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Perceived Impact of Online Classes on the Professional Preparedness of Graduating Engineering Students

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Abstract

Last March 2019, Philippines suffered the first wave of COVID-19 resulting in most, if not all, educational facilities seizing operations and swiftly shifting into the online learning environment most of us are familiar with. Currently, the Technological Institute of the Philippines Quezon City (T.I.P QC) has adapted to more flexible learning approaches as the threat of COVID-19 slowly dwindles away. With the standard learning approach shifting once again into the new normal, this study aims to explore the effects and impacts of the previous modality of learning, online format, on a graduating engineering student's professional preparedness. COVID-19 has caused significant changes in how instructors impart knowledge and how students interact with Higher Education (HE). Different teaching and learning approaches have been adopted to account for social exclusion, learners' varied requirements, and the fact that they may live far from the HE classroom.Online learning is one such mode that was heavily adapted in the Philippines (Montemayor, 2020). In online classes, instructors instruct learners simultaneously in a digital classroom and synchronously online using video-conferencing tools. In this small-scale exploratory study, graduating students who took a six-week course through online classes are interviewed about their experiences and opinions. Despite communication difficulties between students who attended through various modalities, individuals did value the freedom it provided, according to the findings. The use of several aspects of video conferencing software and other digital tools was considered crucial to online learning's effectiveness. A quantitative study was conducted using a unidimensional 4-point Likert scale questionnaire disseminated through a google form link. Respondents are limited to 26 Graduating Engineering Students of T.I.P. QC Campus. Survey results are further validated through the use of frequency, percentage, weighted mean, ANOVA, Standard Deviation, interpretation, and ranking.

Keywords COVID-19, Higher Education, Online Learning, Professional Preparedness, Graduating Students

1. Introduction

COVID-19 originated in Wuhan, China in December 2019, it is the first pandemic crisis in the 21st century. It spreads quickly, infecting different countries (Coşkun et al. 2021). This epidemic is declared by the World Health Organization (WHO) resulting in a global pandemic. The incubation period of an asymptotic patient can transmit and infect, severe acute respiratory syndrome coronavirus-2 (SARS-COV-2) is an extremely transmittable virus (Huang et al. 2020). To lessen or slow the outspread of Coronavirus the use of personal protective equipment (PPE) and promoting programs about hand washing and keeping a distance from each other is implemented. Patients who are infected are quarantined and immediately apply lockdowns in the area. The way that COVID-19 is infected is by the driblet coming from the lungs through sneezes and coughs of the Covid-19 positive patient, and by having close contact by touching the patient and contaminated objects or environment (WHO 2020a).

Many changes in our culture will be brought forth by the COVID-19 outbreak in 2020. The government has enacted a high-intensity social distancing strategy, restricting the operation of establishments and industries where lots of

people congregate, to stop the spread of dangerous diseases (Ministry of Health and Welfare, 2020). As a result, non-face-to-face contact has become widespread in society, and the ongoing COVID-19 epidemic is making this method of non-face-to-face interaction popular among individuals in contemporary society. In other words, we are moving toward a society where there is less face-to-face interaction. An "untact society" is one in which there is a high prevalence of non-face-to-face communication; it is also referred to as an "on-tact society" to represent the phenomenon wherein face-to-face communication declines.

The structure of education in the university environment has not changed for 100 years. However, the outbreak of the COVID-19 pandemic is forcing school districts to innovate their education models. This necessary change has led administrators and teachers to think innovatively about what tomorrow's classrooms will look like, supported by fully online courses (Carlson 2020). Online learning offers flexibility, convenience, and affordable educational options at any time and anywhere (Carnevale 2000; Dutton et al. 2002). Anyone with access to the internet has access to global educational institutions and information sources. 2 of the 20 have access to a modem, phone lines, and a computer. Students who attend school in rural or other distant areas need this access to knowledge more than others. By incorporating new technologies into the curriculum, education is also made more engaging and stimulating (Shrivastava 1999).

Currently, the Technological Institute of the Philippines just recently implemented a HyFlex learning modality where the researchers give the meaning of HyFlex modality wherein students attend the class both face-to-face and online (Kieper et al. 2020). Simply put, it's where students will mostly still partake in online classes while being allowed to enter school premises under the supervision of their professors. This hybrid format consequentially renames the online learning modality into “Fully Online Class”. The researchers aim to determine the lasting impacts on the professional preparedness of the students participating in fully online courses. Positive experiences with the hybrid course included the availability of the instructor and the flexibility of the class schedule. Convenience, instructor accessibility, and online interactions were listed as advantages of the online course, but technical glitches and a sense of being lost in cyberspace were listed as disadvantages. To improve online and hybrid courses, it is advised that staff be trained and that students become accustomed to the online learning environment (El Mansour et al. 2007).
The study on learning alternatives has been examined and understood in several past attempts. Particularly, (Park and Shea 2020) looked at online learning research over two decades and discovered that the initial research interest focused on distance education and learners' discourse in asynchronous discussion, then a shift in focus to online learners' satisfaction and self-regulation, informal learning, and learning through Massive Open Online Courses or MOOCs.

According to a meta-aggregative systematic review study by (Ashraf et al. 2021: 1538), online Learning can improve students' self-regulation toward learning, satisfaction, and engagement while learning in various domains, particularly in health, while also supporting their academic performance from the perspective of behavioral outcomes. In a systematic review of research focused on the issues with online learning's delivery method, (Rasheed, Kamsin, and Abdullah 2020) found that the main issues that both students and teachers encountered were those with self-regulation and issues with the usage of educational technology.

In this study, the researchers aim to determine whether there are significant impacts that the online learning modality has brought upon students’ preparedness for a professional setting, specifically those who are graduating from the engineering departments. The researchers assume that there is a significant difference between an online graduating student and a graduating student from the traditional format in terms of readiness in the professional setting as according to Christensen (2022), classroom participation can improve a student's education by allowing him to reflect on what he has learned in new ways. Additionally, some general education courses, like science laboratories, have a certain number of hands-on requirements. It's difficult to predict how these standards would be met by online courses. Students' sense of agency is a crucial element of success, according to Zimmerman, Schunk, and DiBenedetto (2017). The usage of self-regulation learning techniques by students is related to their sense of competence or confidence in adopting them. Studies that have looked at the efficacy of online learning have also included systematic reviews and bibliometric analysis. In their meta-analysis, for instance, (Müller and Mildenberger 2021) showed that online learning's various modalities produced similar learning effects. In another research, it was shown that online learning outperformed onsite classrooms in terms of achievement results (Rasheed, Kamsin, and Abdullah 2020). Additionally, meta-analyses by (Bernard et al. 2014) and (Vallée et al. 2020)'s found that online learning produced better learning results.

1.2 Objective of the Study

General Objectives

The proponents seek to determine the impacts of being in an online learning system and determine the preparedness of graduating engineering students in a professional setting in the Technological Institute of the Philippines Quezon City (T.I.P Q.C). It is also an objective of the proponents to determine appropriate solutions if these impacts affect the graduating engineering students negatively. These students shall be evaluated based on seven (7) values expected of graduating engineering students from T.I.P: professional skills, critical thinking and problem-solving skills, communication skills, interpersonal skills, innovativeness, decision-making skills, and the quest for excellence.

Specific Objectives

Specifically, this research is aimed to perform and develop the following objectives:

- To determine the relationship of the Dependent variable (Impact on Professional Preparedness) to the Independent Variable (Online Classes) using mean and standard deviation.
- Determine and recommend appropriate solutions to the negative impacts that affect graduating engineering students.
- Provide recommendations and conclusions to the problem based on the statistical result.

2. Methods

2.1 Research Design

The researchers will take the present factors and current conditions of a group of persons, events, or a class to find facts and data to be interpreted. To determine the difference in the evaluations or variables of the respondents, this study will employ a descriptive-comparative methodology. This approach is the most suitable way to ascertain the profile of the graduating engineering students systematically and accurately, as well as the variation in responses of the engineering students toward the impact of online classes on their preparedness of being professional. Research using this quantitative approach gathers, records, and analyzes large amounts of data. It provides clarification, assuages curiosity, and establishes causality differences.

2.2 Data Collection

Data Collection will be completed by the researchers through a survey questionnaire in a Likert-Scale format. The survey questionnaire will be composed through Google Forms and dispersed online via sharing the Google Form link across social media platforms such as Facebook and Messenger. Respondents are required to log in using their T.I.P. email address to further filter unwanted responses, limiting access to the questionnaire to T.I.P. students only

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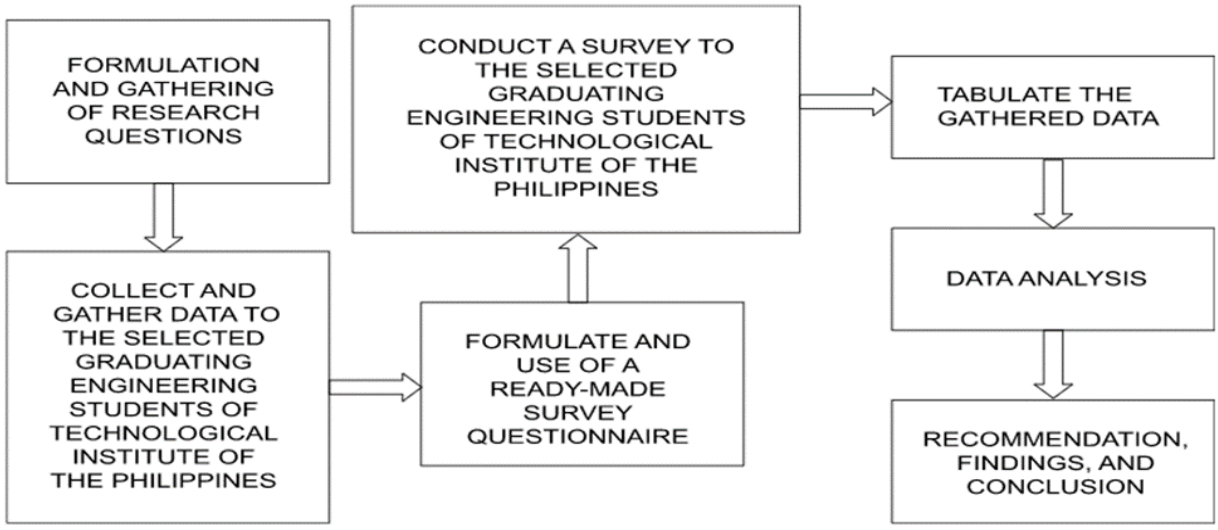

Figure 1. Procedures

The researchers will gather files, journals, publications, and documents from earlier studies, online dissertations, and survey replies from the participants. There are two (2) different categories of data-gathering sources used in this study. The respondents in this study, who are students, will serve as the main source of data. In the interim, secondary sources will be used to assemble another data source. These journal articles, books, histories, critiques, remarks, encyclopedias, and so on. This will be carried out to strengthen the investigation's conceptual and theoretical basis.

3. Results

3.1 Demographic Profile of Respondents

The questionnaire was distributed and answered from October 22, 2022, to December 2, 2022, using Google Form and participated by 26 students who are graduating engineering students from the Technological Institute of the Philippines - Quezon City. Table 2 shows the demographic profile of the respondents. 4 (15.4%) of the respondents are 22 years old, 8 (30.8%) are 23 years old, 6 (23.1%) are 24 years old, 7 (26.9%) are 25 years old and a single invalid input amounting to (3.8%). The poll also counts 11 (42.3%) Male and 15 (57.7%) Female respondents. There are 2 (7.7%) graduating students and 24 (92.3%) are not graduating students.

Table 1. Demographic Profile

Characteristics	Category	Frequency	Percentage
Age	22	4	15.4
	23	8	30.8
	24	6	23.1
	25	7	26.9
	Invalid Input	1	3.8
Gender	Male	11	42.3
	Female	15	57.7
Are you a graduating student?	Yes	2	7.7
	No	24	92.3
What field of Engineering?	CPE	6	23.1
	ECE	3	11.5
	EE	1	3.8
	IE	12	46.2
	ME	4	15.4

3.2 Mean & Standard Deviation (Between Independent and Dependent Variables)

Table 2. Shows the mean and standard deviation of the Professional skills, Critical thinking and problem-solving skills, Communication skills, Interpersonal skills, Innovativeness, Decision making skills and Quest for excellence of the respondents.

Table 2. Mean and Standard Deviation of Dependent Variables

Characteristics	Field of Engineering	Mean	N	Standard Deviation
Professional Skills	CPE	3.4933	6	.08262
	ECE	3.5333	3	.04619
	EE	3.4800	1	
	IE	3.5000	12	.35919
	ME	3.6500	4	.24304
Critical Thinking & Problem-Solving skills	CPE	3.5252	6	.13689
	ECE	3.4872	3	.12364
	EE	3.4321	1	
	IE	3.5737	12	.36762
	ME	3.5385	4	.05439
Communication Skills	CPE	3.4938	6	.16674
	ECE	3.5679	3	.05658
	EE	3.4321	1	
	IE	3.5586	12	.34218
	ME	3.5278	4	.11060
Interpersonal skills	CPE	3.5000	6	.12531
	ECE	3.5455	3	.15746
	EE	3.3636	1	
	IE	3.5000	12	.32548
	ME	3.6136	4	.08704
Innovativeness	CPE	3.5000	6	.09661
	ECE	3.6000	3	.00000
	EE	3.4333	1	
	IE	3.5472	12	.40213
	ME	3.5917	4	.04914
Decision Making Skills	CPE	3.5402	6	.08062
	ECE	3.5747	3	.01991
	EE	3.3793	1	
	IE	3.5115	12	.41765
	ME	3.6552	4	.19302
Quest for Excellence	CPE	3.4706	6	.14881
	ECE	3.5882	3	.15882
	EE	3.5294	1	
	IE	3.5000	12	.39460
	ME	3.5588	4	.17647

3.3 ANOVA

Table 3. shows the F score and the significant level of the means of the Professional Skills, Critical Thinking and Problem-solving Skills, Communication Skills, Interpersonal Skills, Innovativeness, Decision-making Skills, and Quest for Excellence.

Table 3. ANOVA Result

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
ProfTotalMScore	Between Groups	.078	4	.020	.251	.906
	Within Groups	1.635	21	.078		
	Total	1.713	25			
CritTotalMScore	Between Groups	.037	4	.009	.120	.974
	Within Groups	1.620	21	.077		
	Total	1.657	25			
CommTotalMScore	Between Groups	.020	4	.005	.072	.990
	Within Groups	1.470	21	.070		
	Total	1.490	25			
IntTotalMScore	Between Groups	.068	4	.017	.273	.892
	Within Groups	1.316	21	.063		
	Total	1.385	25			
InnoTotalMScore	Between Groups	.042	4	.011	.122	.973
	Within Groups	1.831	21	.087		
	Total	1.873	25			
DeciTotalMScore	Between Groups	.092	4	.023	.234	.916
	Within Groups	2.064	21	.098		
	Total	2.156	25			
QuestTotalMScore	Between Groups	.038	4	.010	.105	.980
	Within Groups	1.924	21	.092		
	Total	1.962	25			

4. Discussions

4.1 Summary of Findings

4.1.1 The demographic profile of the graduating engineering students.

The twenty-six graduating engineering students at the Technological Institute of the Philippines - Quezon City during the school year 2022 - 2023 were composed of 57.7% are male, 42.3% female.

4.1.2. The validity and reliability of the survey questionnaire

The validity and reliability results of the survey questionnaire were tested and analyzed in the SPSS software and thus giving a reliable result of 0.981 exceeding the standard threshold of 0.700 produced by Cronbach's alpha without any exclusions from the respondents and questions.

4.2 Implications

This research may be beneficial to graduating students of the Technological Institute of the Philippines Quezon City (T.I.P.-Q.C.) as it provides relevant information regarding the impacts of the adapted online learning format on the professional preparedness of graduating engineering students.

4.3 Limitations of the Study

The scope of this study is limited to the impact between the online learning modality and the professional preparedness of graduating students from the various engineering departments in the Technological Institute of the Philippines Quezon City. The research is focused on the impacts of the online format of classes on a graduating student's professional skills, critical thinking and problem-solving skills, communication skills, interpersonal skills, innovativeness, decision-making skills, and the quest for excellence.

4.4 Conclusion

The results of this study indicated that the graduating engineering students are professionally prepared despite the number of differences in the respondents in terms of professional skills, critical thinking and problem-solving skills, communication skills, interpersonal skills, innovativeness, and the quest for excellence. This result happened by chance due to the inadequate number of respondents.

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Biographies

Hanz Jerald A. Atok is a 5th year student at Technological Institute of the Philippines Quezon City, where he is pursuing a degree in Bachelor of Science in Industrial Engineering. He has some experience in writing research papers about the subjects in methods, project feasibility and ergonomics with the collaboration of his colleagues. During the composing of the thesis, he gained knowledge in Identifying the main reason of a problem by using different root cause analysis (e.g., Pareto Chart, Ishikawa Diagram, and Problem Tree) and recommending appropriate solutions to the specific problem. Hanz interned in I-Metrics Asia-Pacific Corporation. The company focuses on economics courses he can relate to the systematization of data and learn the basics of IBM SPSS software that the business uses in interpreting the information.

Kent Francis Barcelona is a 4th year Industrial Engineering student with a passion for process optimization and data analysis. He is currently interned at GM motors developing a valuable experience. Kent's ultimate goal is to streamline supply chains and reduce waste, making industry more sustainable.

Earl Christian D. Palma is a 4th year student at Technological Institute of the Philippines, Quezon City campus. He is currently taking Bachelor of Science in Industrial Engineering and is currently shortlisted for the upcoming 2023 graduation ceremony. He specializes in research and project design, with notable experience with ergonomics, accounting, and project feasibility. He interned in B-MIRK Enterprises Corporation and is now currently employed there, being absorbed after completion of internship.

Donnavil T. Valenzuela is a 5th year Industrial Engineering student at the Technological Institute of the Philippines - Quezon City. She has had a lean six sigma white belt certification since August 2020. She worked as a student assistant in the Admissions and Marketing Office at the Technological Institute of the Philippines prior to the pandemic. She wants to follow her aspirations and keep the commitment she made to herself to become an engineer.