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Supervision and management practices of Final Year Engineering Projects: Impacts of COVID-19 Pandemic

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ABSTRACT

CONTEXT
It is essential that supervision and management practices of Final Year Engineering Projects (FYEPs) maintains the quality of education and achieves AQF Level 8 outcomes even during the unprecedented situation due to the COVID-19 pandemic. In this situation, students cannot attend face-to-face meetings with supervisors, cannot perform practical/laboratory-based research, and cannot use software labs for their modelling and simulation works (if applicable). To achieve learning outcomes at AQF Level 8, some strategies and alternative pathways were developed to overcome the impacts of COVID-19 for supervising and managing FYEPs.

PURPOSE OR GOAL
The goal of the paper is to assess the impacts of the COVID-19 pandemic on the supervision and management practices of FYEPs. The paper also discusses the effectiveness of the technology we used for supervision and management of FYEPs, and how the supervisor and student relationship and engagement can effectively be maintained during this COVID-19.

APPROACH OR METHODOLOGY/METHODS
The traditional modes of supervision and management of FYEPs (theses) such as face-to-face meetings, laboratory works, and use of simulation labs were changed to virtual/online operation only to provide essential feedback and directions to the students for their projects. The online communication and learning and teaching tools such as Zoom links, chat windows, outlook team, etc., were employed for maintaining weekly progress (planned tasks). A Google doc communication channel was also considered for each student to monitor their weekly progress.

ACTUAL OR ANTICIPATED OUTCOMES
The students' feedback suggests that students were generally happy with the new ways of student engagement in FYEPs/thesis supervision and management. More specifically, they indicated that they were very happy with the online presentations of mid-term progress and final presentations (direct zoom presentation or recorded video) which were less stressful as opposed to face-to-face presentations. They were able to concentrate more to achieve project outcomes without spending much time on travelling to university.

CONCLUSIONS/RECOMMENDATIONS/SUMMARY
Although there were a few challenges in adapting online supervision and management of FYEPs during COVID-19 pandemic environment, student feedback suggests that they are happy with the online system too.

KEYWORDS

COVID-19 pandemic environment, effectiveness of online engagement with the students, FYEPs online/virtual supervision and management.

Introduction

It is required that Final Year Engineering Projects (FYEPs)/theses meet the requirements of educational standards and AQF Level 8 outcomes. AQF Level 8 outcomes indicate that the graduates should be able to demonstrate the knowledge and skills gained during their study into their future workplace, community involvement and further learning. AQF8 defines research as systematic experimental and theoretical work, the application and/or development of which results in an increase in the dimensions of knowledge (Australian Qualifications Framework Council, 2013, p. 100). Although in normal circumstances the supervision and management practices of FYEPs varies between universities, disciplines, and countries (Rasul et al., 2015a, 2015b, 2015c; Lawson et al., 2014; Ku and Goh, 2010; Schmid et al., 2012), currently, because of the COVID-19 pandemic, the supervision and management strategies needed to be adjusted to ensure the achievement of the requirements of AQF8 outcomes. Assessment criteria also vary from university to university (Rasul et al, 2015c).

The impact of COVID-19 on various disciplines (such as medical, engineering, science, etc.) are significant. The COVID-19 pandemic presents the biggest challenge on the people's life and day-by-day activities (Wang and Huang, 2021, Ghasem and Ghannam, 2021). A transition rapidly occurred from face-to-face, blended, and flipped classroom modes to distant or online modes (Iglesias-Pasad et al., 2021). This temporary shift of instructional delivery happened suddenly due to the pandemic situation. Various studies have been put forward to quantify the problems and challenges (Rafique et al., 2021). For example, a detailed survey on the impact of the COVID-19 pandemic on final year medical students in the United Kingdom was undertaken by Choi et al. (2020). They surveyed 440 students from medical schools throughout the UK and analysed the impact of COVID-19 on final year medical students' examinations and placements and how it might impact their confidence and preparedness for their foundation training (Choi et al., 2020). The University of Sheffield studied the impact of COVID-19 for Aerospace Engineering students (University of Sheffield, 2020). More information on effective teaching and examination strategies for undergraduate learning during COVID-19 school restrictions can be found in recent literature (George, 2020). A focus was made to study the student learning through remote teaching due to the COVID-19 pandemic (Iglesias-Pradas et al., 2021, Silva et al., 2021).

There are benefits and drawbacks of the COVID-19 pandemic. The face-to-face academic classes were transferred to online/remote classes which generates changes in teaching and engagement routines. Silva et al. (2021) concluded that the online classes tend to minimise the overall evaluated impacts. The authors proposed a hybrid student engagement model for their learning. As a result, they estimated that overall impacts could be minimised by 57% (Silva et al., 2021). Rafique et al. (2021) pointed out that the new pedagogy of teaching methods also inspired and motivated students to learn through computers and the internet. On the other hand, Ghasen and Ghannam (2021) concentrated on student interactions with their academics and articulated that limited student interaction occurred during online lectures. Generally, there were less than 20% attendance in lecture and tutorials. Hence there were problems for graduating students for their final year thesis as the students encountered problems in achieving effective technical discussions with their academic supervisors (Ghasen and Ghannam 2021).

With the diverse background of student cohorts (school leavers, mature age, and students from diverse cultural backgrounds in distance and multi-campus modes) at CQUniversity, it is important to ensure that the students meet the requirements of AQF8 learning outcomes and are also satisfied with the delivery, supervision and management practices of FYEPs. The main purpose of this paper is to assess and report the impact and effectiveness of recently adapted virtual/online supervision and management of FYEPs in the COVID-19 pandemic environment. The paper also reports how the supervisor and student's relationship, and engagement were effectively maintained at a distance during the COVID-19 situation. While

the effectiveness of online supervision and management practices of FYEPs is still not clearly understood, this study is very important in that it gives us clear indication on how students were engaged and what was their overall satisfaction on FYEPs supervision and management.

Methodology

The traditional modes of teaching each FYEPs student includes face-to-face meetings, experimental/laboratory works, computer simulations using software labs, etc., to provide essential feedback and directions to the student for successful completion of their FYEPs. Given the recent/current COVID-19 pandemic situation, online learning, and teaching tools such as zoom links, chat windows, news, and discussion forum, Microsoft team, etc., were employed for weekly scheduled tasks. A Google doc communication channel was also created for each student to monitor their weekly progress. The effectiveness of online supervision and management practices of FYEPs is still not clearly understood. The data base linked to online supervision and management is still in its initial stages. As this practice has so far only occurred in 2020 – to date, both students and facilitators are yet to develop full protocols and procedures for online supervision and management. This study presents the methodology used for supervision and management of FYEPs and analyse the effectiveness of employing these practices based on feedback from 2020 at CQUniversity. One of the frameworks used for online supervision and management of FYEPs students can be represented in Figure 1.

The use of experimental facilities, software labs and face-to-face meetings with students are restricted during COVID-19 period. The progress meetings, student engagement, online demonstrations of simulations, etc., were done through the link between A and B in Figure 1. Both A and B are linked with C for progress presentations and final project presentations, again through zoom.

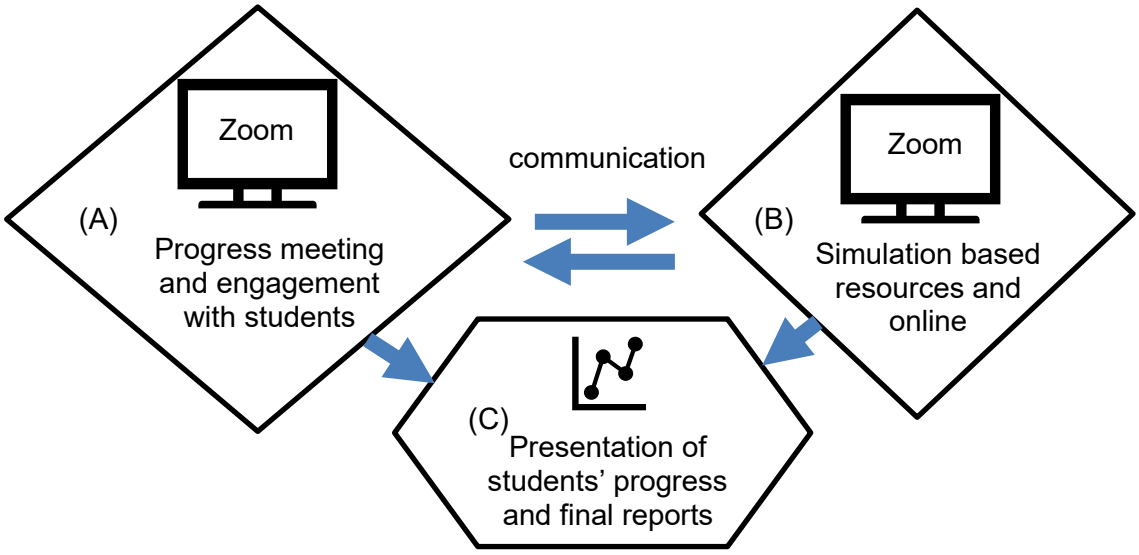

Figure 1: The supervision and management of FYEPs during COVID-19 Pandemic (modified from Mandal and Rasul, 2020)

In addition, using social networks such as Facebook, LinkedIn, Skype, Google, etc are also a trend for online supervision and management of FYEPs as all the information can be digitised in online perspectives which helps to convey knowledge to support student learning. Supervisors and students can talk virtually. Online and flexibility of communication can provide continuous feedback, irrespective of whether supervisors are away from the institution, in another geographic location or in any other situation. Frequent use of emails is also an essential media during COVID-19 pandemic, it has advantage of online learning via

written correspondence. Email, skype, etc have their own advantages to communicate with the students for any update, difficulties, progress, etc.

Results and Discussion

The study investigated the effectiveness of zoom sessions for progress meetings, engagement with students, feedback to student's submissions, how to prepare good presentation slides, ongoing progress, and final presentations. These sessions were recorded for use after hours if they needed to refer to again for any information which were not clearly understood during zoom meetings. Within Term 1 2020, there was no consensus on matters of how to best supervise project students online, how regularly to meet and for how long with groups of students or individuals. As usual, the issues around quality of supervision were related to knowledge gained and students achieving quality learning outcomes as measured by their grades. There was some concern about variations in online supervision style between academics and teaching facilitator. Most of supervisors were quite methodical regarding checking progress of each agreed/scheduled item and taking notes/minutes during the meetings. Weekly meetings are more appropriate and effective, and most of the supervisors organised weekly meetings, 30 minutes to one hour. It can be noted that the research projects that were primarily based on laboratory work were most challenging and finally they were revised as computational and simulation-based projects during COVID-19. They did simulations using the relevant software (if freely available online) and validated their model using the data available in the literature. However, most of the students did not have access to a software lab because the CQUniversity campuses were closed.

What needs to be done or can be done to reduce the impact of COVID-19 for maintaining progress of research students should be correctly identified (Mackenzie, 2020). Scheduling regular meetings is simple and makes it easy to maintain contacts with supervisors while they are off campus. It was evident that the supervisory meetings and relationships at a distance should continue as much as possible, even during non-COVID time. This can be successfully done through developing tailored processes to avoid the impacts of the COVID-19 circumstances. Understanding each other's (i.e., students and supervisors) point of view through online/zoom meetings was important. Review of working practices were needed to settle on a mutual understanding of regular progress. Consideration should be given regarding how to arrange any variation on agreed weekly plans/tasks. In addition to the zoom/chat windows/outlook team meetings, emails and phone calls were/can also be used for maintaining scheduled progress and agreed plans. For zoom meeting, documents should be sent in advance of the meeting date so that participants can read and be fully prepared to talk about them. Screen sharing is a wonderful option for zoom meetings. Although all supervisory relationships are different, there are opportunities to create friendly/good will relationships with students through zoom meetings. Making notes/minutes during remote meetings is another key point during online conversations. There are no problems with joint supervision through zoom or any other form of virtual communication.

The students mentioned that weekly meetings with their supervisor cover weekly requirements and milestones including project scope, literature review, preliminary results, presentations, etc. Through zooms, students from various locations can communicate with the project advisors to sort out the templates and requirements of each required item confidently. As the COVID-19 problems have only recently occurred, detailed quantitative data are not available yet, rather the authors focussed on their own reflections and student feedback for modifying the processes of online supervision and management. It was realised that, although the students were not in the face-to-face mode, the communication and engagement was still at a high level. The authors noticed a gradual improvement on documentation focussing on the template and style of presentation covering the technical content of the set tasks. It was fruitful to ask students to present weekly progress through screen sharing and power point slides. Zoom recording was also another excellent option to

revisit/navigate later what was discussed and agreed upon for maintaining regular progress before next meeting.

There were mostly positive comments provided in CQUniversity's students' evaluations. The online supervision of mature and working students was very attractive to them. The students indicated that, during weekly zoom sessions (by unit coordinator and individual supervisor) on various aspects of project supervision, feedback, and suggestions, it was very useful to listen to how other students were travelling with their projects. The weekly progress reports and meeting minutes submitted online in the same week of a meeting were a very useful exercise as it forced to prepare what will be the contents and quality of online progress submission. In their evaluation/feedback, students expressed that "Unit coordinator of the planning unit explained all the requirements of assessment tasks clearly in the lecture sessions conducted and precisely listed the requirements in unit's Moodle site. Question and answer sessions conducted by the unit coordinator were helpful for completing the assessment tasks. Academic advisor of my project responded to all my questions and pointed me in the right direction throughout planning phase of the project" (Term 1 2020, Thesis planning feedback). Some students from the thesis implementation unit indicated that they were happy to see some weekly videos covering what needed to be done. Generally, students liked the zoom final presentations and indicated that it was a less stressful way to give a presentation, as opposed to a face-to-face presentation which is very stressful for them, sometimes, some students become nerves. They indicated that they gave a better-quality presentation through zoom, compared to face-to-face.

Other important points stated by some individual students in their Term 1 2020 feedback are *It has been my pleasure to work under your guidance. You have been helping me throughout the planning and implementation phase of the project by providing your valuable guidance, report writing style, etc. I am very glad to work with you. I am thankful to you. I hope you stay safe and healthy (Student feedback 1)*. Another student feedback was *It is very helpful throughout the term. He arranged weekly meeting to solve the technical and non-technical issues regarding the project problems. He explained very well how to improve the presentation and thesis writing. He explained how to connect the figure with text, and which points I need to include in thesis to improve the quality of writing. Overall, the weekly meeting and feedback given by him was very helpful to improve the quality of writing and how to complete the task within the time frame (Student feedback 2)*. The student feedback 3 also provided some interesting comments – *It was very good, and we learned a lot, also you helped me to manage my deadlines and taught me how to improve my work day-by-day and the thing you did for us was very appreciable that you work on weekends to meet our deadlines during this critical time*.

Students and supervisors have freedom of ambiance and locations as they can be at any geographical location, only limited by internet access (Hamzah et al, 2017). During COVID-19, usefulness of supervision and management of FYEPs were scored about 4.5 out of 5 on things such as the increase in quality of work, more control over the work, get the things done faster, increases in productivity, support critical aspects, enhances effectiveness of thesis works, etc (Ismail et al, 2020). During COVID-19, technology/online media was a right medium for students and supervisors to share information, update project/thesis progress, project presentations, interaction with peers, etc. It could be more effective for those students and supervisors who have strong skills and up to date knowledge in using digital technologies. It is fair to say from student feedback and the authors own reflections that the students were generally happy with the online methods of student engagement, supervision, and management of FYEPs. The students' weekly communication and presentation on set tasks, and their progressive and improved content in Google doc indicated student learning was well evident. Social interaction through online media should not be neglected compared to face-to-face meeting and discussion (Ismail et al, 2020).

Innovation lies in the development of a 'virtual supervision' tool that enables both stakeholders (supervisors and students) communicate effectively at any time through the

different digital technology/platform mentioned above. Outcome mentioned by Ismail et al. (2020) put an argument that online supervision improves quality of work, productivity, effectiveness on job and job performance, accomplishment of tasks more quickly etc. Earlier, Bender and Dykeman (2016) reported that both traditional and online supervision have same efficiency. These achievements and outcomes clearly satisfy the requirements of AQF8 learning outcomes which are defined by "graduates are expected to demonstrate knowledge and skills for initial work, community involvement and further learning" (AQF, 2013). Broadly, students achieve cognitive skills through synthesizing knowledge, identifying solutions to complex problems with intellectual independence; (ii) understanding a body of knowledge and theoretical concepts; (iii) exercising critical thinking and judgement in developing new understanding; (iv) designing and presenting research outcomes to a variety of audiences, and more mentioned in AQF learning outcomes. Some limitations such as technology/software faults (noise, presentation modes/recording, sudden WiFi loss, power supply, etc) which interrupt in efficiency in online supervisions can be noted.

The proper implementation of online supervision and management of FYEPs could develop students' ability and improve performances which could benefits both supervisors and student. Development of tools to compare different online technology individually to evaluate whether each technology can achieve AQF outcomes could be a topic for future research. Another interesting future research could be an assessment of effectiveness of mixed mode supervision i.e. combination of face-to-face and online supervision.

Conclusions and Recommendations

The paper presented and analysed the impact and effectiveness of introducing online supervision and management of FYEPs during the recent COVID-19 pandemic situation. Although there were a few challenges in adapting to online supervision, student feedback from Term 1 2020 suggests that they were generally happy with the ways we managed the projects and the strategies developed to avoid negative impacts on learning quality of FYEPs. The students said that they were able to concentrate more to achieve the learning outcomes of the projects instead of spending much time travelling to university. The supervision and management practices of FYEPs during this COVID-19 situation can ensure that universities are still able to meet the requirements of AQF8 outcomes. Despite the challenges now on how to incorporate supervisory inputs during COVID-19, this study indicates that the online technologies and social networks can improve students' productivity, effectiveness, and performance.

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