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Perspectives on a Graduate Online Course that Modeled Universal Design for Learning (UDL) to Teach UDL

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ABSTRACT :

The purpose of this article is to provide the instructor and learner perspectives of an online learning technologies course that used Universal Design for Learning (UDL) principles to support the teaching of UDL. Course design was based on current standards and literature related to online course design including ADDIE, Quality Matters Standards, and Universal Design for Learning (UDL). The qualitative study was conducted during Spring 2018 at the conclusion of an online course titled, *Universal Learning for Online Course Design* at a Southwestern University in the US. The instructor provided a design narrative and four graduate students who participated in the course provided learner narratives that were reviewed and analyzed by two external researchers. The findings from this study support continued improvement of course design for the next iteration of the UDL Course, as well as providing ideas for other educators interested in implementing UDL concepts in their courses.

Keywords: ADDIE, Instructional Design, Quality, English as a Second Language, Learning Objectives, Participatory Design, Universal Design for Learning, UDL.

INTRODUCTION :

A university classroom, whether face-to-face or virtual/online, is comprised of learners from a wide variety of backgrounds, experiences, and abilities. This diversity is comprised of learners for whom perhaps English is a second language, who may be sight or hearing challenged, who have mobility limitations, who have experienced various degrees of trauma, and/or deal with many other different life circumstances. Thus, educators are confronted with moving beyond a learning design mentality of "one-size fits all" (Edyburn, 2010, p. 34) to one where learners are engaged via multiple means and modalities. The Universal Design for Learning framework as advanced by CAST (2018) with its three core principles and a variety of resources, "has captured the imagination of policy makers, researchers, administrators, and teachers" (Edyburn, 2005, p. 17), and has the potential to benefit all learners. UDL captured the imagination of an instructor and her students in Spring 2018, and this article presents their perspectives.

The purpose of this article is to present both instructor and learner perspectives of an online learning technologies course applying the Universal Design for Learning (UDL) framework to support the teaching of UDL. This qualitative study was conducted during Spring 2018, at the completion of an online learning technologies course titled, *Universal Learning for Online Course Design* that utilized UDL framework to teach UDL at a Southwestern University in the US. The course will be referred to as the UDL Course for brevity. The findings from this study support continued improvement of course design for the next iteration of the UDL Course as well as providing strategies and recommendations for other educators interested in implementing UDL concepts in their courses. This article includes, 1) Background and Foundation, 2) Methods, 3) Instructor Perspective on UDL Course Design, 4) Learner Perspectives of the UDL Course, 5) Data Analysis and Findings, and 6) Conclusion.

BACKGROUND AND FOUNDATION

The foundations for the design of the online UDL Course included Universal Design for Learning (UDL), Quality Matters Standards, and the instructional design model of ADDIE. UDL was also the primary content for the UDL Course, and ADDIE was addressed as a remedial course topic as well.

UNIVERSAL DESIGN FOR LEARNING (UDL)

Universal Design for Learning is an approach to pedagogy that includes alternatives to make curriculum accessible to individuals with different backgrounds, learning styles, abilities and disabilities in a variety of learning contexts (Meyer, Rose & Gordon, 2014). The assumption behind the UDL framework is that access to information does not necessarily mean access to learning. This is why the principles of the UDL framework address the three brain network areas involved in learning: recognition, strategic, and affective networks (Rose & Meyer, 2002). The UDL principles can be summarized as follows: (1) Principle 1 highlights the need to support recognition learning by providing multiple and flexible methods of representation; (2) Principle 2 emphasizes the support around strategic learning by providing multiple means of action and expression; and (3) Principle 3 supports affective learning by providing multiples options for engagement (Rose & Meyer, 2002).

The application of the UDL philosophy to education aims at creating educational practices and flexible learning environments for a wider range of learners. This model emphasizes on the elimination of barriers to teaching and learning while maintaining academic rigor (Burgstahler, & Cory, 2008; Coomber, 2007).

Effective course design in online and blended environments should meet quality standards, which include accessibility and usability. Although UDL is a broader concept that goes beyond providing access to content and instructional materials (CAST, 2013), accessibility is a core component of this student-centered approach to improve student engagement. Multiple paths for learning to address different learners' needs imply the use of various types of media, online activities, resources and assessments that should adhere to online course design quality standards.

QUALITY MATTERS

Since their inception, the quality of online classes has been in doubt. While online classes offer a diverse student population with convenient, cost effective education, many faculty believe online classes may be the end of academia in a university setting. Faculty have challenged that online classes cannot provide a legitimate learning experience gained from intrinsic relationships between the instructor and student and between students available in colleges and universities. Online courses are unique in that the demonstration of curriculum via transparent course design can easily undergo an evaluation process. Quality Matters (QM) is currently a popular online course design evaluation program that is standards-based; emphasizes peer-review process; and provides feedback for course design, development, evaluation, as well as a process for improvement in the design of online and blended courses.

The QM Rubric includes eight general standards: 1) Course overview and introduction, 2) Learning objectives, 3) Assessment and measurement, 4) Instructional materials, 5) Learner interaction and engagement, 6) Course technology, 7) Learner support, and 8) Accessibility (Quality Matters™ Higher Education Rubric, 2014).

The QM standards are intended for use with courses that are delivered fully online or with a significant online component (hybrid/blended) and is based on insights from experienced online teachers and instructional designers. It is benchmarked by best practices with accrediting bodies and national and international organizations. The standards are designed to facilitate continuous improvement in areas of student learning, retention, and satisfaction. A course must pass a review conducted by a master QM reviewer, one subject matter reviewer, and one external reviewer with a score of 85% and all essential standards met. Each standard assures the course is relevant and assists the student in achieving the learning outcomes.

In relation to accessibility, the intention for QM Rubric Standard 8 is that a course demonstrate accessibility for all students by adhering to the "Principles of Universal Design for Learning (UDL) and is consistent with Web Content Accessibility Guidelines (WCAG)" (Quality Matters™ Rubric Workbook for Higher Education, Fifth Edition, 2014). This provides a beginning place to address accessibility and usability for course design; however, its brevity makes it limited in its usefulness. Thus, the need for the UDL Framework, and combined, "[t]hese guidelines underscore the need for advance planning of content and delivery methods, reflection on the intended outcomes expected of students who complete each course and ways to enhance student participation online with course content" (Robinson & Wizer, 2016, p. 25).

ADDIE Instructional Design

ADDIE is an umbrella term that refers to a group of models sharing common underlying structure and a necessary Instructional System Development (ISD) model that provides a reference for instructional designers, both experienced and novice, as they practice their profession (Branch 2009; Hodell, 2011). The educational philosophy behind ADDIE is that intentional learning needs to be student-centered, innovative, authentic, and inspirational (Branch 2009). ADDIE is an acronym for Analysis, Design, Development, Implementation and Evaluation. ADDIE tends to operate as a system by adopting the Input, Process, and Output (IPO) paradigm (Branch 2009; Hodell, 2011). The input phase interacts with variables recognized in the learning context by accepting data, information, and knowledge. The process phase also aims at stimulating creative and divergent thinking by utilizing procedures to interpret, explain, configure, and display multiple approaches to events that may occur in the learning environment. The output phase also tends to give out the results of the process by clearly presenting "ways of knowing that are translated into ways of doing" (Branch, 2009, p. 3). In this vein, the analysis stage of ADDIE becomes the input element for the system and design, development and evaluation are the process phase, while implementation is the output element (Hodell, 2011).

Analysis. Durak and Ataizi (2016) in their process of transforming an online course using the ADDIE model indicate that their analysis phase includes needs analysis, analysis of learner, content analysis, technical analysis, structural analysis, and the analysis of the online environment. The authors conducted this analysis in order to discover gaps in the elements that influence students learning. Hodell (2011), on the other hand, suggested that analysis is the data gathering ingredient of instructional design, which, among other things, enables instructional designers to contrive the challenges or problems into "tangible actions items" (p. 25).

Design. Durak and Ataizi (2016) explain that design "is a process which includes responding to the questions of how to carry out the objectives and strategies determined in the analysis phase" (p. 2086). Designing their course, the authors defined their objectives and designed their communication factors to ensure that there will be interaction between and among learners, faculty members, and the content. They also designed their course content and technology sub-structure to support the online learning. Further, the authors designed their evaluation system and fashioned an online environment ensuring that resources can be easily utilized by the learners. Durak and Ataizi's (2016) design phase activities confirm Hodell's (2011) assertion that design is the blueprint stage of an instructional system whereby instructional designer produce the blueprint for a project with all the specification needed to accomplish the project.

Development. Durak and Ataizi (2016) indicated that this stage focuses on preparing the platform that will be used. In doing so, they configured their setting, selected modules, and shaped them. They went on to divide course modules, develop them, and prepare the content for the modules, and develop the evaluation systems that would be used. Durak and Ataizi's activities in this stage produced materials to be implemented. They also performed pilot testing to determine the effectiveness of the planned activities. The pilot testing ensured that organizations implemented only appropriate changes and to also see to it that designers felt confident that their designs could be operationalized (Hodell, 2011).

Implementation. This is the stage in which learners begin to interact with the design plan (Durak & Ataizi, 2016; Hodell, 2011). Durak and Ataizi (2016) in this stage of their program design began by introducing the learners to the use of the system they had designed. This was done to ensure that learners familiarize themselves with the overall system that had been put in place, as well as experience how equipment and resources would be used. They also provided supporting materials, such as updating resources that could support learners in the learning environment. They then commenced the course after they ensured that necessary measures had been put in place.

Evaluation. To find out whether the design objectives were being met, Durak and Ataizi (2016) used weekly homework and reflections from learners. They also ensured that instructors provided learners with constant feedback on their homework. Hodell (2011, p. 25), however, made it clear by stating, "Evaluation doesn't deserve to be listed last in the ADDIE model because it takes place in every element and surrounds the instructional design process. Evaluation is a constant guard at the gate of failure." The author indicated that evaluation should involve a continuous review and revision of all the elements of ADDIE. Similarly, Branch (2009) explained that evaluation should initiate, permeate, and conclude any ADDIE process so that designers can intervene in all processes to improve the process and overall design.

METHODS

This article includes the findings from a qualitative study of learner perspectives of UDL learning. In addition to UDL framework, participatory course design was used by the instructor and modeled in the UDL Course. This participatory framework led to an opportunity for a participatory action research process (Duncan & Morrell, 2008) to acquire instructor and learner perspectives, thereby drawing upon the voices of the learners who participated in the UDL Course.

RESEARCH QUESTIONS

1. How was the course designed to model UDL to teach UDL?
2. How will the learners apply UDL in their contexts?
3. How could the UDL Course be improved?

DATA COLLECTION

1. The archived online course, including the syllabus, course map, and modularly developed content were used by the instructor to create a design perspective of the course and address research question number one.
2. Learner perspectives were created by students who took the course to address all three research questions.

PARTICIPANTS AND AUTHORS

Seventeen (17) graduate students took the course. The instructor and several of the graduate students agreed that there was an opportunity to reflect on this course and share outcomes through scholarship. These students were also interested in apprenticeship regarding the process of scholarly publication. Thus, after the course ended, four of the most participatory graduate students in the course were invited to contribute narrative data of their learner perspectives and participate in the writing of this article. Additionally, the instructor's research assistant served as an external researcher for narrative analysis to identify answers to the questions and related themes, thereby avoiding bias in the findings. Finally, a colleague of the instructor who serves as a peer mentor in the area of research methods joined the writing team to further support bias avoidance, inter-rater reliability, and the apprenticing of the graduate students in the area of scholarly publication.

Instructor Perspective on UDL Course Design

This instructor design perspective for the UDL Course provides insight to the course design process and a partial answer to the first research question for this article - How was the course designed to model UDL to teach UDL?

Design Framework

As the UDL Course designer and instructor, I used the previously discussed framework of UDL Guidelines, Quality Matters, and ADDIE (Analysis, Design, Development, Implementation, Evaluation) for the design of the UDL Course. I have been creating online courses for twelve years and have three courses that are Quality Matters recognized. Of note, I recognize that there are various instructional design models besides ADDIE that could also be relevant; however, I have chosen ADDIE for its foundational role in the literature. I use this framework with my students as the first model we discuss as it contains much of the foundational vocabulary for establishing a baseline of knowledge for beginning instructional/learning designers. One further note is the interchangeable use of the terms students and learners. During course design and related to educational literature, the term student is prevalent. However, during the implementation of a course, I believe it is important to become a community of learners, and the transition from student to learner is indicated in this instructor perspective.

Analysis and Design

I was excited to teach the graduate level UDL Course because UDL is an area that I believe is becoming more critical to the field and an area of personal professional growth. The UDL Course, titled *Universal Design for Online Course Design*, was a 100% online course, and I drew from a complete pre-existing online course that was Quality Matters recognized. The course description was:

> This course is a graduate-level course that explores theoretical and practical implications of universal design in the online course. A new paradigm for instructional design is introduced to demonstrate the potential of universal design to reduce barriers to learning. By designing instruction with accommodation in mind, you increase the opportunity to reach a broader audience of learners. In this course, you will learn how to maximize learning opportunities for all students and gain an understanding of global and policy implications.

Learning objectives and participatory design. The UDL Course had pre-existing learning objectives, activities, and assessments. However, a strategy that I use in some graduate courses is one of active student participation (Abdelmalak, 2013) in the form of participatory course design (Parra & Bontly, 2016). Students involved in the participatory course design process start at the beginning of class where they engage in discussion forums to identify personal goals and class goals, then transition to live class meetings where they participate in the co-design and development of the class goals, activities, and assessments. Throughout the course, students continue this process and have the opportunity to negotiate the goals, activities, and assessments as needed.

This UDL Course was an opportunity for participatory course design. Thus, the initial activities for the course included the opportunity for students/learners to participate in co-design of the course. The learners were provided the initial course and learning objectives as well as access to the pre-existing course materials. Course design included provision of two discussion forums for learners to contribute to for the purpose of co-creating the course goals, objectives, activities, and assessments. A live synchronous class orientation was provided using web conferencing for

instructor and learners to discuss the merging of existing and new objectives. Together, the instructor and learners identified the following Course Learning Objectives:

1. Foster an online learning and knowledge building community.
2. Establish background knowledge about the basics of instructional design to ensure everyone establishes a baseline for design vocabulary and concepts.
3. Learn and apply the basics of Universal Design for Learning in face-to-face and online courses.
4. Recognize the implications of diversity, inclusivity, culturally responsive teaching, and globalization on Universal Design for Learning.
5. Explore UDL in relation to accessibility, Americans with Disabilities Act (ADA), policies, and legal ramifications. Further, learners wanted to explore within their individual contexts such as state level or country of student origin.
6. Create online course materials that meet UDL standards as well as taking accessibility into consideration.

In reflecting on UDL (CAST, 2018), this type of active student/learner participation through co-creation of the course itself, modeled the UDL Guidelines for providing multiple means of engagement.

Development, Implementation, & Evaluation

I planned initial activities for the learners to complete, including an Introductions activity that focused on a Superhero theme, setting up technology to be used in the course, a learning style assessment, and a teaching style assessment. I designed a course map (see Appendix A) and developed the UDL Course one module at a time. I provided a live class meeting at the beginning of each module to ensure participatory integrity and learner feedback. As I designed the course activities and assessments, I kept in mind that when one is teaching design concepts, it makes sense to use and model those design concepts. For example, the first module was provided to level the playing field and make sure that all learners had access to critical background knowledge regarding the vocabulary and concepts of the UDL umbrella topic - instructional design. This drew upon the UDL Guideline and options for providing multiple means of representation.

Further, the activities for this introductory module included a live class meeting, reviewing resources and conducting independent online research, online discussion, and the use of multimedia to create a product of learning and assessment. These activities drew upon all of the UDL Guidelines and select options for providing multiple forms of engagement, representation, and action and expression. Though the basic design for the UDL Course was evident from the beginning, the timing and details were developed throughout the semester. Related to ADDIE, I engaged in an iterative process related to development, implementation, and formative learning assessment. The use of formative learning assessment to identify student learning and, if needed, remediation with curriculum changes is a form of course evaluation. Further, as related to evaluation, the work done by the instructor and learners for this article provides yet another opportunity of evaluation supporting the course design process for the next iteration of the course.

Learner Perspectives of the UDL Course

Four graduate students who took the UDL Course provided their perspective narratives in response to the following guiding prompt:

a. Review the course and your contributions in the course. Reflect on your experience, and from your perspective, write a narrative that addresses, 1) what you learned about UDL that specifically relates to how you are or will apply to your own context,

2) how, if at all, the resources, the activities, and the course design modeled UDL to teach UDL, and 3) any reflections, recommendations and ideas for critique, what would do you recommend be done differently, and what didn't work for you?

Perspective 1: Accessibility Defined

A university classroom is comprised of students from a wide variety of backgrounds, experiences, and abilities including students for whom English is a second language, students who are sight or hearing impaired, and students with mobility limitations. As college classrooms become more diverse, instructors are challenged to address a variety of learning styles (visual, auditory, kinesthetic) in ways that engage students with multiple modalities. While developing our skills in instructional design, the *Quality Matters Rubric Standards* (Quality Matters™ Higher Education Rubric, 2014) is a research-based set of standards intended to provide feedback in the development, evaluation, and improvement in the design of online and blended courses. It provides a good outline for course design with Standard 8 (QMR) that evaluates course design from the perspective of accessibility and usability; however, the standard does not reflect a clear depiction of what accessibility is and how it is achieved. A better resource for accessibility are the three guiding principles of Universal Design: Representation, Action and Expression, and Engagement. According to the Center for Teaching Innovation at Cornell University (2018, para. 1):

> Universal Design for Learning (UDL) is a teaching approach that works to accommodate the needs and abilities of all learners and eliminate unnecessary hurdles in the learning process. This means developing a flexible learning environment in which information is presented in multiple ways, students engage in learning in a variety of ways, and students are provided options when demonstrating their learning.

Further, I identified the following from the Center for Teaching Innovation at Cornell University (2018, para. 3) as a critical resource with examples:

> 1. Provide Options for Perception - Based on the premise that learners access information differently, this principle means providing flexible and multiple ways to present information. For example, using PowerPoint as a visual supplement to a lecture.
> 2. Provide Options for Expression - Since learners vary in their abilities to demonstrate their learning in different ways, this principle means providing flexible and multiple ways to allow students to express their knowledge or demonstrate their skills. For example, providing students an option of writing a final exam or submitting a final assignment.
> 3. Provide Options for Comprehension - Students are motivated to learn for different reasons and vary in the types of learning activities that keep them engaged. This third principle means providing multiple ways for engaging in course activities. For example, engaging students in both group work activities and individual work, as opposed to engaging students only in individual work.

My goal, and honestly the goal my dean has for me, is for course design to be more adaptive to a diverse student population. The program I work with is global in nature and reflects students needs on that same scale. Course design following the UDL guidelines is accomplished through thoughtful planning, implementing, and evaluating instruction. The UDL course provided me the opportunity to explore universal design through assignments geared to investigate the history and laws regulating online class design. As designers, we must be aware of the regulations and benchmark the best practices of other institutions to conform to the regulations to better serve our students and protect the institution we work with.

From this exercise, the instructor offered the opportunity to utilize the principles of universal design by selecting a particular learning barrier, developing a case study, and addressing the needs of this student with the creation of a learning plan. This was the most intriguing assignment as we participated in group work and moved from theoretical aspects of course design to actual implementation in a scenario that closely mimics a real world environment.

Universal Design is a framework for faculty to use inclusive instructional practices into their courses to reach a broader range of learners than many traditional classroom approaches. Students feel most successful in courses where clear and consistent expectations are set from the beginning, learning is treated as a process, and a variety of instructional strategies are employed by the instructor. Strategies that I identified from the UDL Course for use in my own courses include:

- Being approachable, available, and demonstrating an honest interest in student learning.
- Offering clarity in the course expectations and content by through a well-designed course syllabus, providing outlines of notes, and using reading and study guides.
- Keeping the content interesting and relevant with hands-on and group activities as well as making sure the content is presented in a clear and concise manner.
- Challenging student learning with techniques such as pausing and questioning procedures during lectures.
- Recognizing individuality in the student experience by being open to student feedback and adjusting to important individual student needs such as learning disabilities.

I don't have a critique or recommendation for the UDL Course, but I think there could be a course designed specifically for even more focus on accessibility that this class serves as a prerequisite for. The class could highlight the technical specifics for video captioning, adapting content to screen readers, creating tables that LMS won't scream about, and modifying pdf's. This would be a GREAT professional development class.

Perspective 2: Participatory Learning Design and A Co-creation Journey

Emerging insights about how students learn, perceive, process, and demonstrate learning inspired me to get involved in research about Universal Design for Learning applied to online learning. When discussing how a diverse group of students learn, we must look into how instructors design, teach, and personalize learning. The UDL course represented an opportunity to share, learn, and reflect on others' perspectives and experiences applying the principles of UDL into a student-centered teaching practice.

Addressing Diversity in My Online Classrooms

Looking back at the beginning of the course, I realize how my perspective regarding design has expanded. Inclusion has gained a new meaning as I am reflecting on and redefining the terms disability and learning limitation. When the course started, I had a clear couple of learning goals: a) to dive deeper into effective strategies to keep students engaged in my online courses, and b) to learn about emerging models to promote effective instructor-student and student-student interactions that are suitable to reach a broader audience of learners. As an instructional designer and a faculty trainer at a Community College in the Southwest, it is always a driving question to find effective ways to mitigate issues related to student engagement and successful course completion. This course provided me with an opportunity to learn the theory and civil rights laws behind the UDL framework while exploring examples and practical ideas to create multiple ways to deliver content, to communicate and assess students' progress, and to engage my online students.

While I worked on the course assignments, I gained understanding of accessibility considerations and flexible course design. I was able to simultaneously refine and enhance my online courses by adding a variety of instructional materials and types of media in order to address the students' different ways to acquire knowledge and demonstrate their learning. Being open-minded and listening carefully to how others are using technologies to include more students into their course design was an endless source of imagination and creativity to enhance my own practice.

From a student perspective, I learned about the theoretical framework and practical guidelines of UDL. However, this experience went beyond my expectation and allowed me to also be on the "driver seat". The instructor provided multiple opportunities for us to engage and actively participate in the course design. Co-creating the course as we learned about our own teaching and learning styles was a rather unusual approach for me. It inspired collective thinking and activities where I got out of my comfort zone while experiencing creative ways to engage in a collective thinking design strategy.

My job is mainly teaching faculty how to teach online, UDL principles, and course design best practices. The way the instructor modeled the principles of UDL has transformed my views regarding the way I can engage as an instructor/learner in my own courses. This co-creation experience made me realize it is time to get creative and get my imagination and life-long learner approach to inspire a type of course design process that is relevant to my students' needs and perceptions of the topic. The teaching style exercise resulted in a reflection about my facilitator and personal approach, which seemed to be consistent with the way I see my teaching philosophy. My students are often faculty who are learning how to teach online, so in that scenario, there is plenty of room for constructive conversation and constant feedback. I leave concepts and principles open for my teachers to apply what seems relevant considering their own teaching style.

I believe in the need for instructors to continue to create innovative ways to integrate and model UDL principles. I think the Accessibility Standards and the UDL guidelines with the specific checkpoints are great sources of creativity and a perfect first "pit stop" in the race towards online learning excellence. I had not had the chance to explore these examples in detail, but I am proud to share that now I have a new e-notebook with brief notes for possible activities and assessments as a result of going through these checkpoints. It is one of those resources I want to keep in my instructional designer pocket at all times.

Using multiple ways to present content and various activities for students to engage with the content, the instructor, and with their peers, makes it easier for the instructor to personalize learning and reach out to all students. I will keep in mind a good balance between group and individual activities making alternative options available for students to participate and demonstrate their learning.

I am determined to include a wider range of learners in my course design by creating a learning community within the course. As students bond and share ideas, the class starts building a sense of trust that makes it possible for collaboration to happen. I experienced this in the UDL Course, and I hope this transfers into my teaching strategies. I was able to explore creative ideas and activities to establish and sustain healthy and active interactions within the group.

As a final reflection, I want to say that group work is always a learning experience for me. Having the opportunity to meet other students and most importantly, having made an effort to work together to accomplish a common goal while having such different backgrounds and work styles, was exactly the taste of the richness found in diverse environments.

Also, collaborating in case studies during this class was a reminder of how it is possible to engage in online brainstorming and create something new together, regardless of our differences and physical distance. When I engage in design and teaching, I will keep in mind the following:

- Instructional design might be more focused on the "how", while curriculum design focuses more on the "what".
- Learning design resonates with me because of its student-centered approach and its focus on the students' learning experience, rather than content or delivery methods.
- When providing instruction, both in face to face and online settings, I will make conscientious efforts to turn classes into "collective thinking sessions".
- Creating activities that aim not only at challenging the students' own views but also at encouraging a deeper exploration to discover where their assumptions come from is a must. This fits more with a constructivist approach and a systems thinking approach to teaching, which is consistent with my teaching style inventory assignment results.
- To share this course experience and list of resources with my students who have been interested in UDL and have had trouble with finding concrete ways to exercise this inclusive approach to course design.
- As I plan courses for faculty to learn how to design and teach courses with the UDL framework in mind, I find the idea of case studies and scenario-based activities a powerful strategy to teach and help teachers collaborate and internalize the UDL principles. Perhaps UDL education/training programs, both for K-12 and higher education faculty, could use a scenario-based approach as it is easy to follow and definitely inspires peer collaboration and ongoing exchange of ideas.
- I will curate resources by creating a bank of links to sites, networks, and documents highlighting "why" I need them, "what" I am addressing in each set of resources, and a list of answers to the question of "how" I am going to address the multiple needs of my students. Basically, I will create some sort of matrix to access my bank of resources that will allow me to gather the resources I want to share with others and keep updating my instructional tool box.

The UDL challenge unfolding in real-time experience. As I gained broader comprehension of the UDL framework and the nuances taking this emerging model from theory to practice, I continued to strengthen a philosophical and practical reflection on the reasons behind the difficulty perceived by faculty when creating universally designed courses. My dissertation research, participation in online course reviews and guided discussions in various online learning conferences, had made it apparent that it is not uncommon that Standard 8, which includes accessibility, is the hardest to address. This is a thought-provoking topic as its underlying philosophy is inclusion and learning opportunities for a wider range of learners. Providing the tools and strategies for students to be able to succeed even if they have a limitation kept me inspired and enthusiastic about this research field.

The course addressed not only a thorough discussion of the UDL model, but most importantly, it included collective dialogue activities around inclusion, culturally responsive teaching, policy related to accessibility, and the recognition of universal design implications in a globalized education system. A suggestion for future implementation could be to create an optional module that emphasizes on the research regarding the gaps in professional development, learning and cultural transformation for successful institution-wide implementation of UDL.

Perspective 3: A Possibility to Teach and Reach Every Student in My Science Classroom

The UDL Course encouraged me to enhance the learning experience of students in an introductory biology course through the use of multiple instructional methods, strategies, materials, and assessments.

As an instructor, I am becoming much more insightful about designing and delivering my course after I learned how the UDL framework emphasizes adapting the curriculum rather than adapting the learner (Rose & Meyer, 2006). It is a challenge in an introductory biology course with a large number of students, most of whom are from biology non-majors, to engage them in biology and practice student-centered learning strategies (Preszler, 2006; Shuster & Preszler, 2014). Undergraduate students usually enroll in science courses as it is a mandatory part of their program rather than from interest. However, when these students find the content and process of learning contextualized, they become more engaged; they interact and participate more in the classroom. Providing multiple approaches towards the goal of scaffolding students through knowledge acquisition, demonstration of skills they develop, and engagement in their own learning can change the scenario in the science classroom.

One area of focus in the UDL Course was a module about Extending UDL. In this module, we addressed inclusivity, culturally responsive teaching, and global learners. The concepts from this module have impacted my course design. To address all learners, there is a need to transform our classroom from traditional teacher-centered, lecture-based, testing during exams to a dynamic, student centered, collaborative, and an inclusive classroom (Bonner, 2004; Handelsman, Miller, & Pfund, 2004; Preszler, 2006). Creating opportunities for every learner to learn is a fundamental objective that can be done by adopting diversity in our teaching and learning practices. Learning when combined with diversity can motivate students to become engaged and reflective learners.

In an in-class activity in the Introductory Biology course I teach, when students read and discuss with peers about global issues on pollution, population explosion, malnutrition, disease, and other problems, they can compare similar issues in their community and try to think about ways to solve it. The students learn about diverse people, race, ethnicities, natural habitat, social, cultural, and political activities around the world that is different from their own experience. Moving beyond their experience helps them to think deeply, analyze critically, and solve problems innovatively. This can help students to learn about the nature of science, appreciate how real-life problems can be solved with the knowledge acquired theoretically, and professional skills developed in the process.

Through participating in the UDL Course, I realized the need to rethink my strategies and to ensure they reflect inclusivity in the class activities for my students (Burgstahler & Cory, 2008). To further promote student engagement, diversity, and inclusivity I have used the following: iClicker assessments, brainstorming, case studies, multimedia for learning and student media creation, and team based cooperative learning.

iClicker assessments. At the beginning of doing an in-class activity, students review their prep assignment by discussing it with other students in the class. Then, we do iClicker assessments to gauge whether they read and understood the topic and concept. The iClicker assessment gives an idea about their background knowledge before they start doing the activity. iClicker assessments promote student-student and student-instructor interactions and support individualized learning (Jensen, Moore & Hatch, 2002; Preszler, Dawe, Shuster, & Shuster, 2007). Related to UDL, iClicker assessments provide multiple means of action and expression using a common assistive technology through which the activity is accessible and functional to most students (Rose & Gravel, 2010).

With this activity, each student is asked to answer a question without hesitating to raise their hand or speak as is in the oral questioning process in a traditional classroom.

Students interact among themselves while answering, and they can change their answer because the machine records the student's latest response. After students have answered, a histogram appears showing the class responses. This enables students to gain a better understanding of the concept, and the instructor can use this formative assessment either to move to the ensuing activity or review the concept.

Brainstorming. In brainstorming, students are asked questions related to the activity, and then a list is prepared from their responses. Next, the answers are categorized to discover the depth of their knowledge. For example, for an activity on "Infectious Diseases and Prevention," students are asked to name the diseases they know. After all the diseases students named are listed on the board, the diseases were categorized (a) according to the causative agent, whether caused by bacteria, virus, fungi and other causes; and (b) according to the treatment available, such as antibiotics, vaccines, surgery, and other procedures. Brainstorming gives an overview of students collective knowledge and is able to evaluate how much they know about the causes and treatment of infectious diseases. Brainstorming also expands the options for perception, which is crucial in the UDL approach, by encouraging metacognition to assess their prior knowledge, present understanding, and strength (Smith, 2012).

Context-based learning and case studies. Context-based learning through stories or real life situations are powerful and effective in stimulating interest in students. Context-based learning helps students learn to connect new information with prior knowledge, which can also encourage imagination and cognitive thinking. Contexts from different countries, cultures, communities, and events bring diversity into the process of learning and understanding based on diverse social, economic, political, and cultural situations.

This process facilitates social learning and emotional intelligence through development of skills to explore, research, ask questions, interpret meaning, and express points of view (Robin, 2008).

I have added context-based learning in my Introductory Biology class through the use of case studies. Analyzing a case study creates opportunities for inductive learners to learn better from examples versus traditional science methods of teaching relevant theory or modeling and then doing the exercises which help deductive learners (Prince & Felder, 2007). Case studies are significant in developing students' abilities to identify and think critically about issues and relationships between science, individual, community, and multiple perspectives (Lundeberg, Levin & Harrington, 1999). In relation to UDL, case study is an important tool for improving students perceptions of science along with the learning outcomes (Lundeberg, Levin, & Harrington, 1999; Lundeberg & Yadav, 2006).

Another activity in my Introductory Biology course is providing students with different case studies of patients. After reading the case study, students need to identify the disease from the symptoms and causative agent. In small groups, students discuss what precautions are needed to prevent the disease and what the patient can do next. This provides students an opportunity to discuss the disease, their experience, connecting their prior knowledge and readings, and other factors that are related with the infection and its spread. In this way, students learn about different opinions among the group and clarify misconceptions. Students think about what recommendations to give to patients in such a situation justifying the recommendations with reasons. In this way, students learn about decision making.

Multimedia for learning and student media creation. Students are given multiple options for completing assignment, for instance, students may choose one way to demonstrate their assignments by creating a podcast, a video, Powerpoint presentation, to draw a comic strip or other ways in which students want to do. Students when meet the assignment criteria for example when doing the "Infection" activity they need to address the name of the disease and the causative agent, symptoms, treatment option (specifically antibiotic/ vaccine/ other drugs), and what they would do to as a member in a community to prevent/reduce the occurrence for this disease. In relation to UDL, students are get flexibility to use what is accessible to them and in what way they want to show (Reynolds & Fletcher-Janzen, 2007).

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Perspective 4: Reinforcing Democratization in the Classroom to Augment Creativity

The UDL Course was designed to introduce students to the principles of Universal Design for Learning (UDL), which are the multiple means of representation, engagement, action and expression.

In one of the first assignments, students were provided with an opportunity to reflect on their "superhero" identity. Through this assignment, students were able to grasp the understanding of concepts, such as instructional design, learning design, and curriculum design. Course activities ensured that students reflected on their learning styles and teaching styles, which led students identifying their learning identities. This activity was particularly significant because "people with a learning identity see themselves as learners, seek and engage life experiences with a learning attitude, and believe in their ability to learn (Kolb & Kolb, 2009, p. 1). For instance, by being able to identify what suits me best in my learning, I was enthused to incorporate those learning styles into my learning process. As a result, I understood why there is a need for instructors to know strategies that incentivize students to engage in all aspects of classroom activities and decision making.

As a prospective teacher and instructional designer focusing on the effective integration of technology in all learning environments, I was enthused to pursue this course to acquire skills and experience on how the principles of UDL could be effectively utilized to support instructional design that support diverse learners. My objective is to design instructions that support learners' economic, social, physical, and emotional needs. Prior to this course, my belief was that instructional design should provide equal opportunities and privileges to all learners so that they would be able to develop their potentials.

Just as Taylor, Dieker, and Delisio (2018, p. 41) indicated, "detailed vision and course objectives will help guide instruction, activities, and engagement during class." Accordingly, the first class was a live orientation of the UDL course and was designed to determine, define, and redefine the course's goals and objectives to meet the needs of the students.

This live session ensured that the students who were present at the orientation session participate effectively in deciding what they hoped to achieve at the end of the course. Also, as the learning process was ongoing, the students, together with the instructor, suggested activities that would assist them in realizing the goals and objectives of the course. This process provided an opportunity for students to experience democratization in their first class meeting as it clarified that the course's activities were student-centered. This democratization was essential as engaging students in classroom activities can play a pivotal role in students' understanding, prediction, and improve students' in-course motivations (Reeve & Lee, 2014). Further, engaging students, "enhances a possibility of intellectual activity, and it accommodates learning in a developmental sense" (Moswela, 2010, p. 62).

It was apparent that activities in the course were designed based on the guiding principles of UDL. For example, to achieve the course's objectives, the instructor and the students adopted the inquiry method of teaching and learning. Using this method, students had to inquire about the meaning of major terminology and brainstorm solutions to specific cases. Also, as earlier noted, the course required that the students understand their individual learning styles. Lastly, the course maintained flexibility in the entire learning process. This flexibility assured that the learners had the choice to determine how they would demonstrate their understanding during the entire period of teaching and learning. The flexibility also provided a room for the students to collaborate with each other to complete projects. These strategies, therefore, made the course satisfy some major aspects of the three guiding principles of UDL.

Specifically, by identifying my learning style, the course assisted me in realizing that I learn best through texts and visuals resources.

As a result, I accessed suitable learning resources that suited my learning, such as written articles and videos to understand some of the terminology used in class as well to do major assignments. Since there were no restrictions, I ensured that the resources I gathered were customized and clarified in such a way that, I believe, would be visually appealing and assist me to better understand the courses' concepts. Inasmuch as the course allowed me to recognize, access, and customize multiple avenues of information, I can conclude that this course met the multiple means of representation guidelines.

Again, the flexibility of the course allowed me to engage in the learning process in a way that made me realize some of my potential. For instance, in the module about developing UDL terminology, in which we were given the choice to demonstrate our understanding of UDL vocabulary, I chose to write a dialogue using some of the given terminology. The dialogue I created was between an instructional designer and her former student discussing instructional design models and UDL implementation in the classroom. Also, in response to another activity, I chose to develop a podcast. The opportunity given to us by the course to communicate our understanding differently, clearly indicated that the course adopted the UDL principle related to multiple means of action and expression guideline.

The autonomy to present my understanding in my own unique way, and the ability to access resources that suited my learning incentivized me to further engage in the courses' activities. My interest was also sustained in the course when I engaged in a collaborative project with other colleagues to brainstorm different learner issues and how to assist learners using the UDL principles to design instructions. The courses' activities sparked my interest, and it indicated that the course aimed at creating multiple means in which students could be engaged in class activities.

These experiences made me realize the essence of ensuring that learners know their learning styles since it will assist instructors to design instructions that cater to learners individual needs. Also, it demonstrates how students' enthusiasm to engage in course activities may be obtained through the provision of several avenues for them to communicate their understanding. The course's activities satisfied the guiding principles of UDL by ensuring that we achieve its objectives by using multiple ways that suit the learners learning and adopted the main ideology of UDL, which is to "attempt to ensure that the means for learning, and their results, are equally accessible to all students" (Rose & Gravel, 2010, p. 2).

It must be emphasized that as a prospective teacher who possesses the experience provided by this course, I will ensure that prior to defining and redefining course's specific objectives, I will assist learners to determine their learning styles. In so doing, I will be able to determine instructional barriers for a range of students. This will, by all means, assist me in determining effective and efficient tools that will assist the diverse needs of the learners. Again, it will also enable me as an instructor to adopt a flexible teaching method, materials, and assessments that assist learners in being creative, and to critically respond to issues that affect them. By flexibility, I mean that learners will have some level of autonomy to actively participate in the decision making of the methods and materials that will assist in their learning. Particularly, I believe, this will serve as a motivating factor to motivate learners to engage in activities in which they took part to organize.

Among other things, as an instructor, I hope to ensure that learners are exposed to new and emerging digital tools and their multiple functions which support diverse teachings and learnings. This exposure will reduce the time students need to search for resources that support their learning.

Again, the ability to apply UDL when I am designing a course for my own students will introduce them to the principles of UDL. My students can then also adopt UDL in the class or in their future endeavors. Equally important, by understanding UDL principles, the students will embrace the fact that one size does not fit all (Harris, 2008; Rose & Gravel, 2010) and as result accept that there is the need to support each other through collaboration and cooperation.

I experienced two key challenges in the UDL Course. First, there was no continuous discussion on issues. Due to the fact that the assessment required a minimum of three replies to obtain full points, most students restricted their replies to only three. As a result, some questions raised by the students during some discussions rarely received replies or answers. This might be attributed to the fact that the students perceived that they had already attained what the assessment rubric required from them. Second, a conundrum I noticed was the tendency of students who posted their responses and replies early to missed out on later posts from other students which might have been beneficial to them. It was evident that the online students in the UDL Course were diverse in terms of resources available, their roles as workers cum students, etc. Admittedly, these circumstances might influence their rate of response to class discussions. Therefore, as we had the free will to post our assignments and reply to our colleagues assignments anytime within an assigned period, there were instances where the first three to five students might post and reply to each other's work in order to meets assessment requirements so that they could proceed to other assignments.

I suggest that after discussion posts, both instructors and students review the discussion to reveal possible questions raised by the students on the discussion board. They can, therefore, open a brief discussion to address these questions that might have been raised.

Lastly, a restriction could be placed on the time to respond to instructor's questions and the time that students' reply to each other's posts. For instance, though a student can respond to major questions at any time, she/he can only respond to colleagues' posts at a time where it is expected that all students have submitted their work. In this case, the students would have the opportunity to review the majority of their colleagues' work.

Data Analysis and Findings

The doctoral research assistant, who was not a student in the UDL Course, examined the course and the learners' perspectives. The methodology for analyzing the course materials and the learner perspectives was primarily qualitative and involved a thematic analysis of the narratives. The doctoral research assistant and the instructor's colleague who provided research methodology mentoring for the writing team, came to an agreement regarding the consistency and the reliability of the themes, thus satisfying inter-rater reliability. The findings of the analysis were sub-divided by research question and coded by concept. Interrelationships among concepts were scrutinized. The perspectives were compared, categorized, and patterns were identified. The themes were emergent, and iterative concepts were drawn from the data. Thus, through this discovery process, conclusions were induced from the interpretative analysis.

The analysis was concentrated on the research questions. The examination found similarities among learner perspectives, and themes began to overlap among the research questions. Overarching themes encompassed how learning about Universal Design for Learning (UDL) and the manner in which it was modeled to them by the instructor had molded the learners' teaching styles and strategies to transform their current and future classrooms. What follows is an analysis of the findings of each research question.

Research Question One: How was the course designed to model UDL to teach UDL?

After carefully analyzing the learners' perspectives regarding research question one, three themes were identified to answer the question of how the course was designed to model UDL to teach UDL; through: 1) exploring UDL through assignments and course activities; 2) students actively participating in the course design; and 3) the instructor's teaching strategies.

Exploring UDL through assignments and course activities. The learners stated that they learned a lot about UDL through various course assignments, particularly the Superhero Introductions assignment and identifying learning styles. In the Superhero assignment, students were asked to reflect on their 'superhero' identity. One learner stated that this activity was particularly significant and quoted Kolb & Kolb (2009) in saying that "people with a learning identity see themselves as learners, seek and engage life experiences with a learning attitude and belief in their ability to learn" (p. 1). Learning about the importance of helping students find their 'superhero' identity helped the learners grasp the understanding of concepts such as instructional design, learning design, and curriculum design.

The course modules also helped students explore UDL. One module in particular stood out for one learner, the module on extending UDL. The learner commented:

> *[W]e addressed inclusivity, culturally responsive teaching, and global learners. The concepts from this module have impacted my course design. To address all learners, there is a need to transform our classroom from traditional teacher-centered, lecture-based, testing during exams to a dynamic, student centered, collaborative, and inclusive classroom.*

Further, students developed case studies utilizing the principles of universal design by selecting a particular learning barrier and addressing the needs of a hypothetical student with the creation of a learning plan. As one of the learners remarked, "Collaborating in case studies during this class was a reminder of how it is possible to engage in online brainstorming and create something new together, regardless of our differences and physical distance." Another student reflected:

> *As I plan courses for faculty to learn how to design and teach courses with the UDL framework in mind, I find the idea of case studies and scenario-based activities, a powerful strategy to teach and help teachers collaborate and internalize the UDL principles.*

Course activities were particularly designed based on the guiding principles of UDL. To achieve the course's objectives, the instructor and the students adopted the inquiry method of teaching and learning where students had to inquire about the meaning of different topics and brainstorm solutions to specific studies. Working on course assignments and activities ensured that students reflected on their learning styles and teaching styles, which led to students identifying their learning identities. One of the learners commented in their perspective, "[b]y identifying my learning style, the course assisted me to realize that I could learn best through texts and visual resources...The ability to access resources that suited my learning incentivized me to further engage in the courses' activities." Another learner affirmed, "Course activities ensured that students reflected on their learning styles and teaching styles, which led students to identify their learning identities." One more student reflected:

> *I was enthused to incorporate those learning styles into my learning process. Again, as a prospective teacher, I comprehended why there is the need to know some strategies that will incentivize students to engage in all aspects of classroom activities and decision makings.*

Actively participating in the course design. For many students, co-creating a course was a unique experience. As one learner commented, "Co-creating the course as we learned about our own teaching and learning styles was a rather unusual approach for me." Another student stated, "The instructor provided multiple opportunities for us to engage and actively participate in the course design." As one of the learners contemplated, co-creating the course "inspired collective thinking and activities where I got out of my comfort zone while experiencing creative ways to engage in a collective thinking design strategy."

As the learning process was ongoing, the students, together with the instructor, suggested activities that would assist them to realize the goals and objectives of the course. This provided an opportunity for the students to experience democratization. They experienced this democracy from the first class meeting, and from the beginning a student commented, "it clarified that the course's activities were going to be student-centered." The student went on to paraphrase Reeve & Lee (2014) stating that this democratization was essential "because engaging students in classroom activities can play a pivotal role in students' understanding and prediction, and it improves students' in-course motivations." Another student quoted Moswela (2010) that further engaging students "enhances a possibility of intellectual activity and it accommodates learning in a developmental sense" (p. 62). One learner summed it up by saying:

> *This co-creation experience made me realize it is time to get creative and get my imagination and life-long learner approach going to inspire a type of course design process that is relevant to my students' needs and perceptions of the topic.*

Through the instructor's teaching strategies. The instructor's myriad teaching strategies was another way that the course modeled UDL to teach UDL.

One teaching strategy that was mentioned in the learner perspectives was flexibility. As one learner noted, "the flexibility of the course allowed me to engage in the learning process in a way that made me realize some of my potentials." Another learner stated that the flexibility gave them "the autonomy to present my understanding in my own unique way." Further, another student commented:

> *The course maintained flexibility throughout the entire learning process. This flexibility assured that the learners had the choice to determine how they would demonstrate their understanding during the entire period of teaching and learning. The flexibility also provided room for students to collaborate with each other to accomplish projects. These strategies, therefore, made the course satisfy some major aspects of the three guiding principles of UDL.*

Another teaching strategy modeled was presenting course material through multiple means of representation. One student stated, "The course aimed at creating multiple means in which students could be engaged in class activities." Another student in their perspective reflected, "Inasmuch as the course allowed me to recognise, access, and customize multiple avenues, I needed information directed to me. [Therefore,] I can conclude that the course met the multiple means of representation guidelines."

Modeling was another teaching strategy employed by the instructor. As one learner summed it up, "The way the instructor modeled the principles of UDL has transformed my views regarding the way I can engage as an instructor/learner in my own courses." The teacher also modeled diversity and inclusion in the course. One student paraphrased Burgstahler & Corey (2008) in saying that through participating in this UDL course,

> *"I realized the need to rethink my strategies and to ensure they reflect inclusivity in the class activities for my students." The student went on to say that in his/her class, "To further promote student engagement, diversity and inclusivity, I have used the following [strategies]: iClicker assessments, brainstorming, case studies, multimedia for learning and student media creation, and team based cooperative learning."*

Research Question Two: How will the learners apply UDL in their contexts?

After analyzing the learners' perspectives, four themes appeared to answer how the learners will apply UDL in their contexts; through, 1) Course design; 2) Teaching strategies; 3) Shaping teaching styles; and 4) Utilizing UDL strategies in future classrooms

Course Design: Multiple modes of representation. The students learned through course activities and assignments firsthand how learners differ in how they perceive and comprehend information that is presented to them. They were immediately able to apply UDL principles into courses they were currently teaching. One learner, a Biology teacher, was encouraged by what he/she had learned in the UDL course to enhance the learning experiences of the students in an introductory biology course through the use of multiple instructional methods, strategies, materials, and assessments. Another student stated, "I was able to simultaneously refine and enhance my own online courses by adding a variety of instructional materials and types of media in order to address the students' different ways to acquire knowledge and demonstrate their learning."

Course design: Strategies to engage all students. Learners in the UDL course who are presently teachers were well aware of the challenges of engaging students in large classrooms and in required courses that students generally are not interested. One learner affirmed their experience with this obstacle by referring to the literature, "It is a challenge in an introductory biology course with large numbers of students, most of whom are biology non-majors, to engage them in biology and practice-centered learning strategies" (Prezler, 2006; Shuster & Prezler, 2014). The student went on to state that undergraduate students usually enroll in science because it is a mandatory part of their program rather than from interest. However:

> When these students find the content and process of learning contextualized, they become more engaged; they interact and participate more in the classroom. Providing multiple approaches towards the goal of scaffolding students through knowledge acquisition, demonstration of the skills they develop, and engagement in their own learning can change the scenario in the science classroom.

Future teachers were aware of this challenge as well, as stated by one learner: "As a prospective teacher, I understood why it is important to know different strategies that will incentivize students to engage in all aspects of classroom activities and decision making."

Course design: Attention to learning styles. Learners also stated in their perspectives how they learned that ensuring that learners know their learning styles will assist instructors to design instructions that cater to learners' individual needs. One learner noted:

> *I will make sure that prior to defining and redefining the course's specific objectives, I will assist learners to determine their learning styles. In doing so, I will be able to determine instructional barriers for a range of students. This will assist me in determining effective and efficient tools that will assist the diverse needs of the learners.*

Teaching Strategies: Balance individual activities with hands-on and collaborative activities. The UDL course taught the learners that it is important to have a balance of individual, hands-on, and collaborative activities. Further, it reinforced that with a mixture of activities, it is important, as one learner stated, to "make sure the content is presented in a clear and concise manner; have a good balance between group and individual activities making alternative options available for students to participate and demonstrate their learning."

Teaching strategies: Challenge student learning. The students also learned about different teaching techniques, such as pausing and questioning procedures during lectures, and creating activities that aim not only at challenging the students' own views but also "encourage a deeper exploration to discover where their assumptions come from." Learners realized that these newly learned teaching strategies fit more with a constructivist and systems thinking approach to learning. Putting this new knowledge into a framework helped learners understand how teaching strategy and theory come together. One student made this connection after taking the teaching style inventory, "a constructivist and systems thinking approach to teaching is consistent with my teaching style inventory assignment results."

Teaching strategies: Multiple ways to complete assignments. Giving students multiple ways to complete assignments was another strategy learned in the course. As one learner reflected, "providing several avenues for students to participate and communicate their understanding stimulates enthusiasm in the students to engage in course activities."

The learner went on to note, "For example, multimedia and student media creation. Students may choose how to demonstrate their assignments by creating a podcast, a video, PowerPoint presentation, or draw a comic strip, or another way."

Teaching strategies: Connect the global to the local. Further, students reflected on the importance of connecting global issues to local issues in problem solving. "Reading and discussing global and local issues with peers help students learn about diverse people, race, ethnicities, natural habitat, social, cultural, and political activities around the world that is different from their own experience."

Teaching strategies: Diversity and inclusion. Learners also understood the importance of providing tools and strategies for students to be able to succeed even if they have limitations. "Creating opportunities for every learner to learn is a fundamental objective that can be done by adopting diversity in our teaching and learning practices. Learning when combined with diversity can motivate students to become engaged and reflective learners." Another learner stated:

> *I am determined to include a wider range of learners in my course design by creating a learning community within the course. As students bond and share ideas, the class starts building a sense of trust that makes it possible for collaboration to happen. I experienced this in the UDL Course, and I hope this transfers into my teaching strategies. I was able to explore creative ideas and activities to establish and sustain healthy and active interactions within the group.*

Teaching strategies: Contextualized learning. Another learning perspective the students gained was that when the content and process of learning is contextualized, students become more engaged. They interact and participate more in the classroom. One learner reflected, "Stories and real-life situations are powerful and effective in stimulating interest in students." The student paraphrased Robin (2008) that context-based learning helps students learn to connect new information with prior knowledge, which can also encourage imagination and cognitive thinking. Contexts from different countries, cultures, communities, and events bring diversity in the process of learning and understanding based on diverse social, economic, political and cultural situations. This process facilitates social learning and emotional intelligence through development of skills to explore, research, ask questions, interpret meaning, and express different points of view. The student went on to say, "I have added context-based learning in my introductory biology class through the use of case studies."

Shaping Teaching Styles: Clear and Consistent. Clarity and consistency was a takeaway from the UDL course that helped shaped learners' teaching styles. One student noted the importance of "offering clarity in the course expectations and content through a well-designed course syllabus, providing outlines of notes, and using reading and study guides." Another student commented, "Students feel most successful in courses where clear and consistent expectations are set from the beginning, learning is treated as a process, and a variety of instructional strategies are employed by the instructor."

Shaping teaching styles: Teacher as facilitator. Moving away from the "sage on the stage" to "the guide on the side" (Prensky, 2010) style of teaching was also impressed upon students. As one student reflected:

> *The teaching style exercise resulted in a reflection about my facilitator and personal approach which seemed to be coherent with the way I see my teaching philosophy. My students are often faculty who are learning how to teach online, so in that scenario, there is plenty of room for constructive conversation and constant feedback. I leave concepts and principles open for my teachers to apply what seems relevant considering their own teaching style.*

Shaping teaching styles: Flexibility. Learners appreciated the instructor's flexible teaching style and will incorporate flexibility into their future classrooms as noted by one learner perspective:

> *As an instructor, I will adopt a flexible teaching method, materials and assessment that assist learners to be creative and critical to issues that affect them. By flexibility, I mean learners will have some level of autonomy to actively participate in the decision making of methods and materials that will assist their learning. Particularly, I believe, this will serve as a motivating factor to motivate learners to engage in activities in which they took part to organize.*

UDL Strategies: Provide Options. Learners discussed UDL principles they will be bringing into their classrooms. Referencing Cornell University's Center for Teaching Innovation (2018), they discussed the need to provide learners multiple options. Regarding providing options for *perceptions*, a learner stated, "Based on the premise that learners' access information differently, this principle means providing flexible and multiple ways to present information. For example, I can use PowerPoint as a visual supplement to a lecture." Discussing providing options for *expression,* another learner paraphrased Reynolds & Fletcher-Janzen (2007) that in relation to UDL, students have the flexibility to use what is accessible to them and choose in which way they want to show their knowledge. Another student noted:

> *Since learners vary in their abilities to demonstrate their learning in different ways, this principle means providing flexible and multiple ways to allow students to express their knowledge or demonstrate their skills. For example, providing students an option of writing a final exam or submitting a final assignment.*

Regarding providing options for *comprehension,* learner's understood that students are motivated to learn for different reasons and vary in the types of learning activities that keep them engaged. One learner explained that this third principle means "providing multiple ways for engaging in course activities. For example, engaging students in both group work activities and individual work, as opposed to engaging students only in individual work."

UDL Strategies: Create innovative ways to integrate and model UDL principles. One learner discussed the need for innovation in teaching to integrate and model UDL principles:

> *I believe in the need for instructors to continue to create innovative ways to integrate and model UDL principles. I think the Accessibility Standards and the UDL guidelines with the specific checkpoints are great sources of creativity and a perfect first "pit stop" in the race towards online learning excellence. I had not had the chance to explore these examples in detail, but I am proud to share that now I have a new e-notebook with brief notes for possible activities*

> *and assessments as a result of going through these checkpoints. It is one of those resources I want to keep in my instructional designer pocket at all times.*

Research Question Three: What were learner perspectives about the UDL Course design including recommendations for improvement?

After analyzing the learners' perspectives, several strengths and areas for improvement were identified. Regarding strengths, five themes appeared to recur in the learners perspectives: 1) sharing, learning, and reflecting; 2) theory, practice, and laws; 3) co-creating the course; 4) achieving objectives in multiple ways; and 5) the course inspired further research into UDL. Concerning areas for improvement, two themes recurred in the learners perspectives: 1) more offerings related to UDL and accessibility and 2) improved discussion forum design. Following are student perspectives regarding the strengths and areas of improvement needed for the course.

Strengths: Sharing, learning, and reflecting. The UDL Course provided the opportunity for learners to share knowledge and ideas, learn new knowledge to take back to their classrooms, and to reflect upon all that they had learned. As one learner stated, "*The UDL course represented an opportunity to share, learn and reflect on others' perspectives and experiences applying the principles of UDL into a student-centered teaching practice.*" When reflecting upon what they had learned in the course, another learner commented, "*Looking back at the beginning of the course, I realize how my perspective regarding design has expanded. Inclusion has gained a new meaning as I am reflecting on and redefining the terms disability and learning limitation*."

Strengths: theory, practice, and laws. Students particularly valued learning about the theory, practice, and laws surrounding UDL. One of the learners stated, **"**From a student perspective, I learned about the theoretical framework and practical guidelines of UDL. However, this experience went beyond my expectation and allowed me to also be on the "driver seat"." Another student stated:

> *As an instructional designer and a faculty trainer at a Community College in the Southwest, it is always a driving question to find effective ways to mitigate issues related to student engagement and successful course completion. This course provided me with an opportunity to learn the theory and civil rights laws behind the UDL framework while exploring examples and practical ideas to create multiple ways to deliver content, to communicate and assess students' progress, and to engage my online students.*

Strengths: Co-creating the course. The learners were engaged by the participatory course design. They enjoyed being able to co-create course objectives, activities, and assessments. As one learner noted:

> *The instructor provided multiple opportunities for us to engage and actively participate in the course design. Co-creating the course as we learned about our own teaching and learning styles was a rather unusual approach for me. It inspired collective thinking and activities where I got out of my comfort zone while experiencing creative ways to engage in a collective thinking design strategy.*

Strengths: Achieving objectives in multiple ways. Learners appreciated being able to achieve the course objectives in diverse ways. They also saw that accomplishing objectives using multiple approaches was an effective UDL strategy. One of the learner's commented that the course's activities satisfied the guiding principles of UDL by ensuring that:

> *We achieve its objectives using multiple ways that suit the learners learning and adopted the main ideology of UDL, which according to Rose & Gravel (2010, p. 2) is 'to attempt to ensure that the means for learning, and their results, are equally accessible to all students'.*

Strengths: The course inspired further research into UDL. Taking the UDL Course sparked the academic interests of students. It inspired them to pursue further research into UDL to apply in their classroom teaching. One learner commented, "This course, and the emerging insights I gained about how students learn, perceive, process, and demonstrate learning, inspired me to get involved in research about Universal Design for Learning applied to online learning."

Improvement: More offerings related to UDL and accessibility. Learners expressed the desire for covering more UDL material during the course. Acknowledging the limitation of time, one learner offered the suggestion of optional or extra credit modules on other important issues not covered in the class modules: "*A suggestion for future implementation could be to create an optional module that emphasizes on the research regarding the gaps in professional development, learning and cultural transformation for successful institution-wide implementation of UDL.*" Another learner commented on the desire for an additional course in the related program:

> *I think there could be a course designed specifically for even more focus on accessibility that this class serves as a prerequisite for. The class could highlight the technical specifics for video captioning, adapting content to screen readers, creating tables that LMS won't scream about, and modifying pdf's. This would be a GREAT professional development class.*

Improvement: Improved discussion forum design. Several suggestions for improvement were shared related to discussion forum activity design. One learner noted the lack of continuity in discussion on issues and a need for deeper conversations on class topics. This learner stated:

> *There was no continuous discussion on issues. Due to the fact that the assessment required a minimum of three replies to obtain full marks, most students restricted their replies to only three. As a result, some questions raised by the students during some discussions rarely received replies or answers. This might be attributed to the fact that the students perceived that they had already attained what the assessment rubric required from them.*

Another area discussed for improving the discussion board forum was to change the rules for participating in the discussion board area. Particularly, more stringent requirements for posting and responding to discussion prompts was discussed in this learner's perspective:

> *A conundrum I noticed was the tendency of students who posted their responses and replies early missed out on later posts from other students, which might have been beneficial to them. It was evident that the online students in the UDL Course were diverse in terms of resources available, their roles as workers cum students, etc. Admittedly, these circumstances might influence their rate of response to class discussions.*

> *Therefore, as we had the free will to post our assignments and reply to our colleagues' assignments anytime within an assigned period, there were instances where the first three to five students might post and reply to each other's work in order to meets assessment requirements so that they proceed to other assignments.*

Additionally, it was suggested that at the end of a discussion board, before moving on to the next discussion topic, to have a space to summarize the different discussion postings and to answer the various questions posed during the discussion forum. It was noted that this could give proper closure to course topics before transitioning into new areas of exploration. One learner commented on this area for improvement in his/her perspective:

> *I suggest that after discussion posts, both instructors and students should review discussions to reveal possible questions raised by the students on the discussion board. They can, therefore, open a brief discussion to address these questions that might have been raised.*

A final suggestion for improving the discussion board forum was to apply more stringent time restrictions on posting discussions. As one learner noted, this would oblige learners to read the contributions of all students, not just what was required of them:

> *A restriction could be placed on the time to respond to instructor's questions and the time students reply to each other's post. For instance, though, a student can respond to major questions at any time, she or he could only respond to colleagues' posts at a time where it is expected that all students have submitted their work. In this case, the students would have the opportunity to review a majority of their colleagues work.*

CONCLUSION

This paper discussed instructor and learner perspectives of an online learning technologies course that utilized Universal Design for Learning (UDL) principles to support the teaching of UDL. Through a 16-week learning journey in the principles of UDL, students gained valuable insight into the important course design principles of ADDIE, Quality Matters Standards, and UDL. While the students learning was valuable, and the course experience was positive, the findings of this qualitative study support continued improvement of course design for the next iteration of the UDL Course to improve the course even further. The next UDL Course iteration can further incorporate providing ideas for other educators interested in implementing UDL concepts in their courses. The findings of this study are intended to be shared with others interested in utilizing UDL in online teaching strategies and course development.

Our findings indicate that immense student learning took place during this 16-week course. Two overall findings resounded in this qualitative narrative study. First, learners in the UDL Course acknowledged the complexity of UDL. They recognized how difficult it is for teachers to apply UDL, particularly when they have not received education or professional development in this area. This was encapsulated in the comments of one learner's perspective:

> *As I gained broader comprehension of the UDL framework and the nuances taking this emerging model from theory to practice, I continued to strengthen a philosophical and practical reflection on the reasons behind the difficulty perceived by faculty when creating universally designed courses.*

Second, they appreciated the opportunity to access information and skill development by taking the UDL Course but recognized that this was just a starting point.

The learners wanted more materials, more coursework, and some of them participated in writing this article.

Given these findings, we recommend additional design-focused research, as the use of UDL for course design is an evolving and iterative process. We believe that the core concepts of UDL can be attractive to teachers and students if presented in an engaging way and these engaging strategies need to be identified and shared. Moreover, as we learned in our course exploration and will continue to heed in our future teaching careers, UDL is a journey, not a destination.

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Appendix: Course Map

Table 1: UDL Course Map

Module/Course Goals	**Learning Objectives**	**Resources, Activities, Assessments**
Course Materials		1.Syllabus 2.Live Class Meetings Schedule 3.Adobe Connect How To & Help 4.Related & Recommended Books 5.Course Map
Getting Started (January 17-February 7)	CLO1	1.Co-Create: What are your goals & key questions? (Questions and replies in discussion forum) 2.Co-Create: What activities and assessments can be done to achieve the class goals & objectives? (Questions and replies in discussion forum) 3.Introductions: We are Superheroes! (Use relevant avatar creation tools and post/reply in discussion forum) 4.Live Course Orientation (Attend or view recording) 5.Set Up Your Tech Toolkit 6.What's your learning style? (44 question index and online discussion) 7.What's your teaching style? (Teaching style survey and online discussion)
Designers' Guide 1: Building Foundations for UDL with Instructional Design (February 8-22)	CLO1, CLO2	1.Live Course Meeting (attend or view recording) 2.The Basics of Instructional Design (Research, answer questions, post replies in discussion forum) 3.What does a Learning Designer/Instructional Designer do? (Use multimedia to answer the question and post/reply in discussion forum)
Designers' Guide 2: The Foundations of Universal Design (February 23-March 12)	CLO1, CLO3	1.Live Course Meeting (attend or view recording) 2.Key UDL Resources & Your Designer's Guide (Resources provided, students research and add their own, students decide how to curate and keep important course content) 3.Develop the Language for UDL (Student use new vocabulary and concepts by creating a learning artifact of choice, post and reply in discussion forum)

Module/Course Goals	Learning Objectives	Resources, Activities, Assessments
Designers' Guide 3: Extending UDL with Diversity, Inclusivity, Culturally Responsive Teaching, & Global Implications (March 12-April 9)	CLO1, CLO4	1.Extending UDL (Resources provided, students research to identify learners or learner characteristics that could benefit from UDL, posts and replies in discussion forum) 2.Team Development (Students form teams) 3.UDL Case Studies (Types of learners and a case model provided, teams choose a learner type and create a case study including recommendations for each of the 3 UDL Principles)
Designers' Guide 4: All About ADA/Accessibility (April 11-May 2)	CLO1, CLO5	1.Live Course Meeting (attend or view recording) 2.Your Timelines of Policy & Response to Policy (Resources provided and students research federal directives for ADA compliance and how relevant entities have responded, create and share timelines in discussion forum) 3.Design/Re-design & Develop an Online Course Module (Students apply learning to creation of personalized online course module, post to discussion forum and provide design support to each other) 4.Required and Extra Credit Mini-Discussions (activities in discussion forums provided to extend learning)
Closing the Loop with Learner Sharing & Course Evaluation (May 2-11)	CLO1, CLO6	1.Learner Sharing (Students create and share in discusion a 10-minute multimedia presentation to highlight created module materials and how course concepts were used) 2.Final Reflection (Students view other students presentation and write a 1-2 page paper reflecting on what new information or ideas learned)