



Using Virtual Teams to Map Digital New Generation Learning Environments into Tertiary Online Learning Spaces

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The term Virtual Teams refers to groups of individuals who work together, often from different geographical locations, using various forms of technology to collaborate in order to achieve a common goal (O'Duinn, 2018). While there is building interest and recognized value of the use of Virtual Teams for international collaborations (Haihong Hu, 2015), there is comparatively little research into the benefits of adopting the same approach to address student learning in online university environments (McCarthy, 2012). Our article addresses this gap in the scholarly literature.

There are similarities between the characteristics of Virtual Teams in the workplace and the provision of tertiary online learning to groups of higher education students. There is a need to be flexible with time and use digital tools to support online engagement. It is, therefore, useful to refer to the literature on Virtual Teams to inform practices in higher education for students enrolled online.

To successfully embed a Virtual Team model into an online teaching platform, it is helpful to deploy a robust framework to inform the design changes required. We suggest using the framework for new generation learning environments (NGLEs) to meet this end. NGLE's are the development of innovative learning spaces on university campuses designed to be flexible and collaborative to maximize student engagement in the learning experience and improve learning outcomes (Jamieson, Miglis, Holm, & Peacock, 2008). This paper commences with a discussion on how the principles underpinning the design of NGLEs can be mapped into an online learning environment, allowing the use of Virtual Teams to attain the much-needed reorganization of existing pedagogy within online learning spaces to meet the changing landscape of student education for new millenniums (Harasim, 2017; Sankey & Hunt, 2017). In doing so, we problematize specific models of online teaching in universities that are not well-aligned with the provision of 21st-century education that requires tertiary students to develop the skills and attributes to ready them for problem-solving and maximizing the affordances of digital technologies. Next, we demonstrate how Virtual Teams can adequately support the design of NGLE in an online learning environment. Finally, we propose a model for Virtual Teams in an online tertiary course. While we will examine the provision for students enrolled in online courses, we acknowledge that face to face students access material using the same means. So the model will need to have relevance to this group also. By presenting a model of Virtual Teams within an online NGLE design, we offer a new theoretical foundation for online teaching and learning that may inform future research.

Literature Review

Traditional Online Teaching and Learning

Universities are changing in their delivery of courses and degrees, and criticism has been raised around the pedagogy deployed, with arguments mobilized that they need to be more engaging and innovative (Kopcha, Rieber, & Walker, 2016). Universities are still considered to underutilize technology (Carabine, 2016), and lecturers have, at times, failed to embrace its affordances and rely on traditional academic work practices (Rai & Chunrao, 2016). Another

possible barrier to change is that students can retain nostalgic conceptions of being taught in lecture halls by sage lecturers and prefer traditional ‘chalk and talk’ lectures (So, 2012).

It is a mantra of the modern corporate university that lecturers are employed to educate learners for a modern, sophisticated and global society (Parker, 2016). The skills and attributes that graduates require to be equipped for this vision of society include critical thinking and problem-solving skills, capacity for intra- and interpersonal collaboration, competence with digital technology, and self-management (Bhagra & Sharma, 2018).

Universities’ failure to be fit for purpose is a dominant discourse in the literature (Di Nauta, Merola, Caputo, & Evangelista, 2018). This discourse of deficit critiquing traditional teaching approaches is mobilized in juxtaposition to claims that online delivery is cutting-edge innovation. As online courses emerged as a way forward in the early 2000s (Radford, 2011), there was a narrow understanding of how new pedagogies could be developed (Siemens, Gašević, & Dawson, 2015; Weaver, 2006). Although they were designed to be innovative, the notion of innovation has been “a placeholder description for anything other than a standard or well-entrenched practice,” (Kopcha et al., 2016, p. 496).

Historically lecturers have delivered content through a 60-minute lecture in a hall, which tends to be followed by a one-hour tutorial that unpacks the lecture material. The shift to online course delivery has resulted in many lecturers applying the same delivery mode of using platforms (such as Moodle and Blackboard) without making any further changes in their teaching approach (DeBoer, Ho, Stump, & Breslow, 2014).

Some online courses, however, have progressed in the provision of a variety of different materials and teaching methods that show a shift from lecture-style online delivery (Yoon & Gruba, 2017). Grouping students to discuss a range of topics has become more common (Healey, Flint, & Harrington, 2016). Interactive quizzes, the adaptive release of course information, and the use of embedded videos are some examples noted in Australian universities online courses (C. Leonard, personal communication, 2nd November 2019).

Although changes in online teaching are apparent, it continues to draw criticism. Rai and Chunrao (2016), for example, contend that teacher-focused lecture videos and responding to multiple-choice questions are “hardly cutting-edge pedagogy” (p. 266). Further, Stephenson (2018), argues the term online learning in itself is a misnomer, as teaching material delivered via didactic traditional teaching methods is merely substituting the teacher with a computer. Additionally, Rai and Chunrao (2016), who explored the behaviour of online learners within traditional university cyber classroom spaces, found that students tend to collect online material without actively engaging in it and that online platforms can result in diminished opportunities to problem-solve. Learners can instead rely on Discussion Forum Question and Answer information rather than becoming engaged in finding out the answer themselves. These online learning environment design characteristics can make tertiary students passive and may fail to allow for or encourage critical thinking.

Emergent Practices

Several emerging paradigm shifts have become evident within university courses which have adopted alternative teaching approaches such as experiential learning (Muvingi, McKay, & Katz, 2018), co-constructivist learning (Reusser, Pauli, & Wright, 2015), and learner-managed approaches (Jackson, 2018), which involve tools and support for learning in the online environment. These approaches support the production of meeting the needs of the 21st-century learner (Stephenson, 2018). The importance of recognizing the contemporary currency of the university is highlighted by Di Nauta et al. (2018). These authors discuss the intersection between the learner and the university's role in the changing landscape of the 21st-century knowledge economy, which responds to the rapid shifts in education provision created through evolving technology.

It is timely, therefore, to consider a reconfiguration of the teaching and learning online space within universities. This ecological approach reflects the focus referred to like-new or next-generation learning spaces or environments (Dane, 2009; Radcliffe, Wilson, Powell, & Tibbetts, 2008), which is considered a pertinent match as it aligns a redesign of the space and practices which we will map into the online platform.

The Intersection of Pedagogy and Design in NGLE

There is a dearth of actionable knowledge about the connections between designed learning environments and learning activity in tertiary settings (Yeoman, 2018). The redesign of the learning space is considered to bring about 21st-century teaching and learning practices (Benade, 2019). There is a connection between these two notions of space and practice. Imms, Cleveland, and Fisher (2016) define an NGLE as a polycentric design infusing information and communication technologies that are flexible and agile and reconceptualize learning and teaching. Our re-conceptualization changes places of learning from weekly teacher content to spaces of learning that allow for flexibility in how they are used, that are engaging and inviting, and attempts to change the nature of the relationships that exist within that space (Istance & Dumont, 2010). The re-conceptualization also allows collaboration and team-based learning (Mei & May 2018) for both lecturers and students. The changing nature of the relationships and flexibility affords pedagogical opportunities to be created that are less likely in more traditional online teaching, and these pedagogical features include the exercise of student-centered learning and project-based inquiry (Benade, 2019).

The proposed digital tertiary NGLE creates a space that shapes how students learn. Carvalho and Yeoman (2018) provide a framework for learning designers to apply the principles of NGLEs to maximize the affordances of the spaces. We use the activity centered analysis and design (ACAD) framework (Carvalho & Yeoman, 2018; Goodyear & Carvalho, 2014) to map the components of the set, epistemic, social design and co-creation and co-configuration activities into an online course in order to provide a conceptual structure for the provision of a digital tertiary NGLE. The framework is designed as an ecological approach to learning design in which learning activities as seen as an emergent phenomenon (Yeoman & Ashmore, 2018). We chose to use this framework in particular as it brings together the space and practice of NGLEs and acknowledges

that NGLEs consider these aspects separately. Figure 1 (see Appendix) details the theoretical scaffold, which is comprised of four components: artifacts, tools, and resources; tasks; dyads groups and teams – roles and division of labor; and new activity (Carvalho & Yeoman, 2018). The framework also allows for a seamless mapping into the online context, as it aligns very well with online platforms commonly used in higher education.

Mapping NGLEs within Online Tertiary Learning Environments

We map a digital tertiary NGLE using the ACAD dimensions of the physically situated (platform to enable learning), socially situated (team-based), and epistemic design (the collaborative task) below.

The Set Design – Physically Situated

NGLE set design considers designs that are visually appealing and welcoming. Flexible open-plan learning spaces with air, light, space, sound, furnishings, and aesthetics are provided (Blackmore et al., 2011). To align with NGLE design practices in the online space is challenging but not impossible. Intelligent learning design can incorporate resources with adequate planning and placement that enables the set design to be visually engaging, interactive, and intuitive to navigate. In alignment with the design of flexibility, the traditional approach of weekly lectures and tutorials may be removed and reconfigured into learning modules.

Furthermore, materials, digital artifacts, and tools are required that are not only supported by the online university platform but also match the ICT literacy of the lecturer and students. Additional professional development may be required to meet the demands of the collaborative online tasks. Collaboration is a vital component of an NGLE environment and where group work is considered paramount (Mahat, Bradbeer, Byers, & Imms, 2018).

The Epistemic Design – Epistemically Situated Tasks

Tasks in NGLEs are framed by student-centric activities that make the learning and engagement central, is social and collaborative, is motivating, attune to individual differences, is appropriately demanding for each learner, and embeds formative assessment (Blackmore et al., 2011; Istance & Dumont, 2010; Lomas & Oblinger, 2006).

Setting student activities or tasks that enable the features of NGLEs to be achieved in online environments is possible through a carefully constructed sequence of learning events. Firstly, explicit instruction is provided to develop the knowledge and skills required for students to participate in the new learning environment. Students engage with course content and develop skills in collaboration and group work (Mei & May 2018). These skills are used to perform the learning tasks undertaken by Virtual Teams. Virtual Teams are an online alignment with the ACAD framework, replacing other face to face epistemic designs. In this tertiary space, Virtual Teams comprise groups of students who collaborate online to solve real-world problems. A comprehensive outline of the structure, processes, and student outcomes of Virtual Teams is detailed in the following section.

The Social Design – Socially Situated

Learners in online digital NGLs are supported to be critical thinkers who learn from and contribute to the learning of others, pursuing novel ideas, managing projects using digital tools and resources that lead to successful outcomes (Fullan, Langworthy, & Barber, 2014). Collaboration and effective communication are attributes of 21st-century learning that are considered to develop deep learning rather than surface learning (Binkley et al., 2012). The social design of collaborative Virtual Teams allows for the development of these skills.

Co-creation and Co-configuration Activity – Emergent Activity

Students are not necessarily positioned as co-creators in universities, as they often lack agency and voice (Bovill, 2013). Again, Virtual Team tasks will address this aspect of student agency and provide group directed activities that encourage meaningful relationships and more active participation in the learning process. Learners can choose their real-world problems and co-construct their learning and their roles within that task structure.

There is significant interaction between the dimensions of the ACAD framework (Carvalho & Yeoman, 2018) – each dimension impacts significantly on others. Epistemic change, for example, is accomplished within the relationship between space, the social, and the materials within the space rather than as a measure (Dumont, Istance, & Benavides, 2010; Mulcahy, Cleveland, & Aberton, 2015). The application of an alternative framework such as the ACAD in the online space, therefore, provides an excellent opportunity to modify pedagogy in the structure of the online platform. We highlight how the adoption of Virtual Teams facilitates student learning as a useful and appropriate conceptual shift that addresses the dilemma of incorporating 21st-century pedagogy of NGLs into online learning.

Virtual Teams in Higher Education

Virtual Teams are groups of people who engage in online collaboration to accomplish learning or a task. Hertel, Geister, and Konradt (2005, p. 71) describe Virtual Teams as “(a) two or more persons who (b) collaborate interactively to achieve common goals, while (c) at least one of the Team members works at a different location, organization, or at a different time, so that (d) communication and coordination is predominantly based on electronic communication media.” Virtual Teams can provide opportunities for tertiary students to engage with each other when there are few chances to meet or interact face to face (Dulebohn & Hoch, 2017).

Virtual Teams can support the development of professional networks where participants share the same beliefs and values and are focused on common goals (Aritz, Walker, Cardon, & Li, 2017). Collaboration between students can occur in online learning environments, via learning communities or communities of practice, where students are assigned to a group to engage in the course material with each other. However, Virtual Teams are different in that they are goal-oriented or outcome-related compared with conventional online teaching where there are discussion posts, and students respond to teacher prompts.

The use of Virtual Teams in tertiary settings can be an ideal pedagogical approach for online teaching and learning, as graduates can develop skills for working across global contexts with such activities enabling flexibility of time with synchronous and asynchronous modes of communication, connections across geographical distance, and capacity for collaboration (Ubell, 2010). Within the online learning environment, the Virtual Team structure can support students' needs and interests. New and emerging technologies can facilitate effective communication and relationships and link learning, specifically with the content relevant to the students' career pathways (Soulé & Warrick, 2015).

Other affordances of Virtual Teams within higher education include the capacity for students to develop teamwork skills in remote and rural learning environments. Successful Virtual Teams are considered to be teams where participants become effective communicators, develop processes for sharing knowledge, develop trust between the members of the team and support the development of interpersonal skills in the virtual workspace (Chatfield, Shlemoon, Redublado, & Darbyshire, 2014). Additionally, Virtual Teams can share specialized skills, knowledge, and experiences online that would otherwise not be possible if they were to engage in alternative modes of learning (Chatfield et al., 2014). Instead of students being passive and isolated recipients of their online learning, students can maximize the potentials that are provided by participating in Virtual Teams.

Virtual Teams within a digital tertiary NGLE framework

The implementation of Virtual Teams within a higher education online teaching course offers advantages for students' learning and engagement, although it can be problematic to administer (Mackay & Fisher, 2012). Research of existing online teaching practices has offered little advice on how to integrate the project components of Virtual Teams into traditional teaching methods and how to guide students towards successful outcomes (Haiyan Hu, 2009). The integration of Virtual Teams into existing online teaching courses may be more successful if all aspects of the teaching and learning design aligned with the design of the learning space. The ACAD framework may be applied here. Consideration could be given to changing the set and social design, which could permit the epistemic design (the introduction of Virtual Teams) to provide for enriched learner practices and learning outcomes (Carvalho & Yeoman, 2018).

To facilitate the implementation of Virtual Teams within the digital tertiary NGLE design, we now bring together elements of Virtual Teams that we have identified in the literature to provide a model for online practice that aligns with the principles of the ACAD framework. In order for the model and framework to support each other, the principles and values of NGLEs need to be followed. These include student-centered approaches to learning, experiential learning, real-world application that students are motivated to participate in, sensitivity to individual differences, and involves formative assessment strategies (Istance & Kools, 2013). The model illustrated in Figure 2 (see Appendix) has been constructed to address the essential components of Virtual Teams, and we propose it would be beneficial for planning the incorporation of Virtual Teams in online learning contexts.

Virtual Teams Model

Mapping the ACAD framework onto the Virtual Teams model is conceptualized in Figure 3 in the Appendix. Figure 2 independently illustrates the three components: structure, process, and outcomes of the Virtual Teams model. These three dimensions will be discussed in detail below concerning its application to the online tertiary learning space and will discuss links made to the ACAD framework (Figure 3). The dimensions are organized differently from Figure 1 as the development of Virtual Teams within online learning is arranged to reflect the nature of teaching and learning sequences.

Structure

The structure of the digital tertiary NGL design incorporates aspects of the Set Design in Figure 1 and includes the design of the physical course. It also articulates the roles and responsibilities of the course participants that relate to Socially Situated structures and arrangements (Figure 1).

Course Content. Material design is a core element of teaching programs that link theory to practice (Richards & Rodgers, 2014). Materials within tertiary courses can refer to published, teacher-created, or authentic materials (for instance, resources individuals source from workplaces) (Yoon & Gruba, 2017). Materials need to align with the curriculum and learning outcomes, student interests and assessment, contemporary culture, and lecturer research interests. Course content will inevitably link with the technological aspects where “the development of technology has challenged the traditional paradigm about the use of technologies and teamwork for teaching and learning” (Haihong Hu, 2015, p. 19). Therefore, the technology used within the online platform should not be used only as a tool for communication but also for the dissemination of information, using multiple modes of instruction and delivery (Stephenson, 2018).

The Role of Students. The role of the student needs to be carefully articulated as the expectations move from any prior expectations that students can beat time, passive recipients of information to active, engaging learners. Students must be made aware at the beginning of the course of the rationale behind the design shift, making the benefits explicit to them from such an approach. Additionally, students need to be cognizant of their role in Virtual Teams and understand that they will be supported where there are potential barriers to participation because of ability differences. This is particularly relevant to address uncertainty and anxiety that may arise as a result of student resistance to new generation practices as students are familiar with traditional lectures and teaching practices (So, 2012).

The Role of Lecturers. Lecturers work in teams which are in line with the socially situated arrangements of Figure 1. The roles that lecturers take need to be clearly defined, and expectations of participation and engagement clearly articulated for students. The role of the lecture may, at times, shift towards facilitation rather than just as a provider of information. In doing so, lecturers provide original course content, organizes student grouping, articulate the processes for learning, defines tasks, and troubleshoots student issues as the course unfolds. Providing formative feedback and assessment support for students during the course is also considered vital. The lecturer's role

may be to monitor group processes and possibly negotiate the conflict between groups to ensure teamwork success. This aspect is of relevance in education as the organizational structure is confined by time and assessment outcomes. Furthermore, the lecturer role differs from virtual team membership in workplace contexts, as the lecturer role denotes the power relationships associated with teacher and assessor.

Design of the Learning Platform. Mapping the concept of a physically situated space into an online platform is one of the more significant challenges to align because of the constraints of the prescribed university delivery platform (such as the learning management systems of Moodle, Blackboard or Canvas). The importance of set design face-to-face is highlighted by research reporting that the design of the learning space impacts on both teachers and learners. Factors such as light, temperature, and flexibility of movement within these spaces support teachers to move to more discursive teaching styles (Barrett, Davies, Zhang, & Barrett, 2015). Therefore, the learning environment is relevant to facilitate effective teaching and learning. Is it possible to take into consideration the affordances of physical set design in the online space? One challenge to achieving this goal is that “current learning management systems do not support a straightforward integration of modern pedagogical models and methodologies” (Gañán, Caballé, Conesa, & Xhafa, 2015, p. 3) such as the integration of technologies. Additionally, technological resources have been integrated into learning platforms in an ad hoc and unsuccessful fashion (Caballé, Xhafa, & Barolli, 2010). Despite these limitations, the design of the learning platform should, as much as possible, incorporate aspects of visually stimulating set design.

A further consideration needed under the umbrella of the course structure is the planning of teams (Piccoli, Powell, & Ives, 2004). It is vital to include pre-course content training (such as ICT and group work skills) to ensure that the diverse abilities (including technological ability) of all students are addressed to maximize successful learning outcomes. In terms of the technological design for Virtual Teams, there has been surprisingly little research into the impact of social media as a collaborative tool (Aritz, Walker, & Cardon, 2018). Online knowledge networks such as Google apps are useful learning tools for students with low confidence in online environments (Robertson, 2012). It is suggested that task performance, particularly complex tasks that involve ambiguity, improves when communication media are more vibrant. Such media involves the ability to handle multiple information simultaneously, the ability to provide timely feedback, the ability to provide a personal focus, and the ability to use natural forms of communication (Aritz et al., 2018). A recent survey showed that while 72% of Virtual Team members believed web conferencing would make their teams more effective, only 34% of Virtual Team members used web conferencing (Ferrazzi, 2014). Aritz et al. (2018) conducted a study investigating the selection of social media in Virtual Team settings and their impact on team communication and coordination. After students participated in a Virtual Team task, they reported the following media were most effective in helping them complete the project together:

- Google Docs
- Facebook
- Google Hangouts
- Skype
- Conference calls

We can conclude from existing research by Beavis & O'Mara (2016) that the introduction of Google Docs and other social media is a supportive feature in the design of successful learning platforms. Students also need access to pre-course training in all listed social media so that they can make informed choices regarding their modes of communication.

Process

Experiential Learning

The process of the digital tertiary NGLE design incorporates the epistemic design referred to in Figure 1 as well as aspects of groups, teams, roles, and divisions of labor that are arranged within the social design. Experiential learning is defined as learning through the process of experiences and learning through reflection on doing (Felicia, 2011). The process reflected in the model is based on experiential learning theory as it sits well within both NGLEs (Whyte, House, & Keys., 2016), and draws strongly from Haihong Hu's (2015) early successes in using Virtual Team to support online learning. Moreover, virtual teams are understood to improve the effectiveness of both teaching and learning practices in higher education (Leal-Rodríguez & Albort-Morant, 2019). Drawing on Hu's application of Kolb, Boyatzis, and Mainemelis (2001) four stages of learning in an online course, we detail a process of experiential learning which involves abstract conceptualization, concrete experience, active experimentation, and reflective observation.

This is a process that we envisage can support the implementation of Virtual Teams in digital tertiary NGLEs.

- **Abstract conceptualization:** Students participate and interact with the course content that is led by the lecturer. Course outlines and expectations are detailed. Course content may be delivered by text as well as video and audio mediums. Multiple means of delivery should keep in mind that students are known to be more motivated by the information that is provided through multimodal means rather than purely reading material (Hartsell & Yuen, 2006).
- **Concrete experience:** Students are actively involved in the project/task. There are various methods of approaching the group task in tertiary Virtual Teams. These can include responding to the lecturer's question as a group, creating presentations, or responding to a topic in the content area that is topical (Haihong Hu, 2015). In choosing topics for students, the lecturer must be mindful that the project design needs to be too difficult to be handled by anyone person in the Team in order to ensure collaboration (Bremner, Peirson-Smith, Jones, & Bhatia, 2014). There is high input from the lecturer to ensure adequate scaffolding of the Team task to allow for the practice of new skills and understanding. It is considered valuable to encourage students to name their team and develop a logo in order to build an identity and relationships within their peers (Haihong Hu, 2015).

Virtual Team group leaders are chosen by the lecturer, where the leader's role is to assist in Team communication between group members and the lecturer.

- Active experimentation: A second opportunity for concrete experiences in the course is provided through active experimentation. At this point, the lecturer shifts in their role to one that is more facilitative, allowing students greater choice over their task (low level of input). The students stay in the same groups. The group now selects their leader, their virtual space, and identifies their problem with the course parameters. Students are expected to develop a proposal for defining and solving a problem (Haihong Hu, 2015). Students apply their knowledge from the initial concrete experience with greater independence.
- Reflective observation: Finally, students are required to comment on their learning of the content knowledge as this relates specifically to the learning outcomes prescribed by the course. We suggest, however, that students engage in critical reflection. When reflective practice is confined to content and process reflection (Cranton, 1994), it becomes characterized by shallow questions such as, 'What worked?', 'What did not work?', and 'What will be different next time?', serving merely as "a coffee break" (Korhonen, Heikkinen, Kiviniemi, & Tynjälä, 2017, p. 1). To enable critical reflection, modeling (Page & Jones, 2018) within the learning platform is provided as a provocation for students to articulate their evolving philosophy (beliefs), principles (theories), and teaching intentions (practices) regarding the course content. This forms the final assessment.

Team Building

Team building is considered as a socially situated (Figure 1) process that occurs throughout the course and is considered critical for the success of Virtual Teams (Goold, Craig, & Coldwell, 2008). Like their face to face counterparts, Virtual Teams have recognizable patterns of development. They first go through active Team building phases of formation. Secondly, there is the development of team skills, thirdly there is the development of management skills, and lastly, there is a focus on self-management (Horvath & Tobin, 2001). It is noteworthy that Virtual Teams go through these stages more quickly than face to face teams (Johnson, Suriya, Yoon, Berrett, & La Fleur, 2002). Haihong Hu (2015) suggests that to be successful, lecturers could incorporate:

- elaborate introductions to establish identity;
- team building activities to develop trust; and
- the creation of a team contract to minimize and manage conflict.

The social design of Virtual Teams should not be left to chance. Aritz et al. (2017), highlight the importance of explicit teaching of collaborative skills to enhance collaboration between students within Virtual Teams. The critical skills needed include assigning roles and tasks, managing conflict, and editing the work produced, and brainstorming initial ideas. Furthermore, to meet

timeline constraints, templates for team contracts might be provided. Templates could include protocols for supportive communication and positive conflict resolution.

It is noted that the optimum team size for Virtual Teams is between 4 and 7 (Alexander, 2006). Team size contributes to effective communication between members. Optimum group size may ameliorate students not participating as one of the traditional difficulties in online group work has been described by Goold et al. (2008, p. 349) as “the management of lurkers (individuals who do not actively participate in the online environment) and shirkers (those who do not arrive in the online environment).”

Undertaking Tasks

Undertaking the task is a co-created and co-configured emergent activity that firstly requires teams to provide a plan of the project in terms of a timeline and tasks that culminate in the project’s completion. This provides the starting point for lecturers to clarify the task, support, supervise, provide formative feedback and troubleshoot the team’s progress during the task process. Teams who begin with the end in mind can be very useful (Haihong Hu, 2015). Secondly, as group work is fraught with the difficulty of perceived student ‘unfairness’ as others work is seen as impacted by the performance of others (Iannone & Simpson, 2017). To mitigate perceived unfairness and increase student willingness to engage in tasks, we recommend the provision of an individual task that contributes to an overall group task. The group task may be the editing of individual contributions, allowing collaboration, peer contribution, and critical reflection of content to occur. As mentioned earlier, students may need direction choosing topics that maximize opportunities for collaboration and allows all members of the team to participate (Bremner et al., 2014) actively. The underpinning principle of the digital tertiary NGLE design, however, needs to encourage and facilitate student-led, co-construction of any project, and its planning.

Lecturer/Student Feedback

It is the lecturer’s responsibility for providing opportunities for students to engage with consistent formative feedback within the process cycle. Feedback is a socially situated activity that is created within the emergent learning task. Here, students are also required to engage in a reciprocal manner that allows for co-constructivist student-focused feedback interactions, which are timely, specific, and descriptive (Wiggins, 2012), and align with the principles of digital tertiary NGLs.

Outcomes

Task completion

Task completion occurs when the planning milestones are met. The final product is uploaded on the Virtual Team site, as a culmination of the individual parts provided by students and the group co-constructivist collaboration.

Learning Outcomes

Task completion must align with the learning outcomes, reflecting details of the course content. We highlight this point as learning design has the potential to lose sight of the purpose (Goodyear, Ellis, & Marmot, 2018).

Assessment

There are challenges in terms of summative assessment when using a Virtual Team approach in the university setting (Aritz et al., 2017). Lecturers should take into consideration the university context of learning and whether it is an individual or group contribution. Iannone and Simpson (2017, p. 2) note that students “prefer to be assessed by new generation assessment methods (taking a new generation to mean non-traditional, especially away from unseen timed exams) in which they recognize the authentic value and which they think will prepare them for entering the workplace.” If students are to engage in the learning tasks fully, it is prudent to ensure that they understand the educational value and purpose of their assessments and the role of the end product within the design process.

Conclusion

Higher education is becoming transformed by the demands of rapidly changing societies and the shifting expectations around what they expect institutions to provide. As universities evolve to meet the challenges, there is a fundamental emphasis on the reconfiguration of traditional teaching and learning in higher education (Leal Filho & Pace, 2016). To better match the demands of this learning paradigm shift, we have proposed a design for online learning that mirrors NGLEs observed in face-to-face teaching and learning environments. The framework of the NGLE can be mapped effectively into the online space. However, we acknowledge that there is room for improvement regarding the capacity of the delivery platform to provide for a stimulating physical alignment.

New generation learning environment literature values group work that enables collaboration in the face to face environment in higher education (Tinto, 2003), and this presents a challenge when students are learning online. We suggest that the establishment of Virtual Teams addresses this obstacle. Virtual Teams have been progressively used in higher education as a result of the increased use of technology with its potential to support collaborative learning and authentic learning tasks (Haihong Hu, 2015).

Implications and Recommendations for Future Research

Many models for Virtual Teams exist that incorporate inputs, processes, and outputs in various configurations (Laisema & Wannapiroon, 2013; Powell, Piccoli, & Ives, 2004). The presentation of a new model in this paper serves to match Virtual Teams within the context of online learning in a university environment. In short, Virtual Teams allow students to practice and develop the necessary skills that will be needed to negotiate their workplace (Salmon, 2019), and for citizenship that transcends narrowness of education purely for the benefit of advanced

capitalism. There are potential barriers that need to be recognized; however, in the development of any new learning model. Such barriers include the issues of inadequate access to technology and the internet, especially in rural and remote areas, for students in low-income areas, or those in marginalized groups (Lee, Lee & Choi, 2016).

Additionally, as Iannone and Simpson (2017) have stated, students are more likely to accept more traditional means of teaching delivery and may be resistant to alternative methods of teaching and learning. What may contribute to this resistance is the self-belief that they will not be able to complete group tasks as effectively, and as a result, may be resistant to the co-operative behaviour required in successful virtual teams (Tran, Oh & Choi, 2016). Finally, the delivery of new pedagogical approaches may present itself with the challenge that not all learners are included. To ameliorate the possibility of isolating any student, practices of universal design for learning might be considered, which allows for as much flexibility in the delivery of assessment to be made (Rose et al., 2018). Further, inclusion can also be facilitated using this approach by allowing alternative individual assessments to be submitted.

The benefits from collaborating in Virtual Teams is well documented, especially for practitioner professional development that supports ongoing networking opportunities for those working in remote locations (Miquel & Duran, 2017). Future research that builds on assessing the model's application for Virtual Teams in online university courses is therefore warranted.

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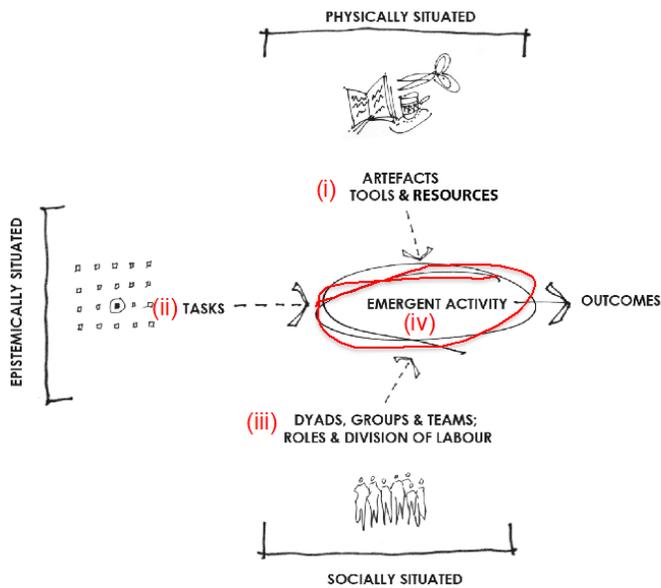
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Appendix

Figure 1

The ACAD framework (Carvalho & Yeoman, 2018, p. 7)



- i. **The set design**, the structures of place, including material and digital artefacts, tools and resources.
- ii. **The epistemic design**, the structures of knowledge and ways of knowing, including the sequence & pace of tasks and assessment.
- iii. **The social design**, the structures of social arrangements, such as groups, dyads, and (un)scripted roles or identities.
- iv. **Co-creation and co-configuration activity**—emergent learning activity—highlights learner's agency to co-configure what is proposed and the ways in which the designed environment can be said to participate in teaching and learning practice.

Figure 2

Virtual Teams model for tertiary online learning



Figure 3
Virtual Teams model within the ACAD framework

