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The Role of Reflective Practice during Emergency Online Teaching: Experiences from a Computer Science Course

Tulimevava Kaunaoawa Mufeti
University of Namibia

ABSTRACT

The global spread of the COVID-19 pandemic posed unprecedented challenges to higher education institutions worldwide. As governments announced lockdown measures that placed restrictions and mandatory closures on establishments that traditionally required gatherings, universities worldwide cancelled face-to-face classes and adapted their mode of offering to online teaching and learning. Using an interpretive study based on a single case, this paper presents the author's most profound experiences with online teaching and learning of the Data Structures and Algorithms course at the University of Namibia (UNAM). Throughout the teaching of this course, the author kept an up-to-date reflective practice journal, and required her students to engage in reflective practice. The author also had an opportunity to engage and discuss her experiences with other lecturers in the School of Computing. The paper therefore presents a narrative of reflections on the meaning of teaching and learning as adapted to emergency online teaching during the COVID-19 pandemic. Findings suggest that reflective practice during emergency online teaching presents an opportunity for educators to experiment with new delivery approaches, as well as to monitor how their interventions can impact the achievement of learning outcomes.

Keywords: *Reflective Practice; Emergency Online Teaching; online learning framework; reflective journal*

INTRODUCTION

The global spread of the COVID-19 pandemic posed unprecedented challenges to higher education institutions worldwide. As governments announced lockdown measures and stay-at-home orders that placed restrictions on movement and enforced mandatory closures of establishments, universities worldwide cancelled face-to-face classes (Hodges, Moore, Lockee, Trust, & Bond, 2020). With the uncertainty and fear of prolonged closures, tertiary education institutions quickly improvised and adapted to the 'new normal' by ordering academic staff to guarantee continuity of teaching and learning activities (Mohmmed, Khidhir, Nazeer, & Vijayan, 2020). This was done to preserve academic year calendars while at the same time, ensuring that students' progression to the next level was not negatively affected. Consequently, many educational institutions quickly transitioned to online learning during the COVID-19 pandemic.

The potential benefits of online teaching and learning are well-documented in the academic literature. Dubbed as "anywhere, anytime" learning (Rubens, Kaplan, & Okamoto, 2012; Bourne, Harris, & Mayadas, 2005), there are several examples demonstrating how technology was useful in emergency situations where academics and their students were not able to meet face-to-face (Czerniewicz, Trotter, & Haupt, 2019). There seems to be no doubt, therefore, on the ability of online learning to provide flexible access for teaching and learning delivery purposes (Brenton, 2009; Kaif, Mujtaba, & Williams, 2009). It is because of this flexibility in time, distance, and space, that online learning was recommended as the preferred form of learning at various educational institutions during the COVID-19 lockdown periods.

The ongoing disagreement, however, seems to be on whether it is the technology or the design of instruction that facilitates learning in an online environment (Ally, 2004). Ally (2004) maintained that the delivery medium is not a determining factor of success in online learning, but rather the quality of the course design. Hodges, Moore, Lockee, Trust, & Bond (2020) support this view, asserting that effective online learning results from a process of careful design and planning that uses a systematic model for design and development of the instructional materials. Other studies, however, seem to suggest that students' learning interests, as well as participation in online learning, are dependent on the technological solution used for delivery (Handayanto, Supandi, & Ariyanto, 2018). The unexpected transition to online learning during the lockdowns seems to be predicated on the availability of technology. However, having a functional Learning Management System and supporting technologies alone is not sufficient to guarantee effective online learning. On the other hand, a well-designed course with no enabling delivery environment will prohibit its users from participating and engaging fully in the course. In sum, then, both the delivery medium and an instructionally designed course are essential to guarantee effective learning in an online environment.

Namibia reported its first COVID-19 case in March 2020. A few days later, the President declared a state of emergency and a phased lockdown period that introduced measures aimed at curbing the spread of the pandemic in Namibia. This included the lockdown of higher educational institutions for a period of 20 days, with a clause giving the prerogative to the Minister responsible for Higher Education to extend the timeline. After the lockdown period was further extended, the University of Namibia (UNAM) issued guidelines compelling resumption of all teaching and learning activities on its official Learning Management System (LMS), Moodle. Initially, the online learning period was only for a temporary period, with the expectation that face-to-face sessions would resume towards the end of the semester to enable completion of practical work and the writing of exams. By the end of the academic semester however, academic institutions in Namibia were still in lockdown, and further guidelines were issued on how the learning and teaching activities for the semester should be concluded online.

The author of this paper was a lecturer in the School of Computing at the University of Namibia. The paper presents a narrative of personal reflections on teaching and learning in the Data Structures and Algorithms (DSA) course, as adapted to emergency online teaching during the COVID-19 pandemic. For this reason, the study is an interpretive study, based on a single case study. The rest of the paper is structured as follows: the Literature Review which reviews the main concepts related to the theory of online learning and online emergency teaching as well as the use of reflective practice; a discussion on e-learning at UNAM; the empirical evidence of the implementation of the DSA course and the author's experiences in teaching the course during the lockdown period. The paper then highlights the themes and common elements that emerged from reflective practice during emergency online teaching.

LITERATURE REVIEW

Online learning

Although very popular in academia, the concept of Online Learning has a variety of definitions, approaches, and central concepts in literature. Ally (2004) has identified other terms commonly used to refer to online learning, including e-learning, web-based learning, Internet learning, distance learning, networked learning, computer assisted learning, tele-learning, and distributed learning. The diversity in the terms seems to be based on the focus or mode of the learning initiative (e.g., computer-based learning could exclude Internet, web-based learning implies the use of browser, Internet learning implies connection to the Internet as opposed to computer-based training). Regardless of the term adopted, however, Ally (2004) has observed that at their core, all these terms implicitly assume the following: (1) the use of some form of technology (usually a computer) to develop and access the learning materials; (2) interaction and engagement with the content, a

facilitator and other learners; (3) support provided during the learning process; (4) acquisition of knowledge, construction of personal meaning and development of the learning experience. Apart from these, however, researchers seem to agree that effective online teaching is characterized by a systematic instructional planning and design process.

Emergency Remote Teaching

Some researchers have argued that the transition to online learning during the COVID-19 pandemic should not be considered as e-learning. In coining the term "emergency remote teaching" (ERT), Hodges, Moore, Lockee, Trust, & Bond, (2020) considered the circumstances and speed with which institutions had to adopt technology-enabled learning. Bozkurt & Sharma (2020) also emphasized that the use of technology during the pandemic presented a temporary solution to the problem that emerged, resulting in the shift of delivery mode. The primary aim of ERT was to provide access to learning content and support continuous learning, rather than providing a robust learning experience during an emergency or a crisis. Furthermore, Hodges, Moore, Lockee, Trust, & Bond, (2020) argued that in emergency remote teaching experienced during the COVID-19 pandemic, the transition to online academics was too swift to afford academics an opportunity to consider the "affordances and possibilities" of online learning.

Several challenges experienced with the implementation of ERT during the COVID-19 crisis are reported in the literature. A study conducted in the Middle East College in Oman, for example, reported how the college transformed its curriculum and build its staff capacity to operate in an online environment, prior to ERT (Mohammed, Khidhir, Nazeer, & Vijayan, 2020). Cognizant of students' challenges in access to technology, the college opted not to create a fixed schedule for synchronous sessions, except in cases where there was prior confirmation of intended attendance by students. Despite their preparedness however, the college still experienced the following challenges: (1) redesigning of content in a short time proved to be a challenging task; (2) students and faculty found it difficult to adapt to the new teaching and learning environment; (3) the online platform did not provide the nuances of face-to-face sessions; (4) students in remote areas of the country had challenges accessing the content.

Regardless of whether it is referred to as online learning or ERT, there seems to be consensus that the role of the instructor when teaching online should be different from traditional face-to-face learning. While the main aim of an instructor/teacher in both online and face-to-face environments remains to facilitate student learning, online facilitation seems to demand much more than face-to-face environments. Ramsden (1992) stipulated that effective teaching is predicated on understanding how students learn. Effective online teaching, therefore, needs to take into consideration those factors that make online learning possible. Table 1 below summarizes the different roles that can be assumed by an online teacher (Brenton, 2009). Although not all courses may need unique individuals to assume these roles, it is important to recognize the different functions necessary in an e-learning intensive course.

Table 1: *Roles of a teacher in e-learning (adapted from (Brenton, 2009)).*

Title	Description
Lecturer	Works with a learning technology professional to produce suitable online content
E-moderator	Responsible for daily upkeep of the course's discussion forum, stimulates discussion, and run learning activities based on the lecture material and reading
Group Facilitator	works with small groups of students on set collaborative activities
Technical/administrator	answers practical queries about the technology or course
Assessor	Assesses/marks students work
Academic guests	provides specialist information on a specific topic

Online Learning and ERT in Africa

Prior to the shutdowns necessitated by COVID-19, a controversial issue had been whether countries in Sub-Saharan Africa (SSA) are ready to deliver their programs via online platforms. On the one hand, some argued that universities in SSA did not have the access to online teaching and learning platforms, neither did they have the required competencies to deliver effective remote teaching or facilitate online learning (World Bank, 2020). In addition, the delivery over synchronous videoconferencing and online platforms as experienced during an emergency provides low quality teaching (Hodges, Moore, Lockee, Trust, & Bond, 2020), because of the limitation on collaboration and innovation in the teaching process (World Bank, 2020). This was also because interventions planned for face-to-face sessions were not always possible for online delivery. The World Bank (2020), for example, reported that some courses that initially required students to participate in laboratory experiments were delivered without this component. On the other hand, researchers have argued that the digital divide and the inequities are not only between societies or different regions of the world but can also be observed within societies. According to this view, generalizing the inequity problem to a region such as SSA is not realistic, as major differences in equity and access were visible even between individuals in "well digitized" societies.

Proponents of online education have long argued that its feasibility is based not only on the capabilities of the institution, but also on the learners' needs and their technology status (Kaif, Mujtaba, & Williams, 2009). This view was also emphasized by Howley (2020), who argued that the instructors' role during emergency remote learning is to continue to support learning for all students, regardless of their learning contexts. Howley (2020) further argued that mere conversions of face to face instruction into video lectures only fades existing social connections and reduces students' cognitive engagement. In a study carried out during prolonged student protests in South Africa, Czerniewicz, Trotter, & Haupt, (2019) reported that although technology-enhanced learning enabled institutions to overcome classroom disruptions, it created even more profound forms of digital exclusion for those that previously did not have access to resources. Apart from access to devices and connectivity, as well as the digital and Internet literacy required to access these devices, the "capability" to participate and engage in self-directed learning is more often tacitly assumed or blatantly ignored, when implementing online learning (Adam, 2020). Institutions that opted for ERT needed therefore to be cognizant of the fact that access to technology and devices, as well as having well-designed and organized content alone are not sufficient; students could ultimately be unable to participate in self-directed learning, a key characteristic of online learning.

CONCEPTUAL FRAMEWORK

The discussion and assessment of the implementation of ERT in this paper is based on an Online Learning Conceptual framework, proposed by Anderson (2004). According to this framework, four central themes are essential for online learning to be effective: learner-centred, knowledge-centred, assessment-centred, and community centred. This section briefly discusses these themes.

Learner-centred approach

Research has shown that students' previous experiences, thoughts, actions and eventual learning are affected by the educational context in which they learn (Ramsden, 1992). In a learner-centred approach, the focus is on the learner rather than the teacher; and on the learning process and how teaching can enable the learning process. It recognizes that every learner brings unique experiences to the learning situation. The learner-centred approach therefore considers learners' pre-existing knowledge, skills, and the learning context (Anderson, 2004). It attempts not only to understand, but also to accommodate the learners' development needs.

One important component of the learner-centred approach widely discussed in the literature is learning styles and individual learner profiles. Researchers seem to agree that individual students have different learning styles, which determine how they approach learning tasks (Cercone, 2008). A learner-centred approach acknowledges the differences and multiplicity of learning styles and caters to the needs of these styles.

Knowledge-centred approach

Knowledge is central to the learning process. The primary responsibility for provide resources and opportunities to learn knowledge structures within the disciplines lies with the instructor (Anderson, 2004). Anderson (2004) also argued that resources alone are not sufficient; the instructor also needs to facilitate learning by providing opportunities for students to learn, reflect and develop new knowledge structures within their disciplines. This view was also presented by Cohen, Raudenbush, & Ball, (2003) who argued that having knowledge is only useful when teachers use it to frame tasks that demand student engagement. They therefore suggested that in addition to focusing on knowledge and how it affects learning, coherent systems must also consider that the value of resources is dependent on how it is activated and harnessed within the usage context, which often results in knowledge adjustments. The knowledge-centred approach therefore emphasizes the relationship that exists between the content and its context of use by the stakeholders.

Assessment-centred approach

Assessment is a process intended to determine whether the learners or students have attained the required competencies in the course. As observed by Moon (2004), assessors want evidence that the learning has taken place, and that the learner is able to express it by fulfilling the set task, such as a written response in an examination. Further, Moon argued that the learner's 'expression or a representation' needs to demonstrate either the quantity or quality of learning that is taking place, as demonstrated in both formative, continuous evaluation, as well as peer and self-evaluation activities incorporated in a course.

Ramsden (1992) asserted that assessment should not only be seen as a process of awarding marks to students. According to Feldman & Marshall, (2020) leaving grading to the instructor alone rests the determination of students' performance in a single authority, which serves to undermine equity and maintains gaps in academic opportunity. Anderson (2004) earlier suggested that an assessment-centred approach must give opportunities to the instructor, peers and can also include machine learning algorithms used to enable reflective assessment of learning. Giving many grading options and assigning the authority of judgement to different people has a potential to eliminate the perceived bias.

Furthermore, there seems to be consensus that students' performance in a course can change if they know what constitutes success. Feldman & Marshall (2020) therefore suggested that instructors must normalize and publicize the grading rubrics and proficiency scales to enable students to understand the performance expectations. Quintana & Quintana (2020) also demonstrated that making the course expectations known from the onset causes less confusion and makes the expectation more explicit for students, thereby improving student's submissions. Also, giving the opportunity to students to revise the work without penalty enabled students to develop higher quality products that met expectations, while alleviating anxiety associated with efforts to meet exit learning outcomes. In designing assessment activities therefore, instructors should put more focus on ensuring that students meet the learning outcomes, rather than punishing them for 'unmet expectations' which can lead to student anxiety. Taking a reflective approach to assessments will further enable instructors and can turn their research findings into actions that can influence the quality of students' learning experience (Quintana & Quintana, 2020).

Community-centred approach

Learning theorists, Vygotsky and Dewey, have long believed that learners do not learn in isolation from others. Learners need interaction with content (e.g., lecture materials prepared by the teachers, books, or freely available learning content on the web), with other people (e.g., other students and the teacher), and/or with other environments such as apprenticeships (Cohen, Raudenbush, & Ball, 2003). A community-centred approach acknowledges that learning comprises members of a social community that support and challenge each other in constructing knowledge relevant to the community (Anderson, 2004). Students who sense that they are part of a learning community are reported to do better, especially in online courses, than those who do not. According to Shea (2006), several factors can improve a community-centred approach to learning: (1) an active presence of the instructor; (2) the instructor's effort to draw in participants; (3) creation of a conducive learning environment; (4) keeping students on track, and (5) addressing student misperceptions and helping them resolve disagreements. The instructor therefore has a role to play in ensuring that a community-centred approach is fostered in online learning.

Using a Portfolio for reflective practice

Reflective practice has been described in the literature as an active engagement in meaning making (Clegg, 2000). Its purpose is to improve the quality of professional performance (Osterman & Kottkamp, 1993). It was first proposed by Donald Schön (1983), who described what he called '*knowing-in-action'* and '*reflection-in-action*.' He observed that practitioners encounter repetitive and routine situations over time, which causes them to become extremely good in their trade (a phenomena he called 'professional specialization'). After attaining professional specialization, the practitioner develops a 'repertoire of expectations and techniques and his actions in the trade become increasingly 'tacit, spontaneous, and automatic' and 'less subject to surprise'. Schon also observed that professional specialization has many benefits, but it can lead to a 'parochial narrowness of vision'. In this narrowness of vision, the professional specialist only chooses to focus on categories that fit the established repertoire, while missing 'important opportunities to think about' daily actions. According to Schon (1983), the only way to deconstruct what the practitioner has overlearned, in this case, is through 'reflection-in-action' by becoming a researcher in the practice context.

Osterman & Kottkamp (1993) argued that reflective practice enables practitioners to 'develop a greater level of self-awareness about the nature and impact of their performance', which 'creates opportunities for professional growth and development'. For this to happen, they likened the role of a practitioner to that of a person that needs to operate in two realms at the same time: being an actor in the drama, while being a critical observer who analyses the performance at the same time. In other words, they are simultaneously a participant (part of the action), and an observer (away from the action). Critically observing one's own action requires taking a conscious decision to reflect on the actions, which is not easy. However, Osterman & Kottkamp (1993) argued that this can be developed through experiential learning.

Knowing when, how or what to reflect upon is not always a clear-cut process. In addition to Schon's reflection-in-action, Boud (2001) proposed that reflection could also happen during two other stages: in anticipation of events, and as post-mortem after the pressure of acting has passed. Regardless of what and when to engage in reflective process, Osterman & Kottkamp (1993) proposed four stages that can be used to achieve critical awareness required in reflective practice: (1) concrete experience, where we develop an awareness of a problem; (2) observation and analysis, where the practitioner steps back from the experience, 'assuming a more detached stance, and stepping outside the action to observe it critically and to describe it fully' (3) abstract reconceptualization, where the practitioner considers new ideas and strategies that could be applied to solve the problem; and (4) active experimentation.

The issue of bias and objectivity in reflection has also received attention in the literature. Larrivee, (2000) contended that an individual's response in a situation is usually affected by a multiplicity of factors: past experiences, beliefs, assumptions, expectations, feelings, moods, personal agendas, and even future aspirations. Therefore, the view, understanding, analysis and evaluation of processes and activities in a situation are not always objective. Furthermore, reflection could also be used as a tool for rationalization and justification of past actions (Dimova & Loughran, 2009). In some cases, they reveal the power dynamics at play (McGarr & Gallchóir, 2020), for example when students' reflections only account for positive experiences as expected by their assessors (Newcomb, Burton, & Edwards, 2018). If we want reflective practice to genuinely contribute to improving practice, it ought to be used only as a tool for self-interrogation and self-improvement (McGarr & Gallchóir, 2020) in practice.

Although widely criticized, reflective practice is also widely used to enhance teaching and learning in higher education institutions. Norton & Campbell (2007) argued that the demands and pressures of being an academic requires action research and practitioner inquiry to be developed through reflective practice. Ramsden (1992) also earlier affirmed that a good teacher continually strives to understand the students, the context of learning, and improves their assessment and teaching strategies accordingly. Thus, teachers can reflect in anticipation of learning by, for example, reflecting on what they want their students to learn and why they want them to learn it. Teachers who reflect on their actions not only improve their professional practice but also develop better self-knowledge and understanding.

E-LEARNING AT UNAM

The evidence of e-learning activities at the University of Namibia dates back to 2002. Shalyefu (2002) reported on a Human Resource Development Project (HRDP) funded by the African Development Bank to build capacity in Information and Communication Technologies (ICTs) and Instructional Design through e-learning. In the HRDP project, e-learning was defined in the context of any form of delivery of content using or mediated by Information and Communication Technologies, whether for learning, instruction, training, information or knowledge sharing (Shalyefu, 2002). Initially, online learning complemented face-to-face teaching and enabled blended learning for on-campus students (Mufeti, 2005). More recently, however, UNAM created a fully-fledged centre, the Centre for Open, Distance and e-Learning (CODeL) to promote the implementation and development of open, distance and e-learning at UNAM (CODeL, 2020). To date, the centre has supported over 6000 distance and online students (CODeL, 2020), and has adopted Moodle as its Learning Management System for all its learning programmes.

In addition to the standard Moodle features, the UNAM LMS also has add-on software plugins and features that enable it to offer value added services to its academic community. The Urkund anti-plagiarism software, for example, is integrated into Moodle to detect plagiarized work and enhance the quality of work submitted by the students. In addition, the LMS also offers the CodeRunner plugin, which provides software compilers for several programming languages such as Python and Java, to enable lecturers to run software programs when grading student answers. This is especially useful for the Computing community at UNAM. The LMS also has a Panopto lecture capture software plugin, which enables lecturers to record and edit searchable classroom videos in the comfort of their homes or offices. This is in addition to a fully dedicated lecture recording studio facility that is available on campus. Mässing (2017) reported that by the end of 2017, the available technology was not capable of supporting the entire University community to go fully online with its courses. However, the technology and systems available at UNAM by January 2020 were state-of-the-art, and able to support the full offering of online classes to its entire academic community. As listed on its website, CODeL offers a set of training programmes to its academic community. The key functions with regard to e-learning are: (1) to implement technology-enhanced learning across the University; (2) to guide staff in planning, designing, and delivering technology-enhanced

courses; (3) to support staff in developing their e-learning skills; and (4) to train lecturers in the use of blended learning approaches such as Flipped Classroom using digital tools. CODeL has thus issued several calls for training since the first semester of 2019. The training has focused on the following areas: Course Design, Assessment, Moodle, Panopto, Urkund, Zoom and Online Facilitation. Since integration of e-learning or blended learning into courses offered to full-time on-campus students were not mandatory, not all lecturers took advantage of these training opportunities. As a result, not all lecturers were fully conversant with the e-learning technologies available at UNAM prior to ERT.

RESEARCH SETTING

This research uses the implementation of the Data Structures and Algorithms (DSA) course, a third year Computer Science course in the School of Computing at UNAM, as a single case study in the year 2020. After completing the course, students should have been able to design, implement, and analyse algorithms for solving computational problems that frequently arise in practical applications. Students learn how to use and implement common data structures, and practice implementing them by solving specified problems in a programming language of their choice. The DSA course consists of 14 different topics, usually covered over a period of 13 weeks. In addition, students write a minimum of two tests and two assignments. Course meetings consist of four lecture hours and three practical hours per week. Prior to ERT directives, only five of the 14 topics were covered, and assessments only covered one assignment and one test. UNAM required academics to provide a schedule of how the remainder of course topics would be covered during ERT. This requirement enabled lecturers to plan and sequence teaching and assessment activities in advance. For the DSA, the initial plan was recording four hours of lectures per week, and a guided three-hour practical session on the LMS using Panopto.

However, it is important to note that the DSA is one of the three courses that the author was responsible for, during the lockdown period. This was in addition to other academic and administrative obligations, which too, had their own demands. In addition to teaching and facilitating learning, most academics also have a multiplicity of roles in their institutions including research, student project supervision, administration, management, and community services (Ramsden, 1992). The role of an academic at home should also not be ignored in ERT, because the stay-at-home expectation was for the academic to perform all their institutional duties from home. Individual academics thus had to balance their time and navigate their multiple roles within a different working context.
Having received training in e-learning and served as the first Coordinator of e-learning at UNAM, the author is well versed in e-learning and considers herself as technology-savvy. The transition to emergency remote online learning however served as a challenge in the teaching of her courses, particularly the Data Structures and Algorithms course of the third year in the Bachelor of Computer Science program. As a result, she opted to keep an up-to-date reflective practice journal of her work as an online teacher and required her students to engage in reflective practice during the teaching of the course. Further, the author also had an opportunity to engage with other lecturers in the School to discuss and get feedback on her experiences with online teaching during this period. Thematic analysis is used to identify and analyse the themes emerging from the implementation.

AUTHOR'S TEACHING EXPERIENCES DURING ERT

This section presents and discusses the author's experiences in teaching the Data Structures and Algorithms (DSA) course during the ERT period. The presentation revisits the online learning framework proposed by Anderson (2004), to outline the approaches emerging from the DSA implementation in the ERT context. This being interpretive research, the results and discussions are combined, as the researcher tries to make meaning of her experiences.

Learner-centred approach

Being technology savvy and equipped with the basic knowledge on how e-learning ought to be implemented worked against me during the emergency remote teaching period. My main concern and primary focus in the initial stages of the lockdown period was my students. Instead of going right into recording my lectures on Panopto and searching for appropriate, supplementary content on the web to enhance my lectures, my knowledge of instructional design principles and rationale kicked in first. I was concerned whether students will be able to access the course content. I did not know whether they had access to devices and connectivity to enable them to access online content. Up until lockdown time, only one student had consistently brought a laptop to the laboratory, and most had access to computers in the lab. In addition, the Java programming language used as a basis for implementing and testing the Data Structures and Algorithms discussed in the course may not have been readily available to the students. Without access and the software, students would not have been able to engage with the content in this course.

During the first week, I organized two synchronous sessions with my students on Zoom. During the first session, only four out of 30 students attended. The rest claimed that they did not have access to the Internet, or that they got the message to meet on Zoom late. As a result, we decided that future meetings will be agreed in advance on WhatsApp. Although plans were made two days before the second arranged session, only eight students were able to join the meeting, and three were not able to participate fully due to poor connectivity. The following is an extract from my reflective journal:

> "*I am experiencing genuine challenges with online teaching. I took me three full days to prepare my first lecture, which should have taken me one day only. It is the end of the week, and I have not been able to prepare a lecture for all scheduled sessions. Thus far, I have not been able to conduct any online practical sessions for my students. I gave an assignment, but many of my students are telling me that they do not own personal computers, and thus have not been able to download and install the required software from their respective homes due to connectivity and bandwidth issues. As a result, students may not submit their practical assignments. Today, I assured my students that they should not worry about this. If they are not able to submit, I will arrange catch-up sessions for them when they are back on campus*."

Knowledge-centred approach

During the first and second weeks of teaching in ERT, I struggled to meet the demands of the course and my students in several areas. Initially, my plan was to record each lecture the day before, and to upload it on the e-learning system in the evening, in time for students to be able to access it the next morning. However, the time taken to prepare and record the lecture exceeded my expectations by far. Although the lecture slides were prepared prior to ERT, I needed to readjust them for online teaching, knowing that the students may not have the opportunity to ask questions instantly when going through the lecture recordings. I therefore tried to make the slides as self-explanatory as possible, creating animations on content I would normally demonstrate on a whiteboard. Although the intention was to improve the learning experience of my students, I found myself overwhelmed by the efforts required to produce a single lecture. I was also not able to produce lectures for my other courses and struggled to keep up with my other administrative responsibilities.

In addition to the quantity of lectures produced, I was greatly concerned about the quality. This is captured below by the extract from week 2 of the DSA reflective journal:

> '*Today, I expressed my greatest concerns on the quality of online lectures to my Dean. I am unhappy with the quality of delivery of my own courses. I feel sorry for the students that must*

attend online lectures that were prepared haphazardly, by lecturers that did not have any form of guidance whatsoever on how to conduct online teaching.'

During the third week of teaching, I arranged a meeting with colleagues to discuss the issue of quality of teaching in our courses. From our discussions, I observed that my colleagues were using a different method of teaching: some enhanced the already prepared content with narrations and supplemented their teaching with appropriate teaching content and animations freely available on the Web. Others recorded their usual PowerPoint slides on Panopto and did not include additional content or attempt to further enhance their slides. Apart from one other colleague, most did not feel overwhelmed with the amount of work and praised the LMS for the opportunity afforded to them. They were happy that they were able to achieve more on the LMS: assign more readings to students, give more self- assessments, and in general felt they achieved more in the online environment that was not possible with face-to-face sessions.

This encounter prompted the beginning of personal critical reflective analysis. The DSA reflective journal had entries questioning why I wanted to enhance every lecture recording with perfect voice narration and animated demonstration. I questioned why I wanted every animation to be 'locally' produced with a UNAM logo. I also questioned why I was not willing to enhance my teaching with additional content freely available on the Web, sometimes from Ivy-league institutions. I also wanted to know whether the animations created really had an impact on students' understanding, and to determine whether students cared to spend time reviewing the recorded content, or they used alternative content from other sources to supplement their learning materials and enhance their learning experience.

From week 4 of online teaching, there were at least three lecture uploads on the DSA course per week. In addition to narrated PowerPoint slides, there is also evidence of additional materials sourced from the Internet and students were able to cover at least one different topic per week. Although I did not successfully manage to produce a lecture on each topic of the approved DSA course syllabus, all the topics were sufficiently covered by the end of the semester.

Assessment-centred approach

Assessment is an integral part of teaching at UNAM. In the DSA course, a minimum of two tests and two assignments is required for continuous assessment marks, and students take a written exam at the end of the semester. Prior to the lockdown, students had competed half of the required minimum number of assessment activities (they had written one test and completed one assignment). In an online environment, however, informal, and formal assessments should happen continually, not necessarily for the purpose of earning a grade, but to understand the processes and outcomes of learning, as well as to determine who has learned (Ramsden, 1992).

In total the DSA course consisted of seven formal assessment activities (quizzes and tests), and three on reflective writing. One week before the semester ended, the University issued a directive that assessments should not only consist of tests and quizzes, but should also include essays, reflections, critiques, and other reports. The reflective journals used in the course were not particularly desired for indicating the attainment of exit learning outcomes; they were merely used as a tool for reflection. The extract below expressing this concern was noted in the journal, and later forwarded to the Dean as part of a comprehensive email detailing concerns with ERT:

'The only form of assessment that we have used so far is online tests and quizzes for those students that were able to participate. We have taken note of other suggested assessment methods that could be used for assessments. I am not disputing that essays, reflections, critiques, and reports could be effective as I have never used them for this purpose. However, to ensure that the students have gained the required competencies, we as lecturers now need to

think creatively to determine how these other methods could be used for the same purpose. The time required to create these assessments, conduct them online and produce a mark that could constitute formative assessment by 12 June is unrealistic in my view.'

Students with clear descriptions and reflections on the learning content did not necessarily perform well in the tests and quizzes. One student who did not do particularly well in the tests and quizzes gave the impression that they had an engaging learning experience in the course and had understood how and where particular data structures could be applied in real-life situations. When compared with the performance of the others, however, there was no correlation between the marks and the reflections given in weekly journals.

Community-centred approach

The community centred activities on the LMS were very limited. Arranged live sessions did not materialize due to limited participation from students. Discussion threads on the forum only attracted posts from a few participants. This is mostly attributed to limited access to the Internet and devices that enable convenient partition. A journal extract reflecting thoughts on this is shown below:

'We have noticed that students that are really struggling with access to online teaching are the poor students, especially the ones who reside in villages. These students are really struggling to buy airtime and keep up with all the video lectures that are uploaded daily. So, with online learning, we are promoting a class of elite students while making it difficult for the needy students to participate in learning. Also, most students are accessing online materials via mobile devices such as telephones and expecting them to do assignments such as programming assignments on a phone is not only unfair, but cruel to say the least.'

Students' participation in WhatsApp conversation was, however, much livelier. They used this platform for asking questions and even discussing course content. Additional content and short videos were also shared and circulated amongst students on the WhatsApp platform. Student also gave suggestions on configurations needed to enable them to participate fully online. A few illustrations are provided below:

'*Mum, please change the file extension to zip which will enable us to send the assignment in that format*'.

'*You only selected that you want the submission to be only .java. Now I am only able to submit a single file*'.

'*Can ma'am please just delete the assignment and reupload the link please?*'

CONCLUSIONS AND RECOMMENDATIONS

The lack of frameworks to manage emergencies and restore educational functions exposed a gap in the preparedness to deal with emergencies disrupting the brick-and-mortal setup of many educational instructions during the COVID-19 pandemic. The repertoire of tools and techniques developed in face-to-face teaching provided an opportunity to improvise, but the unplanned transition to online teaching and learning has its own challenges that even technology savvy users needed to resolve. ERT provided opportunities to learn new lessons that could be utilized during disruptions to improve future preparedness for emergencies. In this paper, the use of reflective practice was considered as a framework that could be used to improve practice during ERT.

The study provided a detailed description of the case, highlighting the unique experiences and complexities of teaching a Data Structure and Algorithms Course at the University of Namibia. Given the subjective nature of interpretive research and the inherent influence of the researcher's perspectives, biases, and assumptions, the findings and experiences may not be readily generalizable to all courses in a variety of contexts. Nevertheless, the study demonstrated that using reflective practice enables instructors to question how the delivery of courses can be continuously adjusted to improve the quality of the delivery of courses. By understanding the contextual factors, paying attention to student participation, listening to students' concerns, and listening to how other lecturers approached their teaching and learning activities, instructors can get ideas to experiment with new delivery approaches and to monitor the effects of different interventions on the achievement of learning outcomes. The study therefore recommends the use of reflective practice in ERT, as it enables even experienced educators struggling with online learning to question their existing assumptions about teaching and learning. It also recommends a framework to design new interventions that can make an impact in the delivery of their courses during ERT.

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