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Open Distance Learning of Modern Engineering Tool and Its Assessment for Civil Engineering Design Project

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Abstract

Open distance learning (ODL) is a new paradigm shift from conventional education systems that provide flexibility to learners in accessing education and training without constraints of time and place. Full Implementation of ODL initiated in all institutions of higher learning in Malaysia after announcement of movement control order by the prime minister of Malaysia in March 2020 due to COVID-19 pandemic. This study aims to investigate the impact of ODL in the attainment of program outcome (PO5) in modern engineering tool usage for a civil engineering design project course. In the ODL environment, the teaching method, assessment method, tool of assessment and rubrics in the assessment of PO5 were revised accordingly. Online practical test was set as the only tool to evaluate students' ability in using the modern engineering tool of this course. Prokon software was employed as the modern engineering tool used by the students in carrying out their individual projects as well as online practical tests. Result of this study has shown that the average attainment of PO5 dropped significantly when online teaching and learning of Prokon software took place. Also, the percentage of students failed in PO5 rose for the semesters during the COVID-19 pandemic. It is anticipated that the remote evaluation process could be unrealistic to measure the ability of students in the psychomotor domain. The challenges of online teaching and learning of modern engineering tools are discussed, and actions need to be taken to tackle the problems and improve the attainment of PO5 among students under an ODL environment.

Keywords: Open Distance Learning, Modern Engineering Tool, Assessment, Civil Engineering Design Project, Online Practical Test

Introduction

In an increasing competitive world, fresh engineering graduates are highly expected from society and industries in fitting multidimensional tasks, immediately after their inception in the profession (Jadhav at al., 2022). A list of competencies and abilities including knowledge, skills, attitudes and ethics are pre-described by accreditation agencies worldwide,

referred to as program outcomes (POs). In Malaysia, any engineering program offered by the institutions of higher learning must meet the accreditation standard and criteria established by the Engineering Technology Accreditation Council (ETAC) or the Engineering Accreditation Council (EAC), where both are operating under Board of Engineers Malaysia (BEM). Under the stated standards and guidelines, any program must implement outcome-based education (OBE) in the curriculum structure. One of the criteria is that an engineering program must have its POs, and each course of the program must have its own course outcomes (COs). There are twelve POs set by the ETAC (Standard, 2020) according to the Washington Accord as engineering knowledge, problem analysis, design/development of solutions, investigation, modern tool usage, the engineer and society, environment and sustainability, ethics, individual and teamwork, communication, project management and finance, and lifelong learning. These POs emphasized the abilities that must be possessed by graduates upon completion of the undertaken program.

Civil engineering design project is considered as the most exciting course in either diploma or degree in civil engineering program. It is an integrated course that is able to demonstrate the ability of students in attaining cognitive, psychomotor and affective domain POs as listed by ETAC. AutoCAD drawing, structural analysis and structural design (reinforced concrete, steel, timber etc.) are commonly laid the basic fundamentals for civil engineering design course. Besides, other associated fields such as construction management, project scheduling, cash flow, bills of quantity, water reticulation system, road and drainage system, sewerage line system, mechanic of soil and earthwork are incorporated as sub-topics of this course. The Civil Engineering Design Project (ECS358) course offered by Universiti Teknologi MARA, under program of Diploma in Civil Engineering, is a guided project-based learning course to comprehend and design a double-storey reinforced concrete (RC) building and preparation of a technical report comprising a set of architectural and structural drawings, structural load analysis, structural elements design calculations (manual and using design software), project schedule (using Microsoft Project software), bill of quantities, soil bearing capacity and integration of infrastructure such as earthwork, road, drainage, sewerage, water reticulation etc. Students are required to perform their project individually, each of them need to have their own set of architectural floor plans and sections, and complete the whole project in the duration of 14 weeks in a semester. Assessment for this course is fully individual continuous evaluation which consists of individual project 30%, common written test 20%, practical test 20% and written report 30%.

A total of five POs involved in this course namely PO3 (design solutions for well-defined technical problems and assist with the design of systems, components, or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations), PO4 (conduct investigations of well-defined problems; locate and search relevant codes and catalogues, conduct standard tests and measurements), PO5 (apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations), PO8 (understand and commit to professional ethics and responsibilities and norms of technician practice) and PO10 (communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions). These POs are mapped well with five COs, weightage of each PO and associated assessment tool can be seen as PO3

(weighted 20% by the common test), PO4 (weighted 10% by the technical report), PO5 (weighted 20% by the practical test), PO8 (weighted 20% from the project and weighted 10% from the technical report) and PO10 (weighted 10% from the technical report and weighted 10% from the project presentation).

To achieve the CO-PO of this course, studio-based activities occupied the majority of student learning times i.e. 6 hours have been spent weekly. In the studio-laboratory, each student is guided by a lecturer to carry out the weekly tasks stated in the lesson plan. Under the faculty's license and availability of computers, students are exposed to RC design software (Esteem) in studio-laboratory. Each student is offered a computer to carry out the modeling task of his or her project, including analysis and design of the RC building using Esteem. Besides studio activities, 1-hour lecture is conducted every week, students are taught on the design philosophy, load paths, structural analysis and design of reinforced concrete elements such as slabs, beams, columns, staircase and footings. In short, the common practice of teaching and learning method for this course is studio lab-based lecture and hands-on, students are required to design a double-storey RC concrete building using manual calculation and verify it with the Esteem Software. They also need to prepare a set of project schedules for the building using Microsoft Project software and doing a case study related to infrastructure works. It is worthy to mention that, for practical tests, a set of modeling questions (using Esteem) will be designed to assess students' psychomotor skills (PO5) i.e. ability in modern tool usage and it is commonly conducted in studio-laboratory.

The outbreak of COVID-19 pandemic has affected the global education system and the implementation of movement control order (MCO) in Malaysia on March 18, 2020 has changed the teaching and learning mode in Malaysia's IHL. During the COVID-19 pandemic, open distance learning (ODL) was compulsory to be implemented throughout the university and faculty, online lectures and online studio activities were conducted for this course. The most challenging part is the use of modern tools (design software needs to be changed) in view of the access to Esteem software being denied in students' homes. Therefore, Prokon software has been introduced to replace Esteem, students are required to use Prokon to carry out their modeling, analysis and design work. As a result, online practical tests by using Prokon software have replaced the physical practical test by using Esteem. More interestingly, has the use of Prokon and online practical tests affected the attainment of students in modern tool usage (PO5) of this course? What are the challenges faced by both lecturers and students when ODL mode is employed in assessing modern tool usage of this course? Therefore, this research aims to investigate the impact of ODL in the attainment of PO5 (modern tool usage) for civil engineering design projects and to discuss the challenges of online teaching and learning in modern engineering tools. It is hoped that current work can assist educators in continual quality improvements (CQI) development and thus improve the attainment program outcome in modern tools under ODL condition.

Table 1 shows the mode of teaching and learning adopted in ECS358 before and during the COVID-19 pandemic. It is worthy to note that for the hybrid mode (FTF+ODL), Prokon is maintained as the design software used as well as online practical test was taking place. This paper consists of two parts, the first part presents the performance of students in PO5 throughout the five semesters, comparisons and detailed discussion are then carried out. In

the later part, challenges in handling ODL of this course are outlined and further analyzed, following suggestions to improve the attainment of PO5 under ODL condition.

Table 1
Mode of teaching and learning for ECS358 before and during COVID-19 pandemic

Semester Description	Semester ID	Remark	Mode of teaching and learning
September 2019	20194	Before COVID-19 pandemic	Fully face to face (FTF)
March 2020	20202	During COVID-19 pandemic	FTF + ODL
October 2020	20204	During COVID-19 pandemic	FTF + ODL
March 2021	20212	During COVID-19 pandemic	FTF + ODL
October 2021	20214	During COVID-19 pandemic	FTF + ODL

Literature Review

Engineering education is one field of higher education. The effectiveness of teaching and learning processes in this subject is mostly determined through the assessment of cognitive, affirmative, and psychomotor work. As per the learning by doing paradigm, technical skills are essential for engineers notwithstanding their knowledge. Therefore, engineering students must have access to modern tools and instruments to conduct and develop both technical and social skills related to their technical field (Noga et al., 2012; Voukelatou, 2019; Wurdinger, 2005). Unfortunately, the COVID-19 pandemic outbreak that emerged in March 2020 and profoundly altered all elements and regulations of daily life was an unexpected obstacle. In a great number of nations, governments have been compelled to impose lengthy periods of lockdown, requiring citizens to remain at home with severely restricted personal interaction with the outside world (Lovri'c et al., 2020).

The impossibility of direct engagement between lecturers and students, as well as between students, compelled them to have online distance learning (ODL) during the pandemic. Considering this obstacle, teaching and assessment approaches have been changed due to the fact that during the lockdown period, the traditional method of teaching and assessment is not suitable to be applied. Numerous studies have recently attempted to determine the major factors and best practices that contribute to the acceptance, adaptation, and effectiveness of online education, such as curriculum planning, course materials support, lecturers' attributes, method of assessment and students' familiarity and availability to technical resources (Shu and Gu, 2018; Arshad and Saeed, 2014; Kummel et al., 2020). As in the case of engineering education, the difficulties concerned with assessing the students are significantly greater. This is due to the need for the engineering students to meet the rigorous requirements of the program accreditations upon completion of their studies (Ewell, 1998; Leslie & Gorman, 2016; Rompelman, 2000). Because of that, the assessment process is crucial to the evaluation of student achievement. It is useful for the lecturers to learn about the accomplishments of the students.

According to Sadler (2005), assessment can be described as the process of evaluating the level and quality of student performance or achievements in a course. Lecturer of the course evaluate students' performances to see how much they have learned about the course material. From the assessment also, the lecturer can also evaluate if the course goals are being met when they assess the performance of the students. Bryan & Clegg (2006); Trigwell & Prosser (1991) mentioned that the students' ability to assess their level of understanding of the course materials would be aided by the assigned task's success in achieving the goals

and objectives of the course. Direct measurement or indirect measurement may be used to evaluate and assess the student development based on their POs and COs (Breslow, 2007). Meanwhile, Binnawas et al (2020) stated that direct measurement evaluates student work in the form of a creativity task using a rubric, while indirect measurement evaluates student perception of the teaching and learning process. Due to that, this paper is to present the performance of PO in modern tool usage before and during Covid-19 pandemic. The challenges of teaching and learning the modern tool usage in the ODL environment are also discussed.

Methodology

Assessment of modern tool usage (PO5) for this course is barely based on a practical test which weighted 20% of the overall score of the course. Before the Covid-19 pandemic, practical tests were conducted in studio-laboratory and students were required to model a single storey reinforced concrete building and to perform analysis and design by using Esteem software provided by the faculty. Students were given 2 hours to complete the task, lecturers evaluated the practical test upon completion of the task and provided immediate feedback to the students.

During the Covid-19 pandemic, practical tests were conducted online in which students are required to carry out analysis and design of certain structural elements such as slab, beam and column by using Prokon software. Prokon was employed instead of Esteem during ODL because it can be executed on its own computer after being registered under an educational license. Students were given 2 hours to complete the task, and submit their work in PDF file through google classroom or other equivalent online platform. Table 2 shows the domain and element of the PO5 evaluation in practical tests (both FTF and online). The Simpson's psychomotor domain (level 1 to level 5) was used to establish the rubric assessment, generally all the domains and elements were similar for both FTF (Esteem) and online (Prokon) practical tests. The major difference was the modeling of the whole building using Esteem and modeling of single structural elements such as slab, beam and column using Prokon. Therefore, some elements for instance setting-up the number of floors, floor height and grid line were taken out from the rubric in an online practical test.

It is important to note that, bill of quantities was listed as one of the elements in the FTF practical test but there was no such requirement in on online practical test. This is because the built-in function existed in Esteem and enabled users to capture the bills of quantities easily. However, students were required to identify critical forces or moments for structural elements such as slab and beam in online practical tests. The performance of PO5 for each student was assessed based on Table 2 and the achievement of PO5 in terms of average score, percentage of students scoring more than 50% and percentage of students scoring less than 50% for the five consecutive semesters are discussed in the following section.

Table 2
Domain and Element of the PO5 Evaluation (Practical Test)

Semester 20194 (before Covid-19 pandemic) FTF Practical Test Software: Esteem			**Semester 20202, 20204, 20212 & 20214 (during Covid-19 pandemic) Online Practical Test Software: Prokon**		
Domain	**Element**	**Mark allocation**	**Domain**	**Element**	**Mark allocation**
P1 (Perception)	1. Identify/ choose the appropriate software to construct the model	1	P1 (Perception)	1. Identify/ choose the appropriate software/ module to solve the problems	5
P1 (Perception)	2. Open a new file and set the number of floors and floor heights in the software	3	P2 (Set)	2. Key-in design parameters in software/ module (i.e., fck, fyk, concrete weight, design code, factor of safety for actions and materials)	5
P2 (Set)	3. Performs appropriate steps to construct gridlines required for the model	5			
P3 (Guided response	4. Perform appropriate steps to construct structural key plans for the building, including key-in of all structural elements (with sizing)	5	P3 (Guided response)	3. Perform appropriate steps to key-in structural elements parameters (i.e., nominal cover, bar diameter, link diameter, size of section, supports, span length)	5
P3 (Guided response)	5. Perform appropriate steps to key -in loadings for every floor	5	P3 (Guided response)	4. Identify and key-in loadings for structural elements	5
P4 (Mechanism)	6. Conduct structural analysis for structural elements at every floor, including parameter and design settings	5	P4 (Mechanism)	5. Conduct structural analysis for structural elements	5
P3 (Guided response)	7. Perform appropriate steps to find bill of quantities for structural members in ESTEEM	5	P4 (Mechanism)	6. Identify critical points/ forces/moments for structural elements	5
P5 (Complex overt response)	8. Perform design for structural elements at every floor, including	10	P5 (Complex overt response)	7. Perform design for structural elements considering critical	10

	parameter and design settings			positions/ forces/moments according to code of practice	
P4 (Mechanism)	9. Save required outputs/ results/ drawings from software	5	P4 (Mechanism)	8. Save required outputs/ results/ drawings from software	5
P4 (Mechanism)	10. Carry out analysis using model to solve problems in standardized ways (DP3)	5	P4 (Mechanism)	9. Carry out extensive analysis using software to solve problems in standardized ways (DP3)	5
Total mark		**49**			**50**

Results and Discussion

Performance of PO5

Table 3 indicates the overall performance of program outcome in modern tool usage (PO5) before and during the COVID-19 pandemic whereas Figure 1 and Figure 2 illustrate the average performance of PO5 and the percentage of students passed or failed the PO5 before and during the COVID-19 pandemic. The number of students enrolled to this course was considered as alternately large group and small group between the consecutive semesters. As shown in Table 3, a large population of students i.e. 179, 254 and 150 students have enrolled to this course in semester 20194, 20204 and 20214 respectively. Meanwhile, the enrollment was 42 and 43 for semester 20202 and 20212 respectively.

Table 3
Overall performance of PO5 before and during the COVID-19 pandemic

Description	**Semester**				
	20194	**20202**	**20204**	**20212**	**20214**
	Before COVID-19 pandemic	During COVID-19 pandemic			
Total students enrolled	179	42	254	43	150
Average PO5 attainment (%)	89	69	59	57	58
Number of students scored PO5 <50%	0	5	69	14	33
Number of students scored PO5 ≥50%	179	37	185	29	117
Percentage of students scored PO5 <50%	0	12	27	33	21
Percentage of students scored PO5 ≥50%	100	88	73	67	79

Apparently from Figure 1, it is observed that average PO5 achievement before COVID-19 pandemic is exceptionally greater than average PO5 achievement during COVID-19

pandemic. Before the COVID-19 pandemic, the average PO5 obtained in semester 20194 was the highest i.e. 89% as can be seen in Table 3. For the semesters during the COVID-19 pandemic, reductions of 20%,30%, 32% and 31% in average PO5 achievement were recorded. Obviously one of the reasons is that the different methods of assessment and the software utilization have had a great impact on the attainment of PO5 for this course. For the semester prior to COVID-19 pandemic, a practical test in measuring PO5 attainment was conducted FTF in studio-laboratory. Lecturers observed the ability of students using Esteem software to answer the question, provided immediate feedback and graded students according to the rubrics FTF practical test as shown in Table 2. In contrast, for the semesters during the COVID-19 pandemic, practical tests were assessed through online. Students were required to respond to the question by using Prokon software at their own location and submit the answer scripts (Prokon's output) via an online platform instructed by the lecturers. Therefore, the mark scores given by lecturers was purely from marking of answer scripts based on the rubrics online practical test (Table 2).

Among the semesters during COVID-19 pandemic, the average PO5 achievement was constant throughout the semesters 20204, 20212, and 20214. This could be explained by the similar nature of the method of assessment. There was no change in terms of grading rubrics, allocation of marks to the students still based on the student's submitted answer scripts. Apart from the average PO5 attainment, it is important to investigate further how many percent of students were unable to achieve performance outcomes in modern tool usage (PO5) for this course, so that a more comprehensive continual quality improvement plan can be taken by the faculty. Therefore, the following section presents the data of passing and failure rate of PO5 attainment for the five semesters.

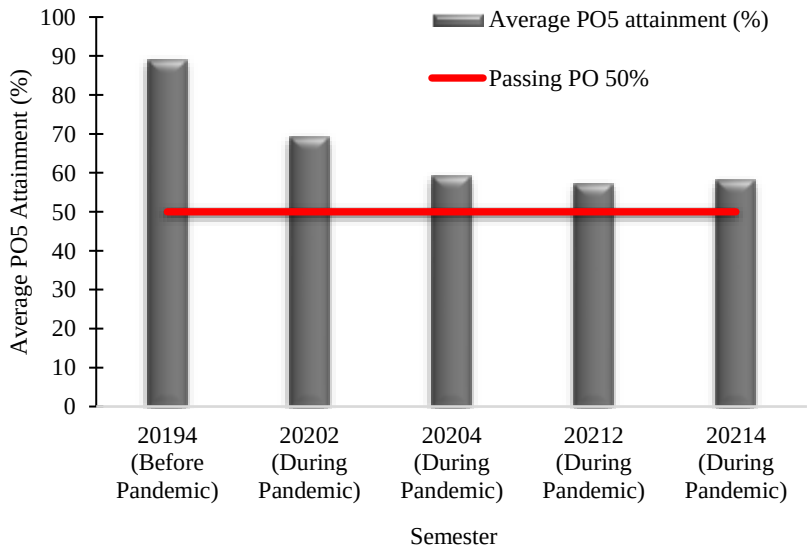

Figure 1: Average performance of PO5 before and during the COVID-19 pandemic

The passing mark score for PO5 attainment is defined by a minimum of 50%, thus students considered failed PO5 if the mark score is lower than 50%. Figure 2 demonstrates

the percentage of students passed or failed in the attainment of PO5. During the FTF practical test (semester 20194), none of the students has failed to demonstrate their psychomotor skill in modern tool usage (using Esteem software). But, when the online practical test took place during COVID-19 pandemic, approximately 12% of students were unable to achieve the program outcome in modern tool usage (using Prokon software) during semester 20202. Thereafter, the failure rate of PO5 attainment was increased to 27% and 33% in semester 20204 and semester 20212 respectively, despite the fact that these semesters went through the same ODL mode. This could be due to the fact that a large number of students i.e. 254 have enrolled in semester 20204, thus required roughly 6 times greater than that of number of teaching staffs in semester 20202. Yet, some of the teaching staff were first time handling this course, so the inconsistency of teaching's confidence may have affected the performance of students in the attainment of PO5. On the other hand, the highest failure rate of PO5 occurred in semester 20212, counted on the total of 43 students. This may be attributed to those repeaters, who did not seriously approach the course and showed low enthusiasm during the online teaching and learning.

For semester 20214, the involvement of a large group of students and greater number of teaching staff have successfully improved the performance of PO5 as compared to previous two semesters. Interestingly, around 79% of students have achieved the minimum 50% of PO5 for this course. It is believed that most of the teaching staff have gained some teaching experiences and the level of confidence in handling this course has increased. In addition, students were exposed to more sets of past semester questions, so that they have gained the confidence in using Prokon software. Those have attempted to do the exercise and facilitate discussion among piers had tendency to score the practical test.

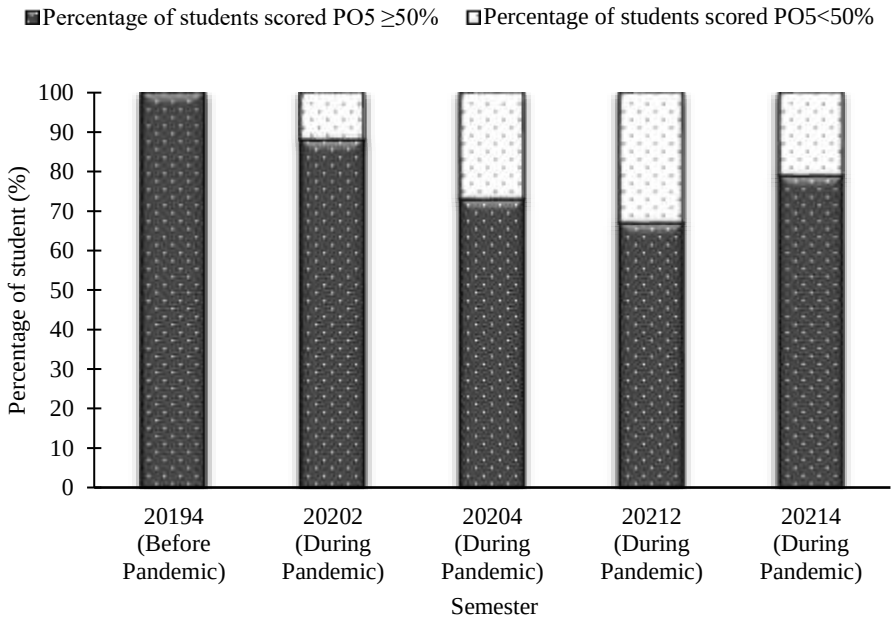

Figure 2: Percentage of students passed or failed PO5 before and during the COVID-19 pandemic

In terms of the relationship between the number of students enrolled and the PO5 attainment during the pandemic semesters, it is found that the number of students has a minor impact on the average PO5 attainment. As can be seen from Table 3, other than

semester 20202, the average performances of PO5 for semesters 20204, 20212 and 20214 were stable. Moreover, there is no specific pattern that can be observed in the perspective of passing and failure of PO5. For instance, the highest number of students in semester 20204 led to the increase in the failure rate compared to the previous semester with a small group of students; inversely the semester 20214 which represents a large group of students yielded a better passing rate of PO5 compared to its previous semester with small groups. Thus, class size is not the major factor affecting the achievement of PO5 during COVID-19 pandemic, the quality of the lecturers and students are the major drives in PO5 attainment. This agrees well with a study conducted by McCool et al (2015) that class size had little or no effect on the students' performance.

Overall, the attainment of program outcome in modern tool usage for this course was satisfactory when ODL was adopted in the teaching and learning process. However, the suitability of ODL in this course is arguable since the method of assessment was totally different from FTF during the practical test. There is a need to improve the effectiveness of online software learning and the online practical test conduct. In order to assist the lecturers in charge and to whom are teaching this course, the major challenges or difficulties faced by both lecturers and students during the COVID-19 pandemic are discussed in the following section, so that a more realistic action can be taken in CQI development of this course specifically in PO5.

Challenge of Teaching and Learning Prokon Software in ODL Environment

During the COVID-19 pandemic, work from home (WFH) scheme was implemented in most of the IHL in Malaysia to sustain the operation of any study program. Accessibility of the internet and availability of technology were the two main basic requirements in teaching and learning activities. Especially for students who live in rural areas, poor internet connection was the major obstacle for them to join the synchronous class. Even though the pre-recorded or recorded teaching videos can be shared to the students, there was a lack of interactions between teachers and learners. According to Saidi et al (2021), the majority of the students preferred synchronous rather than asynchronous. At its worst, Prokon software required some minimum specifications of the hardware to run the analysis and design of the structural elements. Without having a sufficient technology tool such as a computer, students hardly can pay full attention during the online classes or tutorials. It became more crucial in this course because the assessment of modern tool usage is carried out through online practical tests. Thus, it is undoubtedly that technology tools and internet connection have significantly affected the attainment of PO5 for this course.

Competency of lecturers in teaching Prokon software was part of the cause in ineffective learning among students. As mentioned earlier, the huge number of enrollment in semester 20204 led to the involvement of non-experienced lecturers. Due to the shortage of time and the constraints of social distancing, new lectures were not undergone sufficient training. Hence lacking confidence in teaching Prokon, those passive students suffered to gain understanding and most probably gave up learning this design software. Given a short period of time, both lecturers and students must adapt their daily work, they must learn how to use new tools and the way they interact with each other (Garcia et al., 2021). Monitoring of students' progress is equally important in this course, as each of the students is required to carry out individual projects. Meanwhile, they have to complete the modeling of the chosen

structural elements (e.g. beam, slab, column and footing) by using Prokon software and compare the design output with manual calculations. Monitoring in ODL mode is rather difficult if compared to FTF, most of the time, lectures need to refer to the structural key plans in checking the students' calculation work and this is less effective to be carried out through online platforms by clicking the files here and there.

Another challenge in teaching and learning of Prokon software is the attitudes of the student towards online classes. Most of the students did not actively respond during online classes, it is always unreal for the lecturers to see a full list of students online. Some of the students were likely to do other chores while listening to the online lectures, they were easily distracted from their surroundings. ODL has its drawback on students' self-discipline, especially in time management. Some students showed a tendency of late joining the online class. Another bad attitude of students can be seen in terms of submission due date, some students demonstrated low commitment in submitting their tasks as instructed by lecturers and the reason for late submission was misused. Good attitude of students is definitely bringing the enjoyment of the ODL classes and making the learning of Prokon easier.

Both lecturers and students would be beneficial if collaborative teaching and learning can be developed in an ODL environment. But sadly during the pandemic, most of the lectures and students found it difficult to have sharing sessions or discussion within peers due to the limited time and resources. Study by Ismail & Razak (2021) recommended that programming subjects are better to be learned in a collaborative learning environment which involves learning either in pairs or teams so that can promote active learning that is able to boost up the students' motivation. This can be applied in learning Prokon software, because it is considered as one of the practical oriented components in engineering programs.

Physical and mental health problems are also one of the challenges that have to be taken into consideration. Under the COVID-19 threats, most of the people (either lecturers or students) were anxious about their own and family's health, which indirectly created pressures and burden, leading to the low spirit of teaching and learning. This is one of the reasons why lecturers couldn't put full effort in teaching and students couldn't focus during the ODL classes. Not mentioned about strategy planning on the teaching method and monitoring process, one must be physically and mentally fit to make ODL of this course a success.

Conclusion

This paper investigates the impact of ODL in the attainment of modern tool usage for a civil engineering design project and the challenges of online teaching and learning in Prokon software are outlined for the sake of CQI. The implementation of ODL has reduced the average performance in modern tool usage (PO5) of this course by 20-30%. In the same manner, the percentage of failure in PO5 was increasing when the online practical test took place. Throughout the semesters during COVID-19 pandemic, average of P05 attainment remained at 57-59% for the later three semesters once the method of assessment in PO5 has been well established. However, this remote evaluation process is debatable because the ability of students in psychomotor skill can hardly be measured by marking the answer scripts submitted through online.

Class size has no effect on the performance of PO5, the quality of students and the competency of lectures play more roles in affecting the ability of using modern tools in this course. The major challenge of teaching and learning Prokon software in an ODL environment is defined by the accessibility of the internet and availability of technology tools. Without one of these, learning activity cannot be conducted as well as the assessment process. Besides, training on Prokon software should be provided by the faculty to improve the competency of teaching staff and to encourage collaboration among peers. Positive attitude is definitely a key to make the ODL successful, both lecturers and students would have enjoyed the teaching and learning process and establish a mutual understanding to strive together in achieving a good performance in modern tool usage of this course.

Limitation of this study is on the general discussion about challenges of teaching and learning of Prokon software in ODL environment. The outlined challenges are based on the authors' observations and experiences of teaching this course. These should be further verified by conducting both quantitative and qualitative studies for the samples of lecturers and students. However, data presented in this study are essential to form some basics of CQI especially deals with the program outcome in modern tool usage for civil engineering courses. Suitability of the method of assessment and assessment tool for PO5 should be investigated deeper especially when the online practical test is taking place.

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