not yet mastering the best pedagogical approach that can combine online learning with face-to-face learning (Ma'arop, 2016). Technical issues are one of four categories of impediments to online learning. online learning abilities, social context, and online course design as well

as required management, motivation, assistance, and time to participate in online learning activities (Henderikx et al., 2018). These conclusions are nearly identical to the research findings conducted by Lloyd et al. (2021), which indicated that there are four key variables that become impediments to online learning, including interpersonal barriers to both facilitators and users, institutional barriers such as policies, facilities, and funds. Then there are technological and training limitations, as well as difficulties analyzing the costs and benefits of online learning.

Face-to-face learning cannot be totally replaced by online learning. Online learning has only one benefit: it saves time, providing rapid access to knowledge through the easy provision and search and can facilitate peer-to-peer learning. However, most other skills are better learned in person. The combination of several factors is the most basic barrier to online learning. Parties involved in the planning, development, implementation, and evaluation It is possible to assess the quality of online learning, but it is not simple.

Some of these can be executed optimally to provide high-quality online learning. A blended learning adaptation requirements study must be conducted by higher education institutions (Porter et al., 2015). All stakeholders, particularly instructors and students, must contribute to the need's analysis. Higher education institutions must determine the number of professors who can utilize them immediately without training and the percentage of lecturers who require training. Workload changes can be made for lecturers who require training so that they can best prepare for online learning. Furthermore, institutions can hire third parties to help with content production for their instructors' blended learning needs. So that the display quality and the beauty of the information meet the users' expectations.

Barriers experienced by the students of online learning environments have been reported by Markova et al. (2017). Students are generally interested in and challenged by the online learning environment, according to the findings of his research in Russia. However, the majority of them have challenges when it comes to creating a successful communication process in online learning. Students wish that lecturers can create engaging, compelling, communicative, and artistic content so that students feel like they can communicate with their professors even if they don't meet face to face.

As outlined by Stein and Graham, various basic supporting components are required to provide high-quality blended learning. According to Stein and Graham, to produce quality blended learning, several standard supporting components are required, including a system analysis and measurable needs

analysis, clarity of development orientation, provision of network infrastructure, policy and financial support, development team reliability, and the use of technology. Many developers are involved, there is ongoing training, and design, content, implementation, and assessment standards are set for high-quality products. Due to the Covid-19 epidemic, the policy requiring the use of online learning services as an advantage and learning innovation in the management of learning in undergraduate engineering students at Eastern Visayas State University in Ormoc City necessitates a continuous study effort aimed at improving every aspect of it. Undergraduate engineering students, who are at the forefront of content users and the learning process in online learning, must have their perceptions of the usage of online learning assessed. There is a slew of issues that need to be addressed through research. Data from research will be important in resolving flaws in all aspects of online learning, including infrastructure, networks, hardware, and software.

The goal of this study is to determine the satisfaction level of undergraduate engineering students at Eastern Visayas State University in Ormoc City (EVSU-OCC). The findings of this study can be used by higher education policymakers to help them create policies that encourage the use of online learning on campus. Furthermore, the findings of this study can be used to improve online learning services.

FRAMEWORK

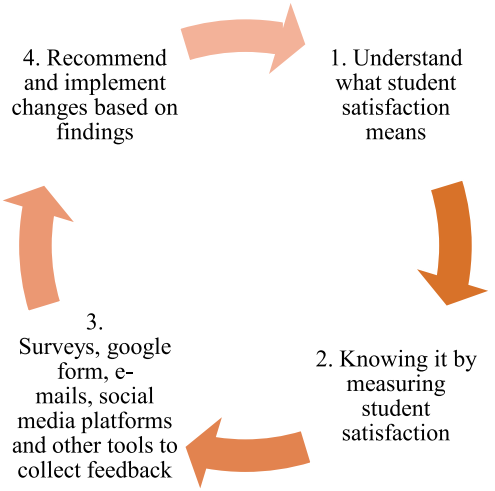

Figure 1: Conceptual Framework

Student satisfaction is a key way to determine how students feel about the distance learning implemented by CHED since the pandemic started to mitigate the spread of the COVID-19 virus. It can correlate to University performance and is directly proportional to the engineering faculty teaching performance. The figure above outlines four steps involved in measuring student satisfaction and shows that it is an ongoing process. A similar study in Singapore conducted by Woo et al. (2020) concluded that most of his respondents reported moderate satisfaction in their online learning experiences indicating indeed that they are more agile during the Fpandemic perhaps because the reason of internet connectivity in the country is incredibly fast compared to other Southeast Asian countries. While in the study of Surahman (2020) in Indonesia reported most of the students are dissatisfied with the online learning environment. Limited internet access and low lecturer attachment and direction are two characteristics that contribute to dissatisfaction.

The reason that needs to assess is very simple: students do not learn what teachers teach and the assessments are the best way to determine whether students have learned something. The difficulty is when the teacher uses those results to serve several different functions. Although the assessment process is very simple, teachers give students stuff to do, then evaluate what they did and draw conclusions. However, the difficulty was drawing lots of different conclusions, and sometimes those purposes conflict, and that is why assessment is such a contentious area assessment that looks justifiable for one perspective. From a different perspective, the important way to navigate this difficult terrain is to shift the focus. Right now, researchers focus on data-driven decision-making. The trouble of data-driven decision-making ends up hoarding vast amounts of data and having very little idea what to do with it; there is a need to focus on decision-driven data collection (Sumner & Tribe, 2008). A focus on improving educational preparation programs at the engineering programs and the successful retention of students participating in these programs have become increasingly important. Appropriate student evaluative feedback can aid in helping to identify program strengths and weaknesses. Listening to student comments and concerns allows for pedagogical progress.

This study constitutes the first formal step in identifying the collective perceptions of undergraduate engineering students who have participated in three main engineering courses, which are the Bachelor of Science in Civil Engineering (BSCE), Bachelor of Science in Mechanical Engineering (BSME),

and Bachelor of Science in Electrical Engineering (BSEE) of Eastern Visayas State University in Ormoc City (EVSU-OCC). This study endeavored to aid University in evaluating, from the students' perspective, the program's ability to meet designed expectations and achieve program goals in a manner that was reasonable for and relevant to student participants. The study's researchers conducted a survey to determine the satisfaction level of the undergraduate engineering students at EVSU-OC. Learning their satisfaction level entails providing the greatest alternative learning mode for students and faculty members, as well as discovering the best recommendations from them, while now participating in COVID-19's E-learning Modality.

OBJECTIVES OF THE STUDY

The study aimed to determine the satisfaction level of the undergraduate engineering students at Eastern Visayas State University in Ormoc City (EVSU-OCC).

METHODOLOGY

Research Design

This study was a prospective, cross-sectional, observational study conducted on undergraduate engineering students receiving online teaching for their professional program due to the lockdown imposed given the current pandemic of COVID-19 across Philippines. The study was led during the time of March 14, 2021 to August 28, 2020. The study was led utilizing a semi-organized survey created and adjusted from the past couple of studies (Roach & Lemasters, 2006; Strong et al., 2012; Walker & Fraser, 2005). It was validated to assess logical consistencies, clarity, comprehensibility, a chronology of items, and refined accordingly to facilitate better comprehension and organization of the questionnaire. The first section of the questionnaire was for the sociodemographic, and the second was the satisfactions questionnaire with a total of 20 questions scored on a five-point Likert scale which 5 with a qualitative equivalent of Strongly Agree, 4 for Agree, 3 for Neutral, 2 for disagree and 1 for Strongly Disagree. The Overall Satisfaction Rate (OSR) of each participant was calculated using the following formula:

The questionnaire was controlled through a web-based mode by getting ready google survey structures. The connection of the survey was shared and

dispersed through different internet-based stages, for example, messages and informing applications to undergrad designing understudies at Eastern Visayas State University in Ormoc City (EVSU-OCC).

Ethical Statement

Before the data gathering, the researcher secured a formal endorsement letter from EVSU-OCC and the Office of Research, Planning, and Development (RPDO) to conduct this study. The researcher then sent a letter of permission to the Campus Director. The approved letter was presented to the engineering faculty. A letter stating the intent of the researcher in conducting the study was attached to the questionnaire. Informed consent was also requested from the participants, and they were also assured of the confidentiality of their responses. The questionnaires were administered online through Google Forms and personal meetups. The participants' answers were checked, tallied, presented in tables, analyzed, and interpreted by the researcher.

Statistical Analysis

The information was recorded into Microsoft Excel and examination was performed utilizing jamovi version 1.6.23. Classification factors were introduced as mean and standard deviation (SD) in view of the dissemination, frequency, and proportions for classification variables. The satisfaction rate among engineering programs, gender, and electronic devices was analyzed using the overall satisfaction rate formula.

RESULTS AND DISCUSSION

Table 1. Summary of Sociodemographic Profile of Students

Sociodemographic Characteristics		Number of participants (%)
Age, (n=168)	18-20 years	41.1%
	21-23 years	49.4%
	24-28 years	7.1%
	29-above	2.4%
Gender, (n=168)	Male	62.7%
	Female	37.3%
Professional Engineering Program, (n=168)	BSCE	51.8%
	BSEE	39.3%
	BSME	8.9%

Year of Program, (n=168)	First Year	33.9%
	Second Year	4.2%
	Third Year	14.9%
	Fourth Year	44.6%
	Fifth Year	2.4%
Type of Electronic Device, (n=168)	Mobile Phone	88.7%
	Laptop	9.5%
	Tablet	0.6%
	Desktop	1.2%

Abbreviation: n, number of total participants

A total of 170 engineering students participated in the study and 2 of them disagreed with consent and were excluded. Finally, in the study, 168 (98.8%) participants participated. The dominant age group is 21–23 years (49.4%). The gender of the male participants was dominant with 62.2%. The majority were civil engineering students (51.8%) and fourth-year students were the majority (44.6%). The commonest device used for online classes was a mobile (88.7%), followed by laptops (9.5%). The details of the sociodemographic profile is summarized in Table 1.

Table 2. Perception of Engineering Undergraduate Regarding Distance/Online Learning

Questions	SA, n (%)	A, n (%)	N, n (%)	D, n (%)	SD, n (%)	Mode
1. With the online classes, I felt more comfortable introducing myself to the faculty compared to conventional classroom teaching.	6 (3.6%)	42 (25%)	91 (54.2%)	24 (14.3%),	5 (3%)	3
2. While teaching online, the faculty met the goal or objectives of each of the topics.	12 (7.1%)	58 (34.5%)	80 (47.6%)	16 (9.5%)	2 (1.2%)	3
3. During online classes, the content of the class was communicated effectively.	8(4.8%)	53 (31.5%)	70 (41.7%)	31 (18.5%)	6 (3.6%)	3
4. The faculty used class time for the online teaching well.	30 (17.9%)	70 (41.7%)	60 (35.7%)	7 (4.2%)	1 (0.6%)	4
5. During online classes, the faculties were supportive and responsive in resolving my queries.	49 (29.3%)	65 (38.9%)	47 (28.1%)	6(3.6%)	0%	4

6. The response time from faculty was quick enough to ask any doubt during online classes.	33 (19.8%)	67 (40.1%)	60 (35.9%)	7(4.2%)	0%	4
7. While teaching online, the faculty made learning an active process by motivating us, helping to develop thought, encouraging us to participate in the discussion.	41 (24.6%)	67 (40.1%)	56 (33.5%)	3(1.8%)	0%	4
8. This style of communication enabled me to get engaged with the faculty during class discussions.	10 (6%)	44 (26.2%)	98 (58.3%)	12 (7.1%)	4(2.4%)	3
9. The communication and discussion with other students were easier during online classes	8 (4.8%)	22 (13.1%)	82 (48.8%)	44 (26.2%)	12 (7.1%)	3
10. With the online teaching, I felt more engaged with my studies.	7 (4.2%)	30 (18%)	90 (53.9%)	24 (14.4%)	16 (9.6%)	3
11. During online classes, I felt I had more opportunities to interact with the faculty than conventional classroom teaching.	7 (4.2%)	29 (17.3%)	81 (48.2%)	37 (22%)	14 (8.3%)	3
12. With online teaching, I felt it was easy to ask questions to the faculty and clear my doubts compared to conventional classroom teaching.	7 (4.2%)	32 (19.2%)	85 (50.9%)	29 (17.4%)	14 (8.4%)	3
13. With online teaching, I feel that it is easier to manage my studies than conventional classroom teaching.	5 (3%)	36 (21.4%)	83 (49.4%)	32 (19%)	12 (7.1%)	3
14. During online classes, the quality of the teaching material projected or taught was the same or comparable to the one used during conventional classroom teaching.	7 (4.2%)	37 (22%)	91 (54.2%)	21 (12.5%)	12 (7.1%)	3
15. An interactive online discussion along with a PowerPoint presentation is an effective way of learning.	28 (16.7%)	56 (33.3%)	73 (43.5%)	11 (6.5%)	0%	3
16. I prefer online teaching and feel online education is worth my time.	7(4.2%)	26 (15.6%)	73 (43.7%)	38 (22.8%)	23 (13.8%)	3

17. The faculties during online classes helped to build discussion and recognize problem areas in my studies.	16(9.6%)	55 (32.9%)	83 (49.7%)	12 (7.2%)	1 (0.6%)	3
18. I got constructive (positive and negative) feedback from the faculty on my assignments.	15(9.1%)	34 (20.6%)	100 (60.6%)	14 (8.5%)	2 (1.2%)	3
19. These online classes have helped me to gain knowledge regarding technology and being technically sound.	23 (13.7%)	54 (32.1%)	70 (41.7%)	16 (9.5%)	5 (3%)	3
20. Overall, how will your grade your experience with online teaching? (For this question, strongly agree on means immensely great experience and Strongly Disagree means extremely poor experience)	11(6.5%)	45 (26.8%)	84 (50%)	22 (13.1%)	6 (3.6%)	3

Abbreviations: SA = strongly agree; A = agree; neutral; D = disagree; SD = strongly disagree; Mode

The majority of the faculty used the class time well and response time was quick enough to ask any doubt during online classes. The faculties were supportive, responsive, and quick enough to resolve the queries. The faculties made the learning active by motivating and encouraging them to participate in discussions (Mode = 4). The details of the responses are shown in Table 2.

Overall Satisfaction Rate (OSR)

Overall Satisfaction rate was determined by the number of participants with positive or negative responses/total number of responses multiplied by 100. A total of 64 (37.76%) participants gave positive responses (Very satisfied and Satisfied), out of which 30 were BSCE, 21 BSEE, and 13 BSME students. A total of 71 (42%) participants gave a negative response (Very dissatisfied and Dissatisfied) to online learning; out of these, 29 were BSCE, 25 BSEE, and 17 BSME students. However, major of the students filled the survey with an answer "neutral," which implies that they are not sure whether they learned something or not. Some studies show that if a participant chooses neutral, they are not interested in the questions or with the topics. They filled it up perhaps for the reason of compliance and showing in a stage of doubt.

A t-test provided evidence of a not statistically significant difference in the student's satisfaction regarding distance learning between male (M=3.17, SD=0.885) and female (M=3.25, SD=0.869) Students; t (0.551) =166, p=0.583. Cohens d add support to the result with a value of 0.0884 effect size. In the findings of this research, there is no statistically significant difference in satisfaction regarding distance learning vis-a-vis gender differences. However, in the literature, they agreed that there is a need for more research on gender debate about differences and similarities from learning strategies to performance and even with satisfactory measurement (Bidjerano, 2005; Price, 2006; Rovai & Baker, 2005).

ANOVA Test shows that there was no statistically significant difference in the student's satisfaction relating to distance learning between BSCE, BSEE, and BSME at the $p<0.05$ level [F (2,41.2) =0.852, p=0.434] in Welch's and even in Fisher's, the output was significantly related at the same benchmark alpha level of 0.05 [F (2,165) =0.861, p=0.424]. The result shows that all programs in the engineering department of EVSU Ormoc City have the same satisfactory level vis-à-vis in distance learning. Two of the reasons for this were the study conducted in one University only and in terms of disciplines or programs were only three. Perhaps this outcome provides us with the idea that we need to expound this study to other states and colleges with more categorized disciplines. There are elements of students' satisfaction based on the study of Ke and Kwak (2013) identified the five elements which are: learner relevance, active learning, authentic learning, learner autonomy, and technical competence. Kuo et al. (2013) determined that learner-instructor interaction and learner-content interaction combined with technology efficacy are valid indicators of students' positive perceptions. However, Battalio (2007), using a criterion approach, argued that a positive course rating requires effective learner-instructor interaction.

CONCLUSIONS

Distance virtual internet learning is a fundamental option in a circumstance like COVID-19 that causes a pandemic and should play a corresponding part in designing engineering understudies, especially in the experiment and laboratory aspects. This study features the issues pivotal in web-based learning and helps comprehend the fundamental changes to be made to defeat the hindrances in showing the expert designing curriculum. The curriculum amendments and development of necessary devices and technology for engineering ungraduated

students at Eastern Visayas State University in Ormoc City will empower them to functional classes. They can work on the viability of the web-based classes, consequently further developing fulfillment levels among understudies. This review was led to survey the fulfillment of designing understudies with virtual classes after disturbance of actual instructing because of the COVID 19 pandemic. The dominant students who participated in the study were Bachelor of Science in Civil Engineering (BSCE) students, followed by Bachelor of Science in Electrical Engineering (BSEE) and Bachelor of Science in Mechanical Engineering (BSME). Large engineering students were dissatisfied with the distant learning pedagogy because of some irregularities. They were generally pleased with the teaching faculty's assistance and reaction but disappointed with communication/technology difficulties and the absence of practical learning. There are so many studies about the satisfaction level of students and they have a common denominator of conclusion, distance learning was not effective, especially to those programs that require experiment and hands-on application to learn.

RECOMMENDATION

In professional courses such as engineering, traditional face-to-face education is regarded as a regular pattern of routine learning. Learners' attention is drawn to face-to-face meetings, which also anchor the focus through additional interactions and brainstorming exercises. The overall satisfaction rate of students was low and most of them were dissatisfied. Because of the unexpected transition to virtual education, several students have reported stress and health issues. Another study believed that the physical classes could be a better platform than virtual classes even if the virtual classes were well adapted. There should be a guideline for the arrangement of the students if face-to-face class proceed. If the pandemic gets worst, there should be a continuity plan of distance learning. There should also be an improvement of the learning pedagogy of teachers, especially to those instructors handling engineering laboratory subjects. For that to implement, the University should invest in a license simulator for the engineering students. Even though they cannot experiment in the actual laboratory, but somehow at least they can experience it in simulations.

A combination of distance learning and traditional teaching can proliferate the student's satisfaction. One of the promising teaching techniques, like the blended learning method and student engagement using the Multiple Attempt

Quizzes method (SMAQ), addresses the shortcomings of virtual teaching. The learning is integrated web-based teaching with a small group, delivering online educational resources alongside interactive classroom lectures and hands-on practical lessons in the blended learning style.

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