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RESEARCH ARTICLE

Description and Assessment of an Innovative International Multi-University Construction Project Management Course

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ABSTRACT

The irreversible effect of globalization is especially evident in the construction industry, where many design and construction management activities, including construction project management education, are witnessing transformation in terms of both process and outcome. Students who are majoring in construction engineering/management and related fields face a growing, complex and interconnected world and thus need to be prepared to meet multidimensional requirements when delivering construction projects in a global setting. The goal of this paper is to describe and assess an online, collaborative, international, multi-university graduate-level course, Global Construction Practices (GCP), which was developed at North Carolina State University to prepare professionals – engineers and construction project managers – for the international construction market. A case study was undertaken on the GCP course, complemented by a survey of students' perceptions of the sixth offering, which happened during the global COVID-19 outbreak. The survey responses were subjected to statistical analysis. Students expressed satisfaction with the course contents and format and looked forward to the classes. The GCP course had elements of evidence-based educational practices and student engagement. Overall, the course design and delivery presented a unique opportunity for exposure and collaboration on international projects while allowing for the peculiarities of local contexts. Some challenges associated with offering such a course included language barriers, time zone differences, academic calendar differences, and technical issues. GCP lecture delivery can be improved by providing more stable Internet connectivity and allowing additional time for presentations. There were however, successful attempts to resolve such challenges and overcome barriers. This course has the potential to make positive changes in the ways that engineering and construction project management students are prepared for successful careers in the global construction market. Awareness of this course also may inspire other education researchers and practitioners to develop similar courses.

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1.0 Introduction

Students who are majoring in construction management (CM) and construction engineering and management (CEM) have to operate in a growing, complex and interconnected world that

has substantial engineering, building (building construction technology and management) and other built-environment needs. Therefore, such students must be prepared to meet multidimensional demands to deliver construction projects in a global setting. As a result of increasing populations and growing economies in emerging countries, the demand for infrastructure construction projects, such as power, roads, rail, and water projects, will continue to rise, requiring approximately $74 trillion in funding from 2020 to 2040 (Oxford Economics, 2017; Cision, 2018). Engineering and other built-environment professionals need to meet the expectations of sophisticated clients, improve society's standards of living, protect the natural environment and natural resources, and maintain a productive project team, among many other demands. Each practitioner in the next generation of engineers must be a combination of scientist, sociologist, leader, and business person (Russell, Hanna, Bank & Shapira, 2007).

Furthermore, global awareness is considered to be an important student outcome as part of the United States Accreditation Board for the Engineering and Technology (ABET) accreditation process. Student Outcome 2 states that students should have "an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural social, environmental, and economic factors." Outcome 4 reinforces the need for students to consider the impact of engineering solutions in global, economic, environmental and societal contexts (ABET 2022). Although training students for so many roles is a daunting task, it has become obligatory for educators in the fields of CM and CEM.

By its very nature, construction project delivery demands collaboration and working among teams (Walls, 2024). Bringing together professionals in multicultural and multilingual settings to work together on international projects involves breaking down language and cultural barriers and addressing the fundamental challenges associated with educational content and different modes of training. Although the long-standing expectation for international construction projects is that professionals from various cultural backgrounds will work together on real-life projects, the prior training of those professionals is not necessarily common or uniform. That is, although the international project is the common denominator, there are quite dissimilar training methods and preparation of engineering and construction project management students for all the skills required, especially for international project teams with cultural and ethnic diversity. Consequently, implementing such projects can be rather challenging.

Furthermore, in today's world, the use of digital technologies has been affecting various sectors of national economies, with construction management education and practice not left out. Authors such as Dupuis, Thompson, Bank and Herridge (2008), Jaselskis, Ruwanpura, Becker, Silva, Jewell and Floyd (2010), Korman and Johnston (2011), Bates (2014), Behzadan, Iqbal and Kamat (2014), Martin, Ahlgrim-Delzell and Budhrani (2017), Baggaley (2019), Borup and Evmenova (2019), Erdogmus (2019) and Borup, Graham, West, Archambault and Spring (2020) have written on issues including the experiences and possibilities of information and communication technology (ICT) in promoting efficiency in life's endeavours in general and efficiency in construction management education and practice in particular. The evolution of the Massive Open Online Course (MOOC) and Building Information Modelling (BIM) highlight such advances and possibilities (Glick, Porter & Smith, 2012; Shanbari & Issa 2018). Digital technology tools or platforms present such possibilities of simulation and virtual co-location of project participants either in education or practice.

In order to understand the major challenges faced in global construction projects and to develop students' skills in global collaboration, an international graduate-level CEM course, Global Construction Practices (GCP), was developed at North Carolina State University (NCSU) as a collaborative effort with instructors (at several universities in various locations worldwide) who were digitally co-located in running the course. The GCP course has been offered successfully six times from 2013 to 2020 and continues to be offered. In the effort to prepare CM/CEM students to become future leaders in the international construction industry, GCP students are exposed to a variety of topics, such as international contracting, risk,

finance, sustainability, cultural diversity, and leadership training, by lecturers across the globe with expertise in each of these areas. Students also have the opportunity to work on projects with teammates from their own university as well as with students from universities in other parts of the world. By the end of the course, the students will have learned how to collaborate with others from different cultural and language backgrounds, as well as gained the ability to coordinate schedules in different time zones.

This paper, using a case-study approach complemented with student survey, seeks to provide (1) a detailed description of the GCP course, (2) investigate the perceptions of GCP students from five universities across various continents regarding the resources, contents and delivery method of the GCP course, and (3) assess the course in the context of the COVID-19 pandemic and associated elements of student engagement with a view to improving the course or developing similar ones in future. The goal of this research is not only to improve the GCP course but also to provide information that other universities can use to consider offering a similar course that engages their construction students with today's global construction environment.

2.0 Literature Review

2.1 The Construction Industry

The construction industry remains significant in every country, as it is responsible for altering the natural environment and transforming it to the built environment to support human activities. The industry supports and equally signals the progress of civilization. How the industry performs in terms of working in project teams is vital. Beyond technical capacity, how members of project teams relate and collaborate affect project success. This is the import of Dada (2007) and Dada (2014), with the latter concluding that even where all resources and technology and technical competence are in place, a project may still not succeed if the elements of relationship and teambuilding or collaboration are missing. Dada (2014) investigated a context of teams working on projects in Nigeria with the possibility of team relationships having effect or challenge with respect to a selected measure of project success. Obviously, scenarios of international project teams comprising members from different national, cultural and linguistic backgrounds can be expected to be more challenging.

According to Oxford Economics (2017) and Cision (2018), the demand for infrastructure construction projects worldwide will continue to grow and has been projected to require approximately $74 trillion in funding from 2020 to 2040. Therefore, the preparation and education of future managers of such infrastructure projects remain important in an age of increasing possibilities of digital education. This is the scenario played out or mimicked in the GCP course comprising an agglomeration of universities in varying geopolitical regions, with students and staff co-located synchronously for the delivery of the course. This work focuses on the characteristics of the GCP course, coupled with a survey of students of the sixth offering with respect to various aspects of the course, including students' satisfaction with it.

2.2 Progress in Distance Education

First introduced in the 1800s, distance education has been widely discussed in the past forty years. Holmberg (1977) was the first significant treatise on distance education, methods and learner types. Introduced in 1980, *Distance Education* is the first journal focusing on media usages, social aspects, target groups, communication methods, and teaching/learning media. Teaching/learning media effectiveness subsequently became major discussion issues as experts examined distance education by mail, newspaper, radio, audio tape, television and, more recently, via satellite and the Internet. Over the decades, therefore, the means and methods have changed and continue to evolve

Essential factors for effective distance education teaching relate to content knowledge, pedagogical knowledge and technology knowledge. Research suggests that institutions need to provide appropriate guidance on pedagogy and the communication technology used, which needs to be powerful enough for students to interact with the teachers engaging them to learn and work collaboratively in class (Borup & Evmenova, 2019).

Synchronous online learning (SOL), along with asynchronous online learning, has been the subject of discussion since the Internet era began around the year 2000. Student-teacher interactive quality mainly depends on technology itself. Several online tools have been used, including chat rooms, instant messaging, video conferencing and customized interactive tools (Martin et al., 2017). Recently, with new technology devices such as smart phones or tablets, students are able to interact with the instructor immediately, with their user experience and in-class engagement thereby increased.

Blended learning was introduced as a way to combine the benefits of traditional and online learning. It has been used in several fields from engineering, medical, business and the military as a way to provide better engagement, optimize class time and offer self-paced learning, thus improving the user learning experience. Without calling it such, many universities have adopted the blended learning approach, allowing students to attend class face-to-face while also providing online resources for them to independently study the course material (Halverson, Graham, Spring, & Drysdale, 2012). Pre-recorded media are heavily used in blended learning for students to review pre- and post-class to aid understanding of the material (Kelly, Mihm-Carmichael & Hammond, 2019).

More recently, the Massive Open Online Courses (MOOC) option has become a mainstream learning platform, based on the concept of open educational resources (OER). The first well-known platform was MIT OpenCourseWare, which allows anyone to download course materials free of charge. The MOOCs, such as Coursera or edX, are the result of collaboration between prestigious universities or from non-profit organisations such as Khan Academy. It is mainly used for asynchronous online learning (including lectures, homework, quizzes, and examinations), with the benefit of self-paced learning for full-time or part-time students. As an online tool, it keeps usage logs of every student for analytical purposes. This allows the instructor to accurately evaluate the course by number of students, learning time, concept understanding, and student engagement. Although drop-off rates for MOOCs are high since they are freely available, they are regarded as a source of commercial education instead of traditional distance education (Baggaley, 2019). However, research suggests that MOOCs actually supplement the more mainstream educational approaches (Bates, 2014).

Whatever the method adopted for delivering content to learners, student engagement remains a key construct. Critical to learning success, student engagement can be categorized into behavioural engagement, affective (emotional) engagement and cognitive engagement. To improve students' engagement, several approaches could be utilized including instructing and collaborating (cognitive engagement), developing relationships and interest (affective engagement), organizing, managing, and tracking progress (behavioral engagement). The Academic Communities of Engagement (ACE) framework introduced three parts of engagement support, including individual support, course support and communities support by different stakeholders (Borup, Graham, West, Archambault & Spring, 2020).

2.3 Advances in Information and Communication Technology for Construction Education

Advances in Information and Communication Technology (ICT) have not only sparked transportation and communication revolutions that have made the planet seem smaller, having broken down traditional geographical barriers to global construction projects (Russell et al., 2007). These technologies have also provided new tools and approaches for CM/CEM education. Jaselskis, Ruwanpura, Becker, Silva, Jewel and Floyd (2010) found that virtual visits supported by advanced ICT systems were better than physical field trips in CM/CEM education. Based on their research, it was concluded that virtual project tours, such as those instituted at Iowa State University, can be used to avoid potential safety hazards in site visits. Virtual tours can also provide each student with an equal learning experience, while students at the rear of a large group on a field trip will likely see, hear and learn less than those at the front of the tour. As an alternative approach to real-world, practice-based learning, simulation and gaming environments can provide CM/CEM students with a contextually rich educational experience.

One early effort in this area was the Construction Management Learning System at Western Michigan University (Sawhney & Mund, 1998). Mukherjee et al. (2004) proposed an extensible general framework for developing a wide variety of situational simulations of CM processes to support interactive learning and training activities. Korman and Johnston (2011) developed a Construction Industry Simulation (COINS) to prepare CEM students for management positions in two important construction industry sectors (commercial buildings and heavy civil infrastructure projects), focusing on human resource management, business development and project management. While the use of simulators is another interactive approach for teaching and learning, it may not have a high enough "fun factor" to attract students. It is worth noting that digital games have been used in AEC training and education since 1969 (Lin, Wu & Chang, 2011), with recent research studies describing gaming environments such as Safety Inspector.

Along with the rise of Building Information Modeling (BIM), many universities are gradually adopting BIM in AEC programmes (Pikas, Sacks & Hazzan, 2013) to meet industry demand for BIM-capable graduates. Some research has focused on changes to the CM/CEM curriculum and the introduction of BIM into different knowledge domains (Clevenger et al., 2010), either through stand-alone courses (Dupuis et al., 2008), the integration of BIM into core courses such as those for scheduling (Hyatt, 2011) and estimation (Sylvester & Dietrich, 2010), as well as into cross-disciplinary courses (Richards & Clevenger, 2011). Besides being a part of learning content, BIM is also a great approach for strengthening CM/CEM education, moving beyond traditional lectures and tutorials (Sacks & Pikas, 2013). Its strong visualization feature can help students understand construction projects from the perspectives of both the product and the process (Sacks & Pikas, 2013; Glick et al., 2012; Kim, 2011; Benjaoran & Bhokha, 2010). Thanks to the rapid increase in computing power and lower hardware prices, technologies such as Virtual Reality (VR) and Augmented Reality (AR) have become very affordable, at least in the developed world, hence their adoption in CM/CEM education in combination with BIM models (Sampaio, Ferreira Rosário & Martins, 2010; Behzadan, Iqbal & Kamat, 2011).

Aside from using ICT in scattered technical topics in CM/CEM education, a blended/hybrid teaching approach has been established as an innovative course delivery method, as compared to traditional face-to-face teaching (Ozcan-Deniz, 2018). In a hybrid course method, teaching and learning occur in both a physical (offline) environment and a cyber (online) environment. Construction management education in conventional courses is done primarily to address local contexts. Even where institutions address international construction, the institutions do it in silos. A major objective of this study is synchronously uniting potential international construction project managers in an online platform to mimic diverse international real-life construction project teams. In essence, this research seeks to answer the following questions: What are the key characteristics of the sixth offering of the GCP course? And what are students' perceptions about the course?

3.0 Research Methods

This is a descriptive case-study approach complemented with a survey of students in the sixth offering of the GCP course.

3.1 Case Study

A major character of a case study is that it is a scientific enquiry that investigates a phenomenon in its real-life context (Yin, 2009). The various methods of case study, e.g., descriptive, explanatory and exploratory, tend to lead to in-depth examination of phenomena and thus allow researchers a leeway or variety of methods to collect data. Case study is a research study and not just a method of data collection. In-depth examination of phenomena can generate specific insights that transcend generalizations.

Thus, an in-depth study, exploration or description of the GCP course (which course started in 2013) was done to reveal some general traits and characteristics of the GCP course, such as course content and format. This was complemented by a special focus (through a survey) on the 2020 offering that predated the COVID-19 pandemic. The case study was complemented by an opinion

survey of students regarding some aspects of the GCP offering. The surveys throw more light on the GCP case study. This approach aligns with the case study reported by West, Paige, Lee, Watts and Scales (2022), which equally adopted the survey approach to determine participant perceptions.

3.2 Student Survey

Since the GCP course is a new approach for teaching CM/CEM concepts in global construction, student feedback is key to evaluating the effectiveness of the course. While the 2020 offering has been chosen as a typical case study, getting opinions of students on the GCP was done through a questionnaire survey of the students. A survey was conducted after the Spring 2020 course offering to gather feedback from students regarding, among others, the content, delivery and technology for better apprehending learner experiences in a multi-institutional course and pre-and post-COVID-19 environment. Part of the survey included the following sections: (a) Student Background Information; (b) Assessment of the Lecture Delivery Method, Resources and their Effectiveness; (c) Challenges Encountered with Course; (d) Perceptions and Views on the Global Construction Practices Course in Light of COVID-19; (e) Students' Engagement Before and After COVID-19 Emergence or Lockdown and (f) Suggested Enhancements.

Data for the survey were gathered through a questionnaire administered on graduate students (all of whom held an undergraduate degree) who took the course at five universities in different continents in Spring 2020 (see Table 2). Mixed methods involving case study, survey of students and self-reports of faculty were adopted in collecting data. The student survey utilized a form of multi-stage sampling technique, as every participating university was selected. The technique of attempted census, which is different from census or enumeration, was used to collect data from the students. The attempted census happens whenever data is requested from the entire population but not every member of the population responds. All the five universities that took part in the Spring 2020 offering of the GCP course were used in the data collection process and no university was left out in terms of data sourcing, although individual students could choose whether or not to participate in the survey.

A questionnaire portal was set up for all students enrolled in the course, in an attempt to maintain students' anonymity in terms of personal information and other identifiers. The names and e-mail addresses of all students who had registered for the course through their respective universities were sent to NCSU as the coordinating institution (for the purpose of assignments, etc.). The students were sent the link to the questionnaire on the Qualtrics platform. (All students thus had the chance to supply the responses needed if they so wished). With this method, completed copies of the questionnaire could not be traced to any particular student. This level of anonymity, coupled with the removal of possible identifiers from the questionnaire, served to improve the objectivity of the responses. In addition, the link to the Qualtrics platform was sent from one of the participating universities that already had graded its students prior to the administration of the questionnaire, thereby removing the effect of power distance. That is, students were not coerced in any way to respond to the questionnaire, thus helping to ensure the objectivity of the responses.

Data collected from the students included their nationality, university, language best spoken, gender, and age group. Students were also asked to indicate their work/study status (full-time or part-time) and to rank the relevance of the course content to their professional performance. Students were requested to express their level of agreement with specific declarative statements that were used as the criteria for assessment of the GCP course on a five-item scale of 'strongly agree' = 5, 'agree' = 4, 'neutral' = 3, 'disagree' = 2, 'strongly disagree' = 1. Other data collected from respondents included satisfaction with various aspects of the GCP course ('highly dissatisfied' = 1; 'dissatisfied' = 2; 'neutral' = 3; 'satisfied' = 4; and 'highly satisfied' = 5). Questions were also asked on the level of students' engagement before and during the COVID-19 lockdown. Table 2 shows the response rate for each university and the aggregated response rate. The students were equally asked to assess their level of engagement with the course before the lockdown and after the lockdown. Overall, the students' response to how they saw the course in

comparison to others was requested with the options of better, same and worse as possible responses.

4.0 Course Description, Data Presentation, Analysis and Discussion

This section describes the GCP course, providing some descriptive statistics followed by descriptive and or inferential statistical analysis.

4.1 Description of the GCP Course

4.1.1. General

The GCP course is a global multi-university graduate-level course developed at NCSU in response to the need for education in global construction project management. Between 2013 and 2020, the GCP course was offered six times, mostly during the Spring term, and continues to be offered. Apart from the Zoom video conferencing technology software introduced during the Fall 2019 and Spring 2020 offerings, the course is the same as the earlier offerings. Table 1 shows the universities that have participated in the GCP course at one time or another while also showing the five universities that participated in the Spring 2020 offering, during which time a survey was done to complement the GCP case study. (It should be noted that apart from the video conferencing Zoom software used in the 2020 offering and the emergence of the COVID-19 pandemic that manifested during the offering, the 2020 offering is representative of previous offerings or all offerings in the course format, content and method.)

Table 1: University Participation in Global Construction Practices Course

2013, 2014, 2016, 2017, 2018, 2023 offerings*	**Spring 2020 offering used in this research**
North Carolina State University, USA	North Carolina State University, USA
Tianjin University, China	Tianjin University, China
Tsinghua University, China	Tsinghua University, China
IIT-Madras, India	Chiang Mai University, Thailand
University of Calgary, Canada (asynchronous delivery due to time zone constraints)	University of Lagos, Nigeria
Ulster University, UK (asynchronous delivery)	
Polytechnic University of Puerto Rico, USA	

*Note that different universities participated in each offering of the course.

Because the GCP course is hosted by NCSU and involves several universities, it is not easy to tailor a one-size-fits-all syllabus and delivery method that completely fits the needs of students at each institution. All instructors agreed to work from a common syllabus, although each instructor was free to add supplementary content and choose from a variety of teaching methods in addition to the synchronized online video conferencing lectures. The learning objectives, teaching methods and assessment system (as described here) are tailored to meet the demands of global construction project management education at the partner universities.

4.1.2 Learning Objectives

There are two major learning objectives of this course. The first is to describe the differences and challenges of constructing projects in a global context. To be competent in managing a global construction project, students need to know the common and unique market environments in all major countries and regions, including the political, cultural, economic and technical conditions that may have an impact on construction projects. Beyond knowing the differences, it is important to understand the associated challenges and approaches for addressing them, including the use of human-centered designs. The second common learning objective is to gain the skill of collaboration as part of a multinational team. Working on a multinational team is unavoidable in a global construction project, requiring collaboration skills for handling professional issues in a cross-cultural context, often with people who speak different languages. As such, it is necessary to use the international context of this course to form multinational virtual teams of students to work on course projects. The interpersonal collaboration

skills and the ability to use contemporary communication tools that students develop in the course will greatly benefit them, as it prepares the students for working as part of a team in future global construction projects.

Some measure of flexibility and integration of local contexts were available. For example, Tianjin University added two additional learning objectives to this course. The first is to have a thorough understanding of the business aspects of the Chinese construction industry. The second additional learning objective is to improve the ability to use English in professional jobs, for which the university organized in-person tutorial classes. Because English is the official language of the GCP course — including teaching, assignment and after-class communication — full exposure to a professional course offered in English should enable students to learn how to work as part of a professional team that communicates in English.

4.1.3 Lecture Hours, Lecture Faculty and Teaching Methods

Considering the different time zones, the time selected to deliver the live real-time lectures was 8:00 a.m. to 10:00 a.m. in the U.S. Eastern Standard Time Zone (which is 5:00 p.m. to 7:00 p.m. in India, 8:00 p.m. to 10:00 p.m. in China, 7:00 p.m. to 9:00 p.m. in Thailand, 1:00 p.m. to 3:00 p.m. in Nigeria, 6:00 a.m. to 8:00 a.m. in Calgary, and 8:00 a.m. to 10:00 a.m. in Puerto Rico). With respect to lecture time selection, it is to be noted that NCSU, located in the United States, is the coordination centre (with respect to controlling the video conferencing for the course, arranging for instructors and hosting the website for pre-recorded lectures and other learning resources). The start time for lectures in the NCSU is 8.00 a.m. This implies that this is the earliest possible time in the USA for office and academic work. Juxtaposing this time implies that starting the lectures any time later than 8.00 AM will be pushing a majority of the participating universities, specifically China, Thailand, India deeper into unofficial work hours. It should be noted that this is a major innovation or special characteristic with this course: Even though it is synchronous online, the time implications for each university differs obviously because the universities are in various continents and regions with different time zones.

All lecturers or speakers were professors or industry experts from various areas of the world and possessed significant construction project experience. They joined the class either by being invited to speak in person at a participating institution or by participating remotely via an online conferencing system. A given topic could be offered by one speaker or several speakers. Some topics were related to different aspects of managing global construction projects, whereas other topics were related to construction in a specific region/country. The topics covered in the lectures included global construction challenges, human-centred design, legal aspects, culture, communication, conflict resolution, leadership, global project finance, labour and productivity issues, international bidding considerations, and construction practices in various regions and countries, i.e., Africa, China, Canada, Europe, the United States (including Puerto Rico), Germany, India, Italy, Nigeria, South Africa, Thailand, Taiwan, and the Middle East. For each lecture, related content in the textbook was assigned as reading material. Faculty members at each university were given the flexibility to provide supplementary materials and apply those materials as they saw fit. All lectures were recorded by a conferencing system (such as Zoom), with the recordings archived in the NCSU digital library and available on the NCSU website to course participants as reference materials.

4.1.4 Student Assessment

Each institution is expected to have its own course assessment system, as the only parts of the course they have in common are the course projects. Two projects are assigned in the course: construction practice around the world (Project I) and an international construction term project (Project II). In Project I, students at each university research and present the practices and innovations in their respective countries with regard to nine areas: overview of industry, construction means and methods, safety regulations, labour regulations, environment regulations, project management and contracting approaches, codes and standards, financial and insurance requirements, and construction education/training. Students at each institution are divided into teams covering each of these areas, and the students submit their final group reports to their own instructors. The GCP course

reserves one lecture for each participating university in order to allow them present their research to students at all institutions. Through the presentation and the Question and Answer (Q/A) sessions, students develop a deep understanding about the construction industry in other countries.

Project II requires each student team to perform a risk analysis on a selected project in the country assigned to the team and to summarize the findings in a report and presentation. Participating universities collaborate to form multinational and multicultural teams that have members from each participating university. Each team represents a different international construction company, with the students starting by selecting a name and defining the nature of the company. Next, the team searches various websites (e.g., World Bank, Google, etc.) to identify a project of interest in its assigned country and performs a risk analysis before deciding whether or not to bid on the project. Risk analysis is covered in the lecture on international bidding, and in this term project risk analysis follows the criteria identified in that lecture: economic, social/cultural, political, religious, and construction logistics/resources. The GCP course reserves two lectures for teams to present and defend their final decision to bid on a project or not. Each university is at liberty to assign its own weights to these assignments. Credit is, however, given for participation because the kind of discussions that take place in class during the online synchronized conferencing lectures is also a common practice in a multinational and multicultural environment and should be encouraged.

4.1.5 Challenges Encountered

Cultural

Challenges occur because of cultural differences. For example, many local Chinese students feel a cultural challenge in this international course because they are not accustomed to interacting with foreign students. Although their number is growing rapidly, international students accounted for only 1.6% of the more than 27 million students at 700 Chinese universities in 2017 as reflected in the 2017-2018 report of the China Centre for Globalisation (Wang & Miao, 2018). As a top 20 university in China, Tianjin University has a somewhat higher proportion of international students (about 5%). Compared to students at universities in the U.S. and Puerto Rico, Asian students at Tianjin University, Tsinghua University, and IIT Madras are more introverted and are more accustomed to passively listening to instructors in the lecture room without actively participating in class discussions. Some lecturers are more accustomed to students in Western classrooms and thus do not tend to give students all key points and conclusions but hope the students will summarize or conclude something for themselves during classroom discussions.

Language

Language is a unique challenge for students at Tianjin University because most students use English as a second language, including most international students. In contrast, English is the native language of most students enrolled at NCSU. While NCSU does have some international students, these students have presumably met the English proficiency requirements for admission. India and Nigeria use English as official language, so it is not an issue for IIT Madras and University of Lagos students. However, for international students at universities in China, the language requirement for admission is Chinese (not English) because the official language of these universities is Chinese. Because insufficient skills in English is a big hurdle for students at Tianjin University, instructors have incorporated extra offline tutorial classes in Chinese to help students understand the technical content.

Communication and Teamwork

Communication challenges mainly arise as students work on Project II, where members of a multinational team must coordinate their work across different time zones and different cultures, using different communication tools. The impact of different time zones and cultures has been discussed earlier, and this section will elaborate on the use of appropriate communication tools. Social media tools such as WhatsApp and Google+ have been the popular communication tools used by many students; however, nearly all of the popular social tools are banned in China, including all Google services (even Google Drive). One alternative is a Chinese social app called WeChat (similar to

WhatsApp), a free social media platform that supports group chats, video/audio conferencing calls, and file sharing. Thanks to an English option in the WeChat language settings, other team members quickly learned from their Chinese teammates how to use WeChat, and they formed discussion groups to coordinate the course project.

Students are presumed to have already developed teamwork skills before entering their graduate programmes; however, this was not true in every case. Some students still experienced difficulties with teamwork and complained that their teammates were not able to understand them. One extreme example was a team that refused to include the work of one student in the team's report and presentation because other team members did not believe that this student understood the work breakdown and was not able to complete the work that was expected. Eventually, the instructors had to intervene to decide how much this student had contributed to the project.

4.1.6 Course Administration

While a multi-institutional international course such as the GCP course provides a great opportunity to meet an institution's educational needs for its CM/CEM programme, it requires a considerable amount of planning and logistics. There are some common expectations for such a course, such as offering a global perspective on managing construction projects and improving skills for working as part of a multinational team. However, there are many constraints for each individual institution in designing this GCP course, the first one being differing expectations at each institution on the outcomes of the course. To address this issue, each participating institution has some flexibility to take into account any special considerations. It is impossible to create a detailed syllabus that will meet all the needs of each participating institution; as such, a basic syllabus, as earlier reported, is used for the course, with each participating institution exercising some freedom to incorporate additional topics.

Different time zones and semester schedules presented a great challenge in coordinating the time for online live conferencing of lectures. The final decision was to schedule the live lectures as the first class of the day (8:00 to 10:00 a.m.) at NCSU. Semester schedules also differ for each university and this too created a challenge when scheduling the course. Figure 1 shows a typical schedule for this course and includes lectures that will be taken together and those to be viewed separately. NCSU begins class for the Spring semester early in January, whereas the Chinese universities start their semester later. These differences are addressed as best as possible to accommodate all universities. Institutions that cannot join at start of lectures for the GCP course have the opportunity to view recordings on the Moodle website.

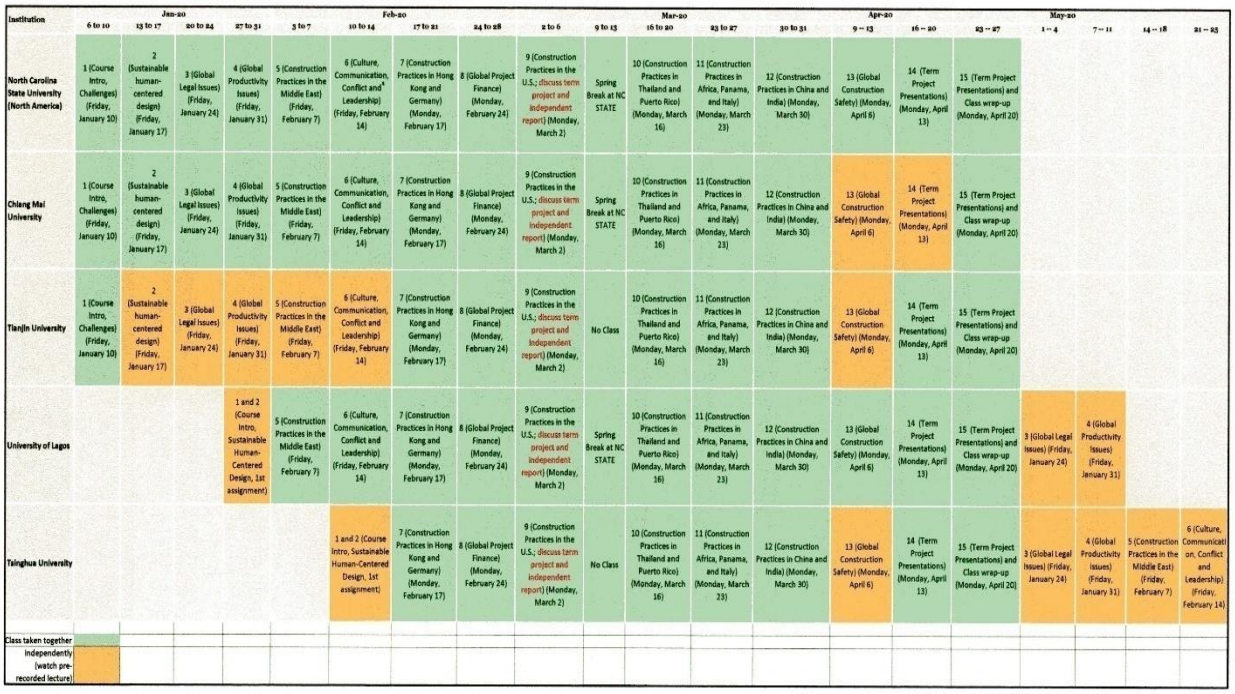


Figure 1: Typical GCP course schedule with multiple universities

5.0 Student Feedback and Perceptions: Descriptive Data, Presentation and Analysis

Table 2 shows the response rate to the questionnaire used for collection of every feedback and all perceptions of all students on the course. This is a needful step to fulfil one of the core aspects of this research.

Table 2: Student Survey Response Rate

University	Country	Enrollment (Number)	Survey Responses	Response Rate
Chiang Mai University	Thailand	10	10	100%
University of Lagos	Nigeria	13	6	46%
North Carolina State University	USA	12	5	42%
Tianjin University	China	12	10	83%
Tsinghua University	China	24	7	29%
	Total	71	38	54%

Objective One: Students' satisfaction with various aspects of the GCP Course.

Table 3 shows the assessment of students' satisfaction with various aspects of the GCP course, such as its delivery method, resources, content and benefits.

Table 3: Assessment of Student Satisfaction with Various Aspects of GCP Course

Criteria	HD	DI	NE	SA	HS	Mean Score	Rank
Cross-cultural exposure	0%	0%	18%	36%	46%	4.27	1
Working in international teams	0%	3%	15%	33%	49%	4.27	1
Course content	0%	3%	14%	34%	48%	4.24	1

Second assignment -Project II (inter-university group)	0%	3%	15%	39%	42%	4.21	4
Knowledge and experience gained	0%	3%	12%	45%	39%	4.21	4
Overall selection of lecturers	0%	3%	15%	42%	39%	4.18	6
Responsiveness of professors (tutors)	0%	0%	21%	39%	39%	4.18	6
First assignment-Project I (home country/region construction industry)	0%	3%	12%	55%	30%	4.12	8
Homework assignments	0%	0%	18%	52%	30%	4.12	8
Opportunity for interacting with others	3%	3%	24%	33%	36%	3.97	10
Understanding other people	0%	3%	33%	30%	33%	3.94	11
Lecture delivery method	3%	0%	18%	58%	21%	3.94	11
Technical support	0%	9%	27%	33%	30%	3.85	13
Learning resources on Moodle website	0%	9%	30%	33%	27%	3.79	14
Average	2%	3%	20%	40%	35%		

HD = Highly dissatisfied; DI = Dissatisfied; NE = Neutral; SA = Satisfied; HS = Highly satisfied

In rating the various aspects of the course as reflected in Table 3, students' satisfaction is highest in relation to the course content, cross-cultural exposure and ability to work in international teams. Students appreciated the high-tech level of collaboration that this course provided by offering a platform for shared understanding and cooperation among international students. They also liked being exposed to teaching faculty over and above the faculty at their own university. Equally, majority of students expressed satisfaction (either 'satisfied' or 'highly satisfied') with each item used to assess satisfaction with the GCP. An average of 75% (40 % plus 35%) expressed satisfaction with each criteria.

Objective Two: Assessment of the level of challenges of issues faced in the GCP course.

Table 4 shows the assessment of the level of challenges of issues faced in the GCP course.

Table 4: Challenges Students Encountered During the GCP Course

Criteria	No Challenge	Minor Challenge	Major Challenge	Mean Score	Rank
Language barrier	3%	57%	40%	2.24	1
Level of contact between students and faculty across universities	18%	48%	33%	2.15	2
Different time zones	30%	36%	33%	2.03	3
Different academic calendars at the different universities	10%	69%	21%	1.97	4
No physical interaction across universities	27%	55%	18%	1.91	5
Level of contact between students and faculty at the same university	33%	48%	18%	1.85	6
Average	20%	52%	27%		

Table 4 presents some of the issues faced by students during the course and the extent to which students found them challenging. Language barrier was the most critical challenge faced by many students. Comments indicate that some students had difficulty understanding some of the lecturers. One student said, "[It is] generally more difficult to communicate with 'foreign friends' due to language

differences." Another student said that their English is not very good, making the course more difficult; the student also stated that they overcame some of these difficulties by viewing the recorded lectures. The second most critical challenge involved the level of contact between students and faculty across the participating universities. Time zone differences (in some cases up to a half day) made it difficult for some students to meet with their team members on their project and to interact with faculty at universities in other parts of the world. The implication is that, even though the lectures were synchronous, students needed to be able to interact with fellow students and faculty members across universities, especially when working on the projects. On average, 20% of students perceived the issues faced during the GCP course to be of 'no challenge', 52% perceived the issues to be minor and 27% perceived the issues as posing a major challenge.

Objective Three: Perceptions of GCP Course in Light of the COVID-19 Pandemic.

As of February 14, 2020, 49,053 laboratory-confirmed cases of the COVID-19 virus and 1,381 resultant deaths had been reported globally (Harapan et al., 2020). Reactions to COVID-19 took on many dimensions across and within nations, ranging from partial or total lockdowns to bans of international travel. Economic and other phenomena, including education, became paralyzed in numerous countries, with most activities shifting to online and virtual delivery methods. With regard to students' perceptions and views regarding the GCP course in light of the COVID-19 pandemic, the participants were asked to express their level of agreement with specific declarative statements that were used as the criteria for assessment.

Table 5 shows the perceptions of the students on the GCP course in light of the COVID-19 pandemic.

Table 5: Perceptions of GCP Course in Light of the COVID-19 Pandemic

Criteria/Declarative Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean Score	Rank
COVID-19 has presented an opportunity or reinforced the need to strengthen the online delivery of the Global Construction Practices course.	0%	0%	6%	47%	47%	4.41	1
The course in its current mode of delivery should enjoy more patronage internationally if COVID-19 persists.	0%	6%	16%	45%	32%	4.03	2
The course in its current format would continue to be effective if we experienced a longer period of time away from campus.	3%	3%	13%	53%	28%	4.00	3
Real-time online lectures are the only realistic way to go in the COVID-19 era.	3%	13%	13%	44%	28%	3.81	4
The course turned out to be a coincidental unintended test run of COVID-19 lockdown lecture delivery requirements.	4%	0%	43%	39%	14%	3.81	4

The course offered a paradigm change to existing physical, national, and geographical spatial limitations.	0%	0%	47%	38%	16%	3.69	6
Course participants were already used to this lecture delivery method before the COVID-19 lockdown.	3%	13%	28%	34%	22%	3.59	7
There was no significant difference in the quality of the learning experience after COVID-19 required students to stay at home.	9%	16%	16%	28%	31%	3.56	8
Average	3%	6%	23%	41%	27%		

From Table 5, on average, 68% of the students (41% for 'agree' and 27% for 'strongly agree') expressed agreement, albeit at different levels, with declarative statements made on the GCP course with respect to the COVID-19 lockdown.

The primary implication of the findings presented in Table 5 is that, although the COVID-19 pandemic is rightly seen as a disruption in human activities, including education, the survey responses do not indicate that students saw the pandemic as a disruption to learning, but rather that the experience helped prepare them for real-life adjustments. Thus, a novel and significant feature of the GCP course is that, although it existed before COVID-19, it was able to address many of the challenges associated with the COVID-19 pandemic. The students had already been using the same lecture delivery method across various universities globally prior to the COVID-19 outbreak and lockdowns. Thus, the GCP course can be seen as an unintended innovation in distance education.

Objective Four: Assessment of Effectiveness of the GCP Course Compared to other Courses.

Students were asked to rate the effectiveness of the GCP course format compared to other courses that they have taken. Fifty percent responded that the delivery method was better, 34% did not see any difference and 5% stated that it was worse (see Table 6).

Table 6: Effectiveness of GCP Course Format Compared to Other Courses

Response	**Number**	**% Response**
Better	19	50%
Same	13	34%
Worse	2	5%
No Response	4	11%
Total	38	100%

Objective Five. Students' engagement before and after COVID-19 emergence or lockdown.

Student engagement refers to the active involvement and participation of students in activities and conditions to produce high-quality learning outcomes (Gunue & Kuzu, 2014). An examination of the GCP course indicates, in the context-level approach to engagement, the presence of learner-to-learner interaction, learner-to-tutor interaction and learner-to-content engagement. Learner-to-teacher interactions are more pronounced in

individual universities than across universities. To complement the situation of the GCP course, an additional line of inquiry was provided, via the student survey, to have students reflect on their level of engagement with the course before and after the COVID-19 emergence or the subsequent lockdown. Using the keys 1= None at all, 2 = Little extent and 3 = Large extent, students were requested to reflect on the GCP course and assess, on average, the extent to which some statements or activities or experiences are true or manifested with respect to their participation in the course **BEFORE COVID-19** emergence or lockdown and during or **'AFTER' COVID-19** emergence or lockdown. Questions, experiences and activities related to emotional or affective engagement, behavioural engagement, and cognitive engagement with the responses are reflected in Tables 7. Meanwhile, it should be noted that before COVID-19, each participating university was physically in one location but connected with other universities online synchronously for lectures. After the lockdown, however, there was perfect online connection where each student could join the lecture from any location. This is the main difference between the lecture delivery mode, pre- and post-COVID-19.

Table 7: Extent or Level of Student Engagement before and after COVID-19 Emergence or Lockdown

Questions, statements or activities or experiences related to specific type of student engagement	**None at all**	**Little Extent**	**Great Extent**	**Total**
I. Questions, statements or activities or experiences related to "Emotional or affective engagement" – student's feelings and emotions				
I looked forward to the lectures with enthusiasm				
Before COVID-19	0.0%	44.8%	55.2%	100%
After COVID-19	6.7%	43.3%	50.0%	100%
I felt satisfaction attending the lectures				
Before COVID-19	3.7%	18.5%	77.8%	100%
After COVID-19	3.6%	32.1%	64.3%	100%
The course held my interest even when working or studying alone outside of class				
Before COVID-19	3.2%	48.4%	48.4%	100%
After COVID-19	3.2%	41.9%	54.8%	100%
I felt that the instructors/tutors respected the views of the students				
Before COVID-19	3.2%	32.3%	64.5%	100%
After COVID-19	6.7%	13.3%	80.0%	100%
II. Questions, statements or activities or experiences related to "behavioral engagement" – student's efforts towards learning and the learning process				
I arrived or joined the class early				

Before COVID-19	12.9%	45.2%	41.9%	100%
After COVID-19	13.3%	33.3%	53.3%	100%
I demonstrated alertness during lectures				
Before COVID-19	3.2%	51.6%	45.2%	100%
After COVID-19	3.3%	46.7%	50.0%	100%
I took notes and asked questions during or after the lectures				
Before COVID-19	10.0%	50.0%	40.0%	100%
After COVID-19	10.0%	46.7%	43.3%	100%
I worked hard and completed my part of assignments and turned my portion in on time				
Before COVID-19	3.2%	22.6%	74.2%	100%
After COVID-19	3.3%	16.7%	80.0%	100%
III. Questions, statements or activities or experiences related to "cognitive engagement" – expression of student's concentration, exploring, going the extra mile, or efforts invested in the learning process related to cognitive engagement				
I made insightful comments, pulling information from previous lectures or materials				
Before COVID-19	16.1%	38.7%	45.2%	100%
After COVID-19	13.3%	40.0%	46.7%	100%
I visited and used the resources available on the Moodle website				
Before COVID-19	22.6%	35.5%	41.9%	100%
After COVID-19	20.0%	33.3%	33.3%	100%
I used additional social media platforms to communicate with other students for group assignments				
Before COVID-19	3.3%	53.3%	46.7%	100%
After COVID-19	3.3%	26.7%	70.0%	100%

Table 7 reflects responses pertaining to the various types of engagement addressed in the survey. With respect to emotional or affective engagement, and based on percentage response, it appears that there was a slight drop in enthusiasm for attending the lectures after the emergence of COVID-19 or the subsequent lockdown. It is interesting to note that students felt that the instructors respected the views of the students even more after the lockdown. Students' level of behavioural engagement appeared to increase after the COVID-19 lockdown as 53% said they arrived or joined the class early compared to 42% prior (see Table 6). There was an indication that students showed more alertness in class after the lockdown. Under cognitive engagement, as shown in Table 6, students showed a greater extent of visiting the Moodle website after the lockdown and also used additional social media platforms to communicate with other students for group assignments.

Overall, majority of the students - in the 'Little extent' and 'Great extent' categories - express a positive level or occurrence of student engagement across the statements and experiences. Clearly promoting student engagement and achievement of learning outcomes were looking forward to the classes with enthusiasm, having a question-and-answer session after each class, having the students get involved in Project I and II as a way to foster teamwork and learning processes, and having access to the NCSU Moodle website for pre-recorded lectures, among many more factors. Overall, the feedback from the student survey, in addition to the case study, adds value in the sense that perceptions, whether right or wrong, have the power to affect customer preference, patronage and market behavior (Weaver, 1981; Lutz et al., 2013). Specifically, West et al. (2022) reported and concurred with other authors on the critical role of students' perceptions in sustaining online enrolment.

6.0 Inferential Statistical Analysis

While the sixth offering of the GCP course is one case study, the case has sub-units in it. The students that responded to the survey instrument form part of the sub-units. Their responses were subjected to inferential statistical analysis, using the Statistical Package for Social Sciences Version 25, which has capacity for analyzing and approximating small samples (Kinnear & Gray, 2007). The results of the inferential analysis could be used – and was used – for analytical generalization only (not statistical generalization) and for theory building, but limited to the context of the case only. The analytical generalization runs in the direction that if the conditions of the 2020 offering are met, certain results will ensue. The analytical generalization is limited by the context. In this study, a null hypothesis with the corresponding alternative hypothesis was set up thus:

Null Hypothesis: There are no significant differences among the participating universities regarding their students' perceptions of the GCP course in light of the COVID-19 pandemic.

Alternative Hypothesis: There are significant differences among the participating universities regarding their students' perceptions of the GCP course in light of the COVID-19 pandemic.

One inferential statistical analysis was done to test the null hypothesis. Table 8 shows the ANOVA test of differences results among the universities on selected aspects or issues of the GCP Course in light of the COVID-19 pandemic.

Table 8: ANOVA test of differences results for selected aspects of GCP course in light of the COVID-19 pandemic among universities

Variable or Issue		Sum of Squares	Df	Mean Square	F	Sig.
There is no difference in learning experience before and after lockdown.	Between Groups	6.185	4	1.546	.840	.512
	Within Groups	49.690	27	1.840		
	Total	55.875	31			
Real-time mode of teaching is the only way to go in COVID era.	Between Groups	5.713	4	1.428	1.238	.319
	Within Groups	31.162	27	1.154		
	Total	36.875	31			
Current teaching format is effective if lockdown is extended.	Between Groups	2.310	4	.577	.658	.626
	Within Groups	23.690	27	.877		
	Total	26.000	31			
The course offered a paradigm change to existing physical, national, and geographical spatial limitations.	Between Groups	.113	4	.028	.046	.996
	Within Groups	16.762	27	.621		
	Total	16.875	31			
Current mode of course delivery will allow additional patronage of GCP course if COVID persists.	Between Groups	5.139	4	1.285	1.874	.145
	Within Groups	17.829	26	.686		
	Total	22.968	30			

Course participants were already used to the lecture delivery method before COVID-19 lockdown.	Between Groups	16.773	4	4.193	5.976	.001
	Within Groups	18.946	27	.702		
	Total	35.719	31			
The GCP course is an unintended test run of COVID-era lecture delivery requirements.	Between Groups	3.624	4	.906	1.271	.306
	Within Groups	19.251	27	.713		
	Total	22.875	31			
COVID presents the opportunity to strengthen online delivery of GCP course.	Between Groups	1.457	4	.364	.958	.446
	Within Groups	10.262	27	.380		
	Total	11.719	31			

Df = Degrees of freedom; Sig. = Significance

The results in Table 8 indicate that except for the statements 'Course participants were already used to the lecture delivery method before COVID-19 lockdown' and 'The course offered a paradigm change to existing physical, national, and geographical spatial limitations', where the p-values are less than 0.05, there are no significant differences among (students of the) participating universities on their perceptions of the GCP course in light of the COVID-19 pandemic on all the variables used or statements used. This implies that except in those two statements all the participating universities see all others in practically the same way. There are significant differences among the universities on the two variables/statements used. This warrants further examination. These perceptions can help in further improvement or decisions on the course, as perceptions can affect decision and market behaviour (Weaver, 1981).

6.1 Other Findings: Faculty Feedback through Interactions and Self-Reports

The course faculty from various universities meet for planning for the course for the semester. After each class, students and faculty freely comment on the presentation and ask questions. The faculty have a feel of each presentation and critique and mentor the students. At the end of the course, the faculty equally engage in course review and interactions, in addition to giving self-reports. The interaction and self-reports cover their assessment of resources and peculiar situations and feedbacks, suggesting areas of possible course enhancements. Among others, what was reported as challenges include Internet connectivity in some institutions, timetable and calendar schedule synchronization and initial communication problems among students, all of which issues were later resolved.

6.2 Lessons Learned and Areas for Improvement

The lessons learnt from hosting the GCP online synchronous course include:

a) The possibility of hosting a multi-university synchronous online course despite challenges that include language, culture, and technology (hardware, software and connectivity) issues, among others. Efforts were made to address the challenges, with students expressing satisfaction overall and displaying enthusiasm and a high level of engagement.
b) Despite the fact that there were no physical contacts and interactions among students across the universities, students nevertheless looked forward to the synchronous online learning classes with enthusiasm. Even though virtual, opportunity for collaboration among students across the universities, use of faculty from both industry and academia from across various regions of the world, fora for questions and answers after each class, access to archived and pre-recorded lectures, and many others, presented opportunities for increased student engagement, leading to improved learning outcomes.
c) Entertaining questions after every class further promotes collaboration, interest and engagement; the intra-university and inter-university team assignments enrich understanding and foster the development of collaboration skills for real-life international projects. Project II mimics real-life international project situations and challenges.
d) Having access to reading materials on the Moodle website, alongside past lectures, give the

students an array of resources that they can consult at their own time and convenience. Additionally, organizing of language classes for students whose language of instruction is not English helps the students and also prepares them for the real world of international projects.

e) The faculty across the universities meet virtually before the start of the course to prepare and synchronize and review the timetable and course calendar, test the readiness of the technology platform for the online lectures, and discuss the curriculum while allowing each university to add local contexts. Exposure to international construction projects and their management over and above local contexts is a major attraction for the students. The pre-course meeting and test-running of equipment with course feedback by faculty further help in addressing areas of challenges. The faculty for the course become a pool of internationally interconnected partners that can collaborate on future research and industry improvement efforts on international construction project management. Meanwhile, a course of this nature requires both technical and human coordination from the coordinating institution.
f) There are considerable richness and variety for students, just as there is significant potential of the use of digital platforms to offer courses, especially in construction management. The fact that five universities can join the sixth offering suggests that, with technology, more students can join. This opens a vista of possibilities for such courses in the future. The technology platforms and connectivity remain a major backbone to implementing a course of this nature.
g) From students' responses to the survey, the online lecture platform was perceived to be an unintended but useful response to challenges of physical lecture delivery as a result of the COVID-19 emergence. With or without such experiences as COVID-19, the lecture method was perceived to still hold a promise for the future.

Overall, the format (method and content) of the GCP course displayed elements of evidence-based educational practice. Real-time feedback, which Hattie and Timperly (2007) suggested can improve students learning outcomes, is provided through the question-and-answer sessions. At the end of every lecture, students ask questions and share perspectives while looking forward to the next class with eagerness. In short, discussions and interactions, question-and-answer sessions, involvement in Projects I & II, use of digital tools, including access to pre-recorded materials, and mimicking real-life international project teams through Project II are among GCP course strategies for enhancing student engagement. From the tutor perspective, evidence-based educational practices involving the use of teaching methods that have been proven to improve students' learning outcomes, e.g., question-and-answer sessions after lectures, real-time feedback from tutors to students especially after presentation of Project I and Project II, and active learning, etc. are used in the GCP course.

7.0 Summary, Conclusions and Recommendations

This paper describes a unique global online learning environment that prepares CEM graduate students to meet the demands and expectations of the international construction industry. A case study of the GCP course offering, complemented with a survey of students who experienced the sixth offering of the GCP course (during which the COVID-19 pandemic emerged), identified and reinforced the advantages and potential of the course as well as areas for improvement. The majority of students expressed satisfaction with various aspects and issues with the GCP course. Students perceived the format employed to deliver the course to be an unintended innovation and a good preparation for COVID 19-era challenges and possibly beyond.

Feedback from faculty members who taught the GCP course during the 2020 offering indicates that having to consider different time zones and semester schedules presented the greatest challenges in terms of coordinating times for the live online lectures. Both faculty members and students remarked that lecture delivery could be improved by providing more stable Internet connectivity. Furthermore, participants noted that allowing additional time for the Project II presentations would be beneficial. Due to differences in learning cultures, students in

multinational teams took some time to adjust to collaboration in a team setting. In addition, some technical issues arose when setting up online conferencing systems and finding proper online communication tools for team collaboration, thus requiring the help of technical support staff from all the participating universities. Efforts were made to address all identified challenges.

The challenges associated with a format such as the GCP course need to be investigated further to overcome the problems and optimize the advantages and possibilities of teaching/learning in various global settings. The three topmost challenges identified in this study are language barrier, the near non-existent level of contact between students and faculty across the universities, and the scheduling inconveniences caused by the difference in time zones. However, the least critical to the students is the level of contact between students and faculty at the same university.

The COVID-19 pandemic also presented the opportunity to strengthen the already established online delivery format of the GCP course. The GCP course has a novel dimension in that, notwithstanding the COVID-19 pandemic outbreak, the lecture delivery method departs from the usual online asynchronous distance learning method, where students learn at their own pace. The GCP course incorporates cyber hardware and software with real-time interactions among students and faculty during lecture delivery across the participating institutions. Consequently, with or without such occurrences as COVID-19, the GCP course presents a case of the possibilities and potential for synchronous online delivery of international construction management education across universities from various regions of the world.

The lessons gleaned from the sixth offering of the GCP course can be applied to future offerings to include several enhancements such as (1) allowing greater independence with regard to where students take the course, i.e., in a classroom setting or independently, (2) facilitating student communication and networking capabilities using social media platforms such as Piazza or WeChat, (3) expanding the use of information and communications technology to incorporate cutting-edge advancements (e.g., live virtual construction site tours in different countries) to provide a richer and more engaging experience for students, and (4) seeking sponsorship (e.g., from the World Bank or any funding agency) for Project II in order to make the experience more realistic and practical for students.

7.1 Implications and Limitations

While the approach used in this research involves a case study boosted with a survey, the researchers also provided descriptive and inferential statistical analyses. The research got in-depth information for lessons learned while studying the GCP case in detail complimented with the use of descriptive statistics. The inferential statistics used on the sub-unit of the case study helped in analytical (but not statistical) generalizations that apply in the context of the case study only. The implications of the research include the possibility, through technology platforms, of improving access to graduate education and optimisation of the use of minimal physical classroom spaces. It may also have the implication that investment in digital technology platforms may continue to overcome the constraints posed by the inadequacy of physical infrastructure. The GCP case study also brought to the fore the possibility of bringing together students and faculty from various parts of the world in online synchronous lectures. This implies the continued possibility of synchronous knowledge sharing through technology platforms.

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