

Flipping the flipped classroom online

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Abstract

The intensification of digital technologies in higher education is prevalent and has become a necessity for current practice on a large scale. In re-acting to the global pandemic, a previous model of the flipped classroom to support 436 pre-service teachers learning required reimagining to facilitate teaching and learning in the online environment. This article reports on the combination of digital instructional tools to engage students in asynchronous and synchronous tasks while implementing the principles of Universal Design for Learning. The HTML5 software package (H5P) was integrated within the online course management system Moodle to promote all students' flexible and self-directed learning prior to participating in a small group synchronous Zoom class with a Faculty member, using PowerPoint and online apps. The integration of technology into higher education large classrooms and the use of UDL as a framework by academics in designing the curriculum going forward, presents an opportunity to support the affective and cognitive learning of the diverse student population in large classes.

Keywords: *Asynchronous and synchronous learning; online teaching; Universal Design for Learning, digital instructional tools, large sized class.*

1. Introduction

The COVID-19 pandemic has and continues to impact pedagogical practices across all sectors of the education continuum, propelling higher education institutions into an era of online teaching and learning dependent on the use of digital tools and various online learning platforms. The movement from traditional face-to-face teaching that was enhanced by digital technology to a fully online learning experience that is contingent on technology, has presented challenges and potentially new opportunities for academics and students alike. Prior to the global pandemic, digital technology facilitated a blended learning experience in higher education institutions with the prominence of the 'flipped classroom' teaching model becoming a pedagogical feature. The design of the flipped classroom (Baker, 2000) enables students to engage with content prior to class to facilitate more interactive and experiential learning in-class. This would suggest that this pedagogical model is effective when working with pre-service teachers, who need to develop discipline knowledge, while simultaneously, practicing and refining application. This illustrates the intricacies of teacher education programmes which are underpinned by learning about teaching and, teaching about teaching (Loughran, 2005). However, this article will detail how "the thoughtful fusion of face-to-face and online learning experiences" (Garrison & Vaughan, 2008, p.5) for a large class underwent a further 'flip' when the traditional face-to-face component of a module moved online, leading to the re-design of the online learning experience using the Universal Design for Learning principles and capitalising on digital instructional tools such as the HTML5 software package H5P integrated with the online learning platform, Moodle.

2. Description of the Teaching/ Learning Context

The impetus for reviewing and consequently, redesigning the teaching and learning context that will be reported here, was to move traditional face to face teaching to an online learning environment for a class of 436 students. This large class were registered to complete an early childhood mathematics education module as part of their second year of the Bachelor of Education initial teaching education programme at Dublin City University during January to April, 2021. In previous years, this module was designed on the premise of being a flipped classroom whereby, approximately 400 students would have engaged with material online independently (asynchronously) in advance of a small group (approximately 40 students) face-to-face two-hour workshop. However, on reflection of previous practices, the asynchronous activities lacked variety as they primarily focused on online reading material that was more applicable to a particular type of learner. This may have contributed to the perceived lack of engagement or completion of the activity that was observed by faculty members when drawing on the students' learning in the face to face workshops. Consequently, faculty members were allocating increased time introducing the content presented in asynchronous material as it predicated the experiential learning experiences in

the workshops, leading to reduced time for student-faculty interaction and feedback. This implied that the rationale for the implementation of the flipped classroom teaching model was counterproductive, meaning that the nature of the asynchronous activities required consideration and redevelopment.

The need for the redesign of the teaching and learning activities for this large class was further amplified when the face-to-face small group workshops pivoted to synchronous online teaching using one-hour Zoom meetings. Replicating the interactive and hands on nature of the face to face workshops on Zoom would prove challenging but the means to do so required investigation so that the pre-service teachers would learn about early childhood mathematics but also the teaching of early childhood mathematics education. Echoing Loughran's (2005) understanding of teacher education, the principles and pedagogies used to teach the content needed to be modelled by teacher educators to inform the students' future teaching and prepare them for teaching. In response to the current teaching landscape, this meant that pre-service teachers need to be prepared to teach children, either face-to-face and/or online. This remit posed many challenges for the faculty members teaching online and particularly for the early childhood mathematics education module where discussing and collaborating in small groups of peers while handling concrete resources and manipulatives is central to good early mathematics pedagogy (Dooley et al., 2014; Gifford, 2004).

In an effort to support the students' engagement, learning and their future teaching, the Universal Design for Learning (UDL) framework (Centre for Applied Special Technology, (CAST), 2018) was utilized when redesigning the flipped classroom to establish an active learning pedagogical method that integrated a mixture of asynchronous and synchronous activities. The UDL principles of Engagement, Representation, Action & Expression were adopted in an effort to ensure that the student population within the large class could access and participate in the weekly flipped classroom comprising of asynchronous and synchronous learning experiences. In advance and in preparation for a live Zoom workshop which was based on a PowerPoint presentation and the integration of online apps, the student engaged with H5P interactive content comprising of activities and tasks that varied each week. H5P is an open source content creation tool that hosts a range of multi-media resources and facilitates the incorporation of UDL when designing teaching and learning experiences. The H5P presentations and teaching materials to complement the Zoom workshops were made available on the students' online learning platform, Moodle. Appendix A illustrates a sample of the flipped classroom activities that aimed to accommodate learner differences and variability of the 436 pre-service teachers learning about early childhood mathematics education. Feedback was sought from the students midway through the semester to ascertain the students' perspectives on the activities in terms of their affective (positive learning experience) and cognitive (actual knowledge gain) learning. While the feedback was largely positive about the teaching and learning experience, feasible suggestions that were offered

by the students, were reflected in the flipped classroom activities for the remaining weeks of the semester. On completion of the module, students were again requested to provide feedback on the changes made, and on this occasion, it would appear that the asynchronous and synchronous activities suited the students' learning. Nevertheless, in considering this positive student feedback, it was important to note that relying solely on student perceptions may not be indicative of assessing student engagement and academic achievement stemming from the flipped classroom (McNally et al., 2017).

3. Literature Review

Universal Design for Learning is a pedagogical framework that aims to provide an equal and inclusive learning experience for students and which caters for differences of learning approaches (CAST, 2018). A universally designed curriculum provides a range of options for engaging students in the learning process and takes into consideration that no single approach will work for all students (Spencer, 2011; Saap, 2009). As indicated in Appendix A, UDL is established on three core principles 1). Multiple means of engagement (the "why" of learning) 2). Multiple means of representation (the "what" of learning) and 3). Multiple means of action and expression (the "how" of learning). Teaching and learning can be accessible for all students by intentionally planning options for i) learner engagement, ii) content representation and iii) learning expression, using instructional design concepts, pedagogical knowledge, and instructional technology (Capp, 2017). Kumar & Wideman (2014) corroborate that underpinning pedagogical practices with UDL can have a positive influence on increased flexibility, social presence, reduced stress, and enhanced success of students' learning. Therefore, when UDL is embedded in the design of the teaching and learning experience, the diversity of learner needs, styles and abilities can be accommodated for, making the framework particularly applicable in supporting the inclusion of students in a large class (Dean et al., 2017).

In the teaching and learning context reported here, the combination of the digital instructional tools H5P, PowerPoint, Moodle and online apps, assisted with the application of the UDL principles while simultaneously, expediting active teaching and learning in the online flipped classroom. Brame's (2013) definition of flipping the classroom means "students gain first exposure to new material outside of class, usually via reading or lecture videos, and then use class time to do the harder work of assimilating that knowledge, perhaps through problem solving, discussion, or debates". In relating this pedagogical practice to a revision of Bloom's taxonomy (Anderson & Krathwohl, 2001), Brame argues that the flipped classroom affords students the opportunity to participate in lower levels of cognitive work like gaining knowledge and conceptual understanding outside of the class and consequently creates time and space to engage in higher forms of cognitive work (application, analysis, synthesis, and/or evaluation) in class with the support of peers and a faculty member. Research indicates

that students can be kept highly engaged when using this flipped classroom model in higher education as it fosters empowerment of students to self-direct their learning by managing their learning pace and self-regulating their learning (Reyna et al., 2020; Barnard et al., 2009). Although digital technology and active learning support this instructional model, it should be highlighted that social presence and teacher immediacy are contributing factors to successful student engagement and participation in the flipped classroom (Gunter & Kenny, 2014). Faculty members who wish to adopt this instructional model should ensure that the curriculum is driving the teaching and learning experience, as opposed to the availability of technology (Shelly et al., 2012). Similarly, Long et al. (2017) recognise that effective teaching with technology requires understanding the mutually strengthening relationship between technology, pedagogy and content to develop appropriate and context-specific instructional strategies. In doing so, can lead to a positive impact on all students' affective and cognitive learning both inside and outside of the large classroom (Dean et al., 2017).

4. Analysis of / Reflection on / Implications for Practice

As a pedagogical model, the flipped classroom has its challenges for implementation. For example, the development of online learning materials is time-consuming and requires digital competency and skills using the technology, in this case the use of H5P. Training was provided by the University's Teaching Enhancement Unit to assist with the initial introduction to H5P but it was through experimentation, student feedback and reflecting on UDL, that the potential of H5P as an instructional tool to provide an inclusive learning experience became apparent. The integration of digital technology into higher education presents an opportunity to transform traditional pedagogy and is of particular relevance in these unprecedented times;

Rather than lamenting the fact that the role of teacher education and indeed of the University in a world of super complexity is now radically changed, it is perhaps even more exciting to be a part of this era as it has unbounded possibilities, unknown unknowns, space for risk and experimentation, permission to be uncertain and insecure, and contains the awkward spaces in which we can find some of those unknown unknowns (Ling, 2017, p.570).

As the teaching and learning context discussed in this paper illustrates, the implementation of the UDL framework can support academics in curriculum design whereby enabling an inclusive learning environment that will continue to be of critical importance post-COVID, whether the instruction is face-to-face or online. The modelling of applying UDL to teacher education is of significance too as it grants pre-service teachers an opportunity to engage in experiential learning of the pedagogical practices that they will implement when providing an inclusive education to children in the future. On reflection of the changes made to the

module this year, further transparency and explicit communication of the rationale for the pedagogical approach adopted would have further enriched the educational experience for the pre-service teachers. While the paper documents how the UDL principles were aligned with the flipped classroom model using a combination of digital instructional tools and active learning specific to an early childhood mathematics education module, it offers an insight into how academics can effectively meet the diverse needs of a large class without compromising the quality of teaching and learning.

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Appendix A: Alignment of Universal Design for Learning (UDL) Principles to Asynchronous and Synchronous Learning of Early Childhood Mathematics Education.

UDL Principles	Example of intentional planning and practice
<p>Engagement For purposeful, motivated learners, stimulate interest and motivation for learning.</p>	<ul style="list-style-type: none"> ● With each activity integrated on Moodle, the student was able to indicate activity completion which then enabled them to chart their progress using the Completion Progress Bar built-in app on Moodle ● Created a 'checklist' for the completion of each activity or task in the H5P presentation set ● 'Slides' of H5P and Zoom workshop presentations were made available on Moodle to access and/or download in advance of each week ● Flexibility planned for when students completing the asynchronous activities and tasks each week before the Zoom workshop ● All reading material, e-books and resources were hyperlinked in H5P and workshop presentations for ease of access ● Options made available for students to learn content with clear degrees of difficulty by providing additional reading material and a range of teaching resources for independent study ● Choice was provided to complete an asynchronous activity from a menu of options ● Students encouraged to post on forum and respond to peer posts to foster collaboration and sense of community within the online learning environment. Faculty members then used forum posts to facilitate discussion in Zoom workshop ● Focused the reading of academic literature in H5P by posing a series of questions and allowed for various ways to respond ● Google Jamboard provided on Moodle for the anonymous posting of questions ● An online classroom culture created where students are empowered and able to support their own self-talk and support one another's positive attitudes toward learning in Zoom breakout room discussions. ● Feedback sought mid-semester to inform the teaching and learning of subsequent weeks
<p>Representation For resourceful, knowledgeable learners, present information and content in different ways</p>	<ul style="list-style-type: none"> ● While a consistent approach was taken to the design of the Moodle module page, the Accessibility option was made available to students to adapt the color, design, graphics or layout ● Alternative for auditory information was provided by closed caption videos, subtitles of podcasts, and transcripts of audio ● Content presented by text, image and video on H5P and PowerPoint presentations ● Hyperlinks made available in H5P and Zoom workshops to apps, websites and online resources to build understanding and to support the teaching of early mathematics ● Guidance provided in Zoom workshops on the teaching of activities and closed caption videos of practice shared ● Students encouraged to participate in reflective and interactive in-class discussions in Zoom workshops about applying knowledge/skills learned in class to enhance their understanding of content and express their knowledge and understanding in future classroom contexts
<p>Action & Expression For strategic, goal-directed learners, differentiate the ways that students can express what they know.</p>	<ul style="list-style-type: none"> ● Faculty member and students used virtual and concrete mathematical manipulatives from online apps on BrainingCamp.com, and ToyTheater.com to demonstrate understanding and to model the use of the resources in mathematics teaching ● Required students to upload photograph to Moodle discussion forum of completed tasks using online apps on BrainingCamp.com, and ToyTheater.com ● Created formative assessment activities such as written responses exported or posted to Moodle discussion forum or H5P quizzes, fill-in-blanks or drag and drop activity ● Encouraged students to respond to in-class Zoom discussion through verbal, polls, breakout rooms or chat function