Towards Deep Learning in Online Courses: A Case Study in Cross-pollinating Universal Design for Learning and Dialogic Teaching

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Abstract: This article presents a case study of an online course that cross-pollinated Universal Design for Learning (UDL) and dialogic teaching to facilitate deep learning. Conceptualized through the UDL framework, dialogue and dialogic teaching, and deep learning, our analysis employs the methods of design-based research and thematic analysis to unpack the pedagogical cross-pollination in facilitating deep learning in a postgraduate online course. In particular, we examine the course goals, major online compositions, instruction and pedagogies, and assessment. We also explore student learning experiences in approaching deep learning by analyzing their postings in the discussion forums. Findings include multiple pedagogical strategies that fostered deep learning in this online course. This study contributes to the growing literature on online teaching and learning, particularly through cross-pollinating UDL and dialogic teaching to facilitate deep learning in higher education.

Keywords: Universal Design for Learning (UDL), dialogic teaching, deep learning, pedagogy, cross-pollination, online teaching and learning, higher education.

Introduction

In recent years, research and studies on Universal Design for Learning (UDL) have become prevalent in higher education (Rao, 2021; Evmenova, 2018; He, 2014). The overall purposes of UDL are to address and ensure accessibility, inclusion, and diversity in education. In the practical sense, UDL is implemented as a pedagogical framework and seen as a sustainable approach (Fornauf & Erickson, 2020; Kumar & Wideman, 2014). Applying this integrative framework and approach to course design and practice in postsecondary education, however, does not necessarily engender deep learning, a concept meaning a learning process through which students think critically, connect the new learning with their prior knowledge and lived experiences, and/or translate the newly acquired learnings into their own terms and personalized sense-making (Entwistle & Ramsden, 2015). To facilitate deep learning, it is necessary to embed constructivist pedagogies, such as dialogic teaching, into the application of UDL. This seems to be particularly important in the virtual learning environment, where traditional in-person instruction and pedagogies cannot be simply transposed and become effective.

In this study, we argue that cross-pollinating UDL and dialogic teaching could facilitate deep learning, including in online settings. We applied such pedagogical cross-pollination in an entirely online course in a Canadian graduate institution, addressing two questions: (1) how were UDL and dialogic teaching cross-pollinated in the online course? (2) how did the cross-pollination of UDL and dialogic teaching facilitate deep learning in the virtual environment? Our explorations in and reflections on cross-pollinating UDL and dialogic teaching in an online course are meaningful and valuable when many courses are presently delivered remotely in higher education (Toukan & Niyozov, 2023) and instructors are necessary to continuously improve effective dialogue with their students in

online courses (Sousa, 2021). Overall, the study contributes to the growing literature on improving online teaching and learning, specifically by UDL and dialogic teaching cross-pollination.

This paper begins by conceptualizing the study's framework: UDL, dialogue and dialogic teaching, and deep learning. Then we introduce the research context and methods -- design-based research (DBR) and thematic analysis. The following is a section describing and analyzing the course components, including goals, major online compositions, instruction and pedagogies, and assessments. This section aims to examine how UDL and dialogic teaching are cross-pollinated in the course design. Next, findings and discussions are intertwined to present a variety of instructional and pedagogical strategies featuring UDL and dialogic teaching cross-pollination. These strategies are framing a dialogic UDL-guided synchronous session for deep learning, approaching deep learning asynchronously in discussion forums, fostering an online learning community for deep learning, and deepening learning in authorial teaching and learning. Specifically, we explore students' learning experiences in approaching deep learning through their postings in the course discussion forums. The paper ends with its limitations and potential avenues for future research.

Conceptual Framework

In this section, we conceptualize the framework and justify the cross-pollination of UDL and dialogic teaching for the purpose of deep learning.

The UDL Framework

UDL is defined as a framework that optimizes teaching and learning for all people and makes learning inclusive and transformative (CAST, 2018). As an instructional framework (Evmenova, 2018; Kumar & Wideman, 2014), UDL focuses on overcoming the learning environment's limitations rather than learners' (Al-Azawei et al., 2016), shifting adaptability from students' shoulders to curriculum (Rose & Meyer, 2006). This requires not only accessible information but also accessible pedagogy (Rose et al., 2006). Pedagogy, according to UDL developers and researchers, means the educational methods used by proficient educators to highlight important concepts, provide scaffolding for practice, model expert performance, and guide learners (Rose & Meyer, 2006; Rose et al. 2006). Such pedagogy is made accessible through applying three major principles that are intended to reflect learner differences in three learning networks: recognition, strategy, and affection (CAST, 2018; Al-Azawei, et al., 2016; Kumar & Wideman, 2014).

Specifically, the recognition network relates to the first principle representing the "*what*" of learning; it is about providing multiple means of representations. This principle requires presenting learning content in different ways, such as text, audio, video, and other multimedia, to accommodate learner variability. However, making information accessible to learners is not sufficient; teaching students to work on information is equally important (Rose et al., 2006). Therefore, educators should ensure students' full accessibility to the tool that highlights key points, models inquiry, and connects new information to prior knowledge.

Principle two is associated with the strategic network about the "*how*" of learning; it pertains to providing multiple means of action and expression. Specifically, teachers should provide alternatives for students to express and reflect their knowledge in multiple formats, for instance, interviews, graphs, papers, and others (Al-Azawei, et al., 2016). When applying the second principle, educators should offer diverse scaffolds and supports for student learning, including optional readings linked to prior knowledge, prompt responses to emails, and timely feedback on assignments. The third principle is linked with the affective network of the "*why*" of learning; it points to providing multiple means of engagement. This principle recognizes the importance of recruiting interest, arousing curiosity,

sustaining motivation, and promoting self-regulation in the learning process. To this end, teachers should engage students through diverse instructional methods and strategies, including discussion, debate, interview, problem-solving projects. In a nutshell, these three principles relate to the networks of recognition, strategy, and affection respectively, aiming to address learning accessibility, diversity, and inclusion in the dynamic process of teaching and learning (Rose et al., 2006; Fornauf & Erickson, 2020; Al-Azawei et al., 2016).

Overall, UDL is an integrative framework (Fornauf & Erickson, 2020), providing not only the overarching principles, but also a set of supporting guidelines and checkpoints. Noteworthily, in practice, not all these guidelines and checkpoints are necessarily applied to a single UDL-based course (Rao et al., 2014; Evmenova, 2018). Also, UDL-based courses are open to using complementary instruction and pedagogies yet to be specified in the framework (Rao et al., 2015), such as dialogic teaching.

Dialogue and Dialogic Teaching

In his seminal book *Pedagogy of the Oppressed*, Paulo Freire (1970/2003) defines dialogue as an indispensable component in learning and knowing. In educational settings, dialogue is situated in participants' thoughts, language, aspirations, and conditions, aiming to develop their critical inquiry, collaborative learning, knowledge recreation, and social transformation (Shor & Freire, 1987). Such highly situated dialogue, according to Razzak (2020), has two important educational connotations: epistemological relationship and epistemological curiosity. The former refers to the interaction between those who know and seek to know, while the latter views dialogue as a means to deepen understanding of specific knowledge, fueled by the individual's continuous curiosity.

Rooted in dialogue, dialogic teaching is a pedagogical approach that capitalizes on the power of speech to promote learning and cognitive development, privileging the strategic integration of student voices through collective problem-solving via dialogue (Alexander, 2008). This pedagogy, from a Freirean critical educational standpoint, involves dialogue-based problem-solving between teachers and students, with emphasis on student agency in the educational process (Shor, 1993). Central to dialogic teaching is the development of students' critical consciousness that cultivates students with four qualities: power awareness, critical literacy, desocialization, and self-organization/self-education (Shor, 1993). To achieve this, the teacher should act as a critically aware facilitator, helping participants craft a deeper, critical understanding of the content in a discussion environment where everyone's voice is equally heard (Lankshear, 1993). Also, Shor and Freire (1987) recommend teachers leverage four tensions as "developmental forces in a dialogic class" (p. 18). They are: (1) tensions between familiar objects and unfamiliar critical scrutiny, (2) the routine school curriculum and the critical classroom, (3) the students' prior experiences and the new perspectives of thinking and knowing, and (4) students' reflection and analysis on the topic and their teachers'. These tensions are embedded in students' subjectivity, aiming to elevate them beyond their initial perspectives to foster reflections and deep learning.

To provide teachers with guidelines in dialogic teaching, Alexander (2008) underscores five pivotal principles: collectivity, reciprocity, supportiveness, cumulation, and purposefulness. Applying these principles, obviously, is not an easy mission for practitioners who are committed to dialogic teaching; such a mission seems to become more challenging in an online format, which complicates the conversation (Sousa, 2019). Interestingly, although virtual learning has become a widely used form of education, especially during and post the COVID-19 pandemic (Toukan & Niyozov, 2023), there is a paucity of research exploring dialogue and dialogic teaching in online settings, especially at the graduate level (Sousa, 2019; Farooq & Benade, 2019).

Deep Learning

The concept of deep learning involves critical thinking, integrating student learning with their prior knowledge, and creating new connections and concepts (Entwistle & Ramsden, 2015). In their study examining teaching practice and student learning outcome, Smith and Colby (2007) claim that engaging students in intentional, substantive, and inclusive dialogue is a critical step to foster deep learning. In that sense, deep learning could be somewhat construed as an outcome of effective dialogue. This outcome includes a deeper grasp of concepts, enhanced appreciation of disciplinary issues and reasoning, increased awareness of important factors, improved judgment, and refined discussion and dialogue abilities, among others (Skinner, 2010). To achieve such learning outcomes, Freire emphasizes the importance of allowing students to think critically, participate in decision-making, form their own perceptions of the world and knowledge, develop new ideas and attitudes based on their existing ones, and actively express and apply their insights (Razzak, 2020).

Deep learning hinges on four critical elements: a motivating context, active learner engagement, interaction with peers and teachers, and a structured knowledge foundation (Biggs & Telfer, 1987). Undoubtedly, actualizing these four elements for deep learning is a daunting task in the virtual learning environment. For instance, threaded discussion forums provide more space and time for students to formulate and articulate their viewpoints, which seems to help promote students' participation in learning activities. However, the chronological and hierarchical structure of the discussion posts (Farooq & Benade, 2019), and lack of immediacy in responses to questions (Sousa, 2019) hinder in-depth discussion through such an asynchronous dialogue. Such pros and cons in virtual settings necessitate the intentionality of applying constructive pedagogy and instruction, such as dialogic teaching, into online teaching.

With the concepts outlined above, we argue that cross-pollinating UDL and dialogic teaching holds the promise to facilitate deep learning online. For one thing, the UDL framework provides the principles into which dialogic teaching can be incorporated. Such incorporation could enhance the enactment of the UDL framework, which is critical to promoting deep learning. For another, dialogic teaching adds specific elements to the implementation of UDL towards deep learning. For instance, developing critical consciousness, creating a class of being collective, reciprocal, supportive, cumulative, and purposeful, and so on. These elements could provide complementary ways to actualize the UDL framework in practice.

Research Context and Methodology

This study was conducted at a Canadian graduate institution for education in 2020-2021. The online course under study is on the topic of teacher development from comparative and cross-cultural perspectives; it has a history of over fifteen years. In this case study, the second author was the instructor. He began to teach the course in person in 2005 and offered the hybrid mode from 2014. Since then, the instructor has been iteratively incorporating the UDL attributes and dialogic pedagogy into the course. This reported course was its first fully online format due to the COVID-19 pandemic. It presented challenges in maintaining the high quality of in-person and hybrid modes, making the exploration of this latest iteration a valuable reflection on his continuous teaching and learning.

The 12-week course consisted of 12 synchronous sessions and an asynchronous learning platform on the university's learning management system. It enrolled 24 students, primarily master's students and several doctoral students, most of whom were teachers and educational researchers with diverse cultural backgrounds. As a course implementing UDL, it was sensitive to disability and accessibility, but no student disclosed a disability or requested accommodations during the course.

The study addresses two questions: (1) How were UDL and dialogic teaching cross-pollinated in the online course? (2) How did the cross-pollination of UDL and dialogic teaching facilitate deep learning in the virtual environment? We utilized two research methods, i.e., design-based research (DBR) and thematic analysis.

Design-based Research (DBR)

DBR refers to a collection of approaches developed by educators, specifically designed to enhance the impact, application, and integration of educational research for improved practice (Anderson & Shattuck, 2012). This pragmatic methodology, situated in a real educational context, focuses on designing interventions, such as learning activities and pedagogy. In this study, we cross-pollinated UDL and dialogic teaching to facilitate deep learning in a Canadian postgraduate institution. Such a local context may limit the pedagogical generalizability; but still, we see its possibility to apply to other graduate courses and upper division undergraduate courses. In this sense, a claim's validity in DBR is based on the changes and consequences the intervention produces in a given system, rather than the statistical differences it has achieved (Barab & Squire, 2004).

Like many other DBR researchers, we conducted an initial gap analysis to help conceptualize the design of this online course. Although focusing on one single offering, this course, as aforementioned, had been exposed to iterative refinement since the instructor offered it in person in 2005. Such iteration, central to DBR, entailed ongoing intervention and revision (Johnson et al., 2017; Barab & Squire, 2004) that were sensitive to evolving educational contexts, such as shifting from offline to online teaching like this study. It was this iterative feature alluding to "the situated nature of retrospective analyses" as a key strength of DBR that positioned us to develop and test hypotheses about "what work[ed]", by exploring "how, when, and why" it worked and by clearly defining what "it" referred to (Cobb et al., 2003, p. 13)

Thematic Analysis

This study employed thematic analysis, a method informed by Schutz's theory of social phenomenology, to identify, analyze, and interpret patterns of meaning within qualitative data (Clarke & Braun, 2017). Specifically, we utilized a hybrid of the theory-driven deductive analyses (Crabtree & Miller, 1999) and the data-driven inductive approach (Boyatzis, 1998) in data analysis. In the former approach, a priori template codebook was created according to UDL's three principles (multiple means of representations, action and expression, and engagement) and the five essential features of dialogic teaching (collective, reciprocal, supportive, cumulative, and purposeful). This template was developed based on the research questions and the conceptual framework. Also included in the codebook were the four fundamental lesson components – goals, assessments, methods, and materials (Rao & Meo, 2016). We used these components to see how they reflected the cross-pollination of UDL and dialogic features. For instance, in analyzing one of the course goals: "to constructively engage participants' prior knowledge and lived experiences" (course syllabus), we coded this goal as a means of engagement (UDL Principle Three) that features dialogic teaching of being cumulative and purposeful. Using this deductive analysis was particularly helpful in examining how the cross-pollinating attributes of UDL and dialogic teaching were mirrored in the course design.

The inductive approach, on the other hand, was used to understand the learning experience of the students, specifically in analyzing their postings in discussion forums. To this end, we followed the six phrases proposed by Braun and Clarke (2006) from familiarizing ourselves with the data to producing a scholarly report of the analysis. It is worth mentioning that such thematic analysis was an iterative and reflexive process rather than a linear and step-by-step procedure (Johnson et al., 2017).

Researcher Positionality and Credibility

In this study, the first author was a teaching assistant to the instructor and a then master student. As a former instructor teaching at a Chinese university, she has particular interest in pedagogy and instruction in higher education, especially in virtual settings. For the second author, his triple roles as the course designer, instructor, and researcher, like many other DBR researchers, challenged the credibility of the claims generated from the study (Johnson et al., 2017; Barab & Squire, 2004). However, as Barab and Kirshner (2001) argue, it is the researcher's functional constraint as a designer that makes useful their explanation of the course design. This resonates with Anderson and Shattuck (2012) when they highlight the value of inside knowledge and the challenge of balancing objectivity and bias in DBR.

To uphold the research rigor and credibility, we employed member checking and peer briefing to establish its trustworthiness. We also kept journals of reflexivity through the entire process of teaching and research.

Data Collection and Analysis

This study was conducted in a naturalistic context (Barab & Squire, 2004) that was situated in the 12-week synchronous sessions and the asynchronous discussion forums. Collected data included course syllabus, postings, documents of Task Guidance and Sessional Agenda, reading materials, course evaluation, and students' course profiles. Following data collection, as mentioned earlier, we used deductive and inductive thematic coding process to analyze the data (Bogdan & Biklen, 2007). Specifically, we used the deductive coding to analyze how the UDL principles and dialogic pedagogy were operationalized in the course materials, such as course syllabus, Task Guidance, and Sessional Agenda. Themes for deductive coding were course goals, assessment, materials, and pedagogies.

The inductive coding, on the other hand, was applied in analyzing postings and the qualitative data in the course evaluation. After reading the data line by line, we determined the initial codes and then used these codes for future core conceptual categories from which the analysis was constructed. As an example, in analyzing students' questions in their reflective postings, we collated them into potential themes, "connecting with reading content", "relevant prior knowledge", "linking to personal experiences", and so on. Following this was generating a thematic map to refine a broader theme of "relational learning in approaching deep learning".

Course Description and Analysis

As a DBR study, we designed and implemented the course by cross-pollinating UDL and dialogic teaching to foster deep learning. Such pedagogical cross-pollination was embedded into the course at the outset of course design. Below we analyze such embedment through the course focal elements, including course goals, major online compositions, instruction and pedagogies, and course assessment.

Course Goals

Like many other graduate courses (e.g., T-560 at the Harvard Graduate School of Education in Rose et al., 2006), the course goals were largely implicit, as they partially read:

> […] to develop a more refined set of understandings, conceptualizations and general questions which will serve us all as a roadmap for the rest of the course. These frameworks, concepts and approaches should be applied to subsequent readings,

discussions, presentations, and assignments related to the particular regions we are dealing with. […] we should apply them in a critical fashion, not only examining what is present, but what is absent […], and why that might be so, with the aim ultimately of increasing depth and richness of understanding. (Course syllabus)

Though not explicitly prescribed, the course goals indicated three important features in applying UDL principles and dialogic teaching. First, students were required to use the acquired knowledge in the earlier sessions "to develop a more refined set of understandings, conceptualizations and general questions" in the later ones. This required not only accessing to the knowledge, but also working with the knowledge (UDL Principle One: multiple means of representation). To achieve this goal, the instructor's scaffolding was critical; educators should facilitate students' critical thinking and connection with their prior knowledge and experience (Rose et al., 2006). We explore and reflect the pedagogical strategies in the later section of findings and discussion. Secondly, this course used many "discussions, presentations, and assignments related to the particular regions we are dealing with". Such diverse means of expressing knowledge were the application of UDL Principle Two about multiple means of action and expression. More importantly, such means of knowledge expression were expected to be "in a critical fashion" to examine the present and the absent and explore the reasons. This, apparently, was associated with developing students' critical consciousness during dialogic teaching. Lastly, the course ultimate goal was "increasing depth and richness of understanding (of the relevant topics)"; this was related with the third UDL principle (multiple means of engagement) and dialogic teaching, particularly in terms of fully engaging students in the learning process, sustaining their motivation, and making them leave the course with more questions for further studies. We exemplify practical instruction and pedagogies in the following discussion.

One more goal implied in the course was to cultivate students' capacity to ask and respond questions, which is particularly important in the online learning environment (Wang, 2005). This goal was achieved through creating dialogic opportunities in the learning process. Specifically, questions and questioning played an essential role in the course design and practice. As an example, the course syllabus was aligned with a set of overarching questions, as seen below, guiding the students through the course:

What does it mean to do cross-cultural research and development projects on teaching and teacher development? What are the potential benefits and limitations of such a cross-cultural approach: how can outsider perspectives from another cultural context inform our understandings of our own context; to what degree can our outsider perspectives bring deeper understanding to other cultural contexts? Can outsiders critically analyze and pass value judgments on those of other backgrounds? How can these be done in a rigorous, critical yet constructive and sensitive manner, while avoiding sliding the extremes of romantic valorization or close-minded denigration of the other? (Course syllabus)

By presenting these questions, the instructor purposively not only provided multiple insights into the topics to be discussed but also modeled the formulation of deep questions in the learning process.

Major Online Compositions

The course comprised synchronous Zoom webinars and asynchronous components through the university's course management system. The webinars consisted of twelve three-hour sessions while

the asynchronous components included Announcements, Modules, and other elements. The Announcements feature allowed the instructor to communicate with students via email, providing them with course information, Task Guidance, Sessional Agenda, reading materials, academic events, reminders, and holiday greetings. Each of the Modules, except for the introductory one, was corresponding to the individual synchronous session, hosting two discussion forums: Reading Summaries and Responses (RSRs), and Post-Session Reflections (PSRs). As the names suggested, the RSRs forum was for students to post summaries and responses relating to reading materials, while the PSRs forum was for postings of student reflection on their learning experiences in the synchronous sessions. Different from RSRs posts that were required assignments and had specific requirements, PSRs postings were optional, aiming to open a space for students to "co-construct the course more iteratively" (Toukan & Niyozov, 2023, p. 14).

Regarding RSRs, the course had a few requirements for the students. First, students were required to post their reading summaries at least 24 hours before the synchronous sessions to allow time for responses from their peers and teacher. Secondly, RSRs were mandatory assignments; each student should contribute at least 4 reading summaries and 4 responses to the forum. These assignments accounted for 32% of their final grade. To balance students' RSRs contributions in different sessions, the instructor assigned specific sessions they were supposed to contribute to. Noteworthily, student contributions to reading summaries and responses would not fall in the same session, to avoid overwhelming coursework in a single week. Next, students could choose textual, non-textual (e.g., images, cartoons, diagrams), or mixed formats for their summaries and responses. This aimed to encourage diverse expressions of knowledge (application of UDL Principle Two, multiple means of action and expression). Lastly, RSRs should be "critical, constructive, and creative analysis of the readings with implications for the development of your (students') knowledge and understanding of themes and issues related to teacher development" (Course syllabus).

From the perspective of cross-pollinating UDL and dialogic teaching, we highlight three key points. First, although the course materials were primarily text-based and occasionally supplemented with podcasts and videos, this did not undermine its UDL attributes, as complete application of UDL principles, as mentioned somewhere earlier, is not required (Rao et al., 2014; Evmenova, 2018). Second, we encouraged students to use non-textual methods to summarize readings and provide responses. This strategy, to some extent, was an encouraging and creative way to express their knowing and learning, particularly in academic virtual settings. Furthermore, the explicit requirements for RSRs played a vital role in promoting dialogic teaching and deep learning by enabling students to be better prepared for class activities and by fostering critical analysis and the connection of new ideas with prior knowledge, as highlighted by Akyol and Garrison (2011).

Instruction and Pedagogies

The course syllabus outlined a comprehensive approach to online instruction and pedagogies:

> The course will follow a deep dialogical approach in order to constructively, reflexively, creatively, and critically engage the readings or participants' values, practices, assumptions, and beliefs from their life and work experiences. Based on the primacy of dialogue, each topic/session is expected to ensure that the participants' personal knowledge, the readings, and the instructors' knowledge are brought into synthesized and integrated learning outcomes. Instructional variety (seminars, pair/group discussions, lectures, guest speakers, controversy, debate, Video-recordings) and intellectual challenge are the key elements in the course's pedagogy. (Course syllabus)

These instructional and pedagogical features highlighted three main aspects. One, dialogic and critical learning process. The course encouraged students to engage with readings and reflect on their own values, practices, assumptions, and beliefs, drawing from their life and work experiences. This approach aligned with the ideas of Shor and Freire (1987), emphasizing the interplay between readings, students' prior knowledge, and personal experiences. Two, varied instructional methods and strategies. The course employed diverse instructional methods, such as breakout room discussions, academic controversy, interviews, jigsaw, to maintain student interest, motivation, and self-learning. These strategies were linked to the affective network in the UDL framework, catering to students' emotional and motivational needs. Three, emphasis on deep learning outcomes. Students were expected to achieve synthesized and integrated learning outcomes that required higher-order skills such as analysis, synthesis, and evaluation, as outlined in Bloom's (1984) Taxonomy. Strengthening such higher-order skills is a process of approaching deep learning for students.

Course Assessment

Course assessment, a process of evaluating students' learning, is relevant to UDL Principle Two – multiple means of action and expression (Rose et al., 2006; Rao & Meo, 2016). In this online course, we provide multiple means to express knowledge. This knowledge expression encompasses four components: (1) prepared and active participation in synchronous and asynchronous settings (12%); (2) required, constructive, critical and creative reading summaries and responses (RSRs, 32%); (3) conference-style group presentation (20%); and (4) final assignments (36%). As we have explained RSRs in the previous section, we will focus on the third and fourth components.

For group presentation, students could choose topics of their interests, not necessarily aligned with the topics in the course. Evaluation would be based on "creativity, critical engagement with the topic, connection with your (presenters') experiences, observance of time allocated" (Course syllabus). We encouraged students to use technology and digital tools like Padlet to enhance peer engagement. Regarding the final assignment, it was divided into two parts: (1) paper proposal or framework outline (8%), and (2) a major course paper or a conceptual-operational framework (28%). The proposal or outline was a pre-final assignment that was returned to the individual student with the instructor's comment and suggestion. Such feedback allowed students to improve their final paper or framework, thereby being recommended and practiced in some UDL-based courses (Kumar & Wideman, 2014).

Findings and Discussions

In the online environment, deep learning necessitates intentional, structural, and organizational design (Johnson et al., 2017). In this study, we argue that this could be achieved by cross-pollinating UDL and dialogic teaching. Below, we explore and reflect on such cross-pollination by examining the curricular and pedagogical strategies implemented in the course practice. Specifically, we mainly use Session Eight as a case study to illustrate the pedagogical cross-pollination and students' learning experiences.

Framing Dialogic UDL-guided Synchronous Sessions for Deep Learning

The pivotal role of teachers in initiating a dialogic class, as underscored by Shor and Freire (1987), is supported in this course through using a repertoire of dialogic approaches to engaging the class (Alexander, 2008; Boyd & Markarian, 2015). Such engagement started from explicit guidance and clear communication before the meeting session. Take Session Eight as an example, one week before class, students received a notification of Task Guidance through the Announcements. This guidance

provided a reading list that included one core/communal reading and eight group readings. In this guidance, each student was assigned to one group. The Guidance explicitly required students to: (1) read the core and assigned readings; (2) prepare for teaching others about their assigned papers; (3) compare their assigned reading with the core reading by i) identifying one way how the assigned reading connects with the core reading; ii) using the assigned reading to refute the argument made by the authors in the core reading; (4) prepare creative summaries and responses. Through these tasks, we could see that emphasis was on comparison (comparing the core and assigned group readings), connection (in what way they could connect), and refutation (one refuting the other). These pedagogical approaches facilitated deep learning by focus on connections between content aspects, formulating hypotheses or beliefs, and fostering intrinsic interest in learning and understanding (Smith & Colby, 2007).

Following the Task Guidance, a Sessional Agenda was sent to students one day before the session, outlining the class structure, activities, and timing. For brevity, we exemplify a few key items chronologically: (1) a 40-minute group presentation; (2) a 25-minute "Jigsaw 1" focusing on the second and third tasks in the Guidance; (3) a 45-minute "Jigsaw 2" where groups from Jigsaw 1 merge into three larger groups to teach about their assigned papers and prepare a challenging question for the instructor; and (4) a 15-minute whole class discussion where the instructor addresses students' questions.

Based on these pre-session Task Guidance and Sessional Agenda, along with our pedagogical practice, we highlight two key attributes relevant to cross-pollinating UDL and dialogic teaching in the course. One attribute pertained to the unstructured mini-lectures during the synchronous session. Different from some UDL-based courses that featured structured lectures (Rose et al., 2006), this online course provided "organic" (unstructured) mini-lectures that were built on student's knowledge and came right upon their inputs. They aimed to connect with the existing research, expand the scope, and stretch students' understanding of the topics. Importantly, they contributed to knowledge co-construction between the students and instructor. In this examplar session, following students' two jigsaw activities, the instructor gave two "organic" mini-lectures in response to their two deep questions: What is the purpose of education? And how has decolonization discourse influenced you (the instructor) as a Southern (non-Eurocentric) scholar? It is worth mentioning that the instructor continued to reflect on his responses to the questions and engage in the discussion with the students post-session. This demonstrates that dialogic teaching is an ongoing process of learning and relearning for both students and teachers, promoting deep learning through active knowledge reconstruction (Alexander, 2008; Shor & Freire, 1987).

The other key feature is the intentional construction of a dialogic class in each session. As seen from this instance, before the session, the instructor intentionally divided the class into eight groups, assigned readings one week ahead, conveyed task requirements timely, communicated the class agenda in advance, and leveraged two jigsaw activities. During the student-led breakout room discussion, the instructor joined some groups, attended student discussion, and dropped one or two questions in between. Instructor's participation is critical in the online setting, as Rohfield and Hiemstra (1995) note that student learning improves when instructors keep discussions focused, contribute knowledge and insights, integrate discussion threads and course components, and maintain group harmony. Overall, the orchestration, scaffolding, and facilitation that the instructor practiced in the synchronous session were paramount in promoting student deep learning (Hambacher et al., 2018; Garrison & Cleveland-Innes, 2005).

Approaching Deep Learning Asynchronously in Discussion Forums

As aforementioned in the section about major online compositions, the course created RSRs and PSRs forums for students to engage in discussion through posting their reading summaries, responses, and post-session reflections. Compared with RSRs, PSRs were more revealing to mirror students' learning experiences, especially in the sense that they were voluntary contributions and did not affect students' final evaluation. Therefore, we use three postings in Session Eight PSRs forum to illustrate how students approached deep learning asynchronously. In this example, a student reflected on the question that was discussed in her group in the Jigsaw 2 activity (bigger group discussion and prepared a challenging question). This question was associated with school corruption and private tutoring. As a tutor, the student observed that parents urged their kids to study "not for the sake of being educated but for the sake of competition" (PSR, Session Eight), aiming to improve their children's competitiveness for sought-after programs like medicine and engineering in Canada through tutoring. She reflected:

> […] I wonder if the fundamental purpose and beauty of education has been lost to capitalistic values, and I wonder what the solution is. I also wonder if it is going to become next to impossible to get accepted into post-secondary eventually as the average (grade) necessary for these programs is becoming higher and higher, and if universities should take a step back and analyze whether or not accepting such few students really makes their institutions prestigious. […] Will tutors become less necessary if universities are willing to accept more students? […] How much has the need to "sell ourselves" and commodify our education impacted our desire to learn? (PSR, Session Eight)

This student ended her post with a cartoon alluding to school corruption and private tutoring:

Figure 1. A cartoon posted on Session Eight PSR Forum.

Following her reflection, another student responded:

> I loved your reflection and this photograph [...] It makes me think about the question my group posed to the Professor:"What is the purpose of Education?", especially when education, as a system, is arguably not fundamentally based on meritocracy and

how you move students emotionally, spiritually/how you mold them as people. I have had conversations with privileged people on their experiences with school and how they got their degrees not being the most ethical, but because of their position in terms of power. It works in their favour. Education has benefited by monopolizing on the common notion that education is a meritocratic and honorable endeavour. But I would beg to question if that is the true and sole intention in many contexts - country, power/position, type of study, etc. (PSR, Session Eight)

After this student's response, the instructor commented:

(student's name), excellent reflection! Your point about how tutoring has helped improve grades, get to "best"- paying professions is absolutely correct. Mark Bray has written tons on this matter - shadow education, private education, and tutoring... it is a huge industry and really damaging the profession and the education enterprise. But within market- neoliberal, that is what education is all about! My question is: how did you feel then while you were tutoring and how do you feel about it today? (PSR, Session Eight)

In this instance, the student connected her personal experience to the topic in discussion, critiqued the social reality, and posed more questions of what, why, and how. The respondent student, similarly, associated her colleague's questions to a broader question-- what's the purpose of education. She also related it to her conversations with some elites in understanding education. Reading the reflection and response, the instructor resonated with the student's viewpoints and invited the reflecting student to recall her feelings as a tutor and to see the difference, if any, of her thoughts for the present and the past.

Such dynamic interactions between the students and instructor were commonly seen in both the PSRs and RSRs forums, featuring a multiplicity of questions that were tied into students' summaries, responses, and reflections. These questions were often connected with students' prior knowledge and personal experiences, enabling them to engage in dialogues not only with their peers and instructor but also with themselves. Dialogue, as mentioned precedingly in the section of dialogue and dialogic teaching, has epistemological relationship and epistemological curiosity (Freire, 2000; Razzak, 2020). In this sense, students' inquiries and questioning were tools for expanding their curiosity, while connecting prior knowledge and experience helped them seal the relationship between what they know and what they don't. It is through such extended and interconnected learning process that students achieve deep learning (Biggs, 1999).

Fostering an Online Learning Community for Deep Learning

A good learning community is crucial for deep learning. Many instructors acknowledge its importance in the virtual environment (e.g., Boyd & Markarian, 2015; Sousa, 2019). To foster a learning community online, we had a few tactics in UDL and dialogic teaching cross-pollination. First, like what Kumar & Wideman (2014) did, the instructor invited the students to complete their profiles before the first session. These profiles were a start to open the conversation line in the community. However, as they were not related to course content or subject matter, their social connections were limited in the sense of developing a learning community. Therefore, synchronous sessions and asynchronous discussion forums would be the central places to develop a facilitating learning community.

Secondly, in the synchronous sessions, multiple cooperative learning initiatives, such as jigsaw, interview, debate, not only sustained students' learning interest but also provided students opportunities to learn together, which, in turn, fostered the learning community. The two jigsaw activities in Session Eight were a good case in point. In organizing these group activities, notably, we maintained the group compositions for several weeks; thus, students had more chances to learn together, hence promoting their collaboration. Such intentional practice in fostering students' communal knowing and learning seemed to be helpful, as eight students mentioned its benefits in their reflections and course evaluation. One student pertinently commented: "This was the only course where I was able to create a relationship with other students and I think this has a great deal to do with the way the professor managed the course" (note in course evaluation).

Next, as mentioned earlier in the section of major online compositions, the discussion forums were the central venue to develop students' sense of community. To illustrate, we use two students' responses to one reading summary in Session 10 RSRs forum. Keep in mind that RSRs were required assignments and should be critical, constructive, and creative. In this illustration, the reading summary, however, focused on the content of the article without making critical analysis. One student responded to the summary:

> Hi (student name), thanks for your summary of this article. It reminded me of the "very difficult and original question" that my group posed to the professor two weeks ago: what is the purpose of education?
> The reforms in Ghana that you described seem to come from an instrumental conception of education. According to these reforms, education ought to have "economic relevance" and should provide young people with "occupational or vocational skills" that will lead to success in the workplace. […]
> But should this be the main motive and justification for our education practices? Is there more, perhaps on a theoretical or aesthetic level that we ought to strive toward? What place do the fine arts or philosophy have in this highly pragmatic conception of education? Is there a strictly "human" aspect to education that ought to be nurtured just as conscientiously? […]
> […] As an arts educator, I think that nurturing the purely aesthetic is important for developing well-rounded people. It can lead to an appreciation of the beauty and uniqueness of life that can be a source of inspiration and inner strength in our most challenging times. (RSR, Session 10)

Another respondent followed:

> Thanks for the summary (name of the summary writer)!
> It is interesting to consider the idea of 21st century skills as vocational skills. It seems that we have accepted that "critical thinking", as an example, is a vocational skill, yet avoid considering its political and ideological nature as a liberal-democratic one. In my own reading of Richard Tabulawa's paper, he critiques international aid efforts by western agencies who condition their financial support on education reform that include learner-centred pedagogy, even though, as he claims that "there is no compelling empirical research evidence that there is a positive (and causal) relationship between the pedagogy and students' cognitive learning." and that such policy must be recognized as intrinsically politically driven.
> This raises an interesting question, though. If we accept the role of secondary schools to be vocational in nature, as Ghana has done, and if we accept that Western countries

tout 21st century skills are needed in today's globalized economy, then, is infusing 21st century skills training to Ghana's curriculum helping students (by making them more employable globally) or hurting them (by making them less employable locally)? (RSR, Session 10)

This student ended his response with a cartoon:

Figure 2. A cartoon (https://imgflip.com/meme/144961820/Trojan-Horse) posted on Session 10 RSR Forum.

Dialogic teaching is characterized by supportiveness and reciprocity, the two distinctive features essential for fostering a learning community. Supportiveness ensures a safe environment for expressing and exchanging ideas, while reciprocity involves active listening and considering different viewpoints (Alexander, 2008, 2020). From these two illustrative postings, we could see students demonstrating respect and openness to learning. They started their responses with a friendly thank-you and were not judgmental in giving their responses. Beyond that, the respondents demonstrated different strategies of being critical, constructive, and creative in responding to the reading summary, such as linking ideas to a larger perspective (1st respondent), connecting to personal experience (1st respondent), relating to other reading (2nd respondent), and using cartoons (2nd respondent). These were all important approaches to deep learning that the summary writer may learn through these responses.

Additionally, it is no doubt that instructors played a vital role in fostering a learning community for deep learning. In particular, instructors' active facilitation is recognized as an important component in a strong learning community for deep learning (Hambacher et al., 2018). We will not reiterate this element as we have discussed it somewhere before. Other than that, the instructor's timely response to emails and his easy access, as a few students commented in the course evaluation, contributed to cultivating a learning community for deep learning.

Deepening Learning in Authorial Teaching and Learning

Authorial teaching and authorial learning are the notions focusing on such an educational relationship that the teacher should facilitate a learning process wherein students redefine traditional learning

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concepts based on their personal values, beliefs, intentions, expectations, and goals (Matusov, 2011). This redefinition shapes their understanding of what learning is, what is achievable, and what constitutes quality learning. Such redefinition of learning, we argue, is where deep learning emerges, or, at the very least, what the cross-pollination of UDL and dialogic teaching aims for.

As a case study using qualitative methods, we could not identify the extent to which the students experienced deep learning, but the following PSRs on the last session indicates the impact students' learning experience on their future learning and education. One student wrote, "Through this class, I have learned that in the journey of finding answers to questions, one ends up with more questions" (PSR, Session 12). From the 13 PSRs in this session, it seems that the students kept questioning, puzzling, and troubling education in the course. For instance, one student reflected:

> Today's discussion was quite interesting as it provided an opportunity for further reflection on what we've learned so far. In my group we discussed how we are discovering that education is inherently politically driven. Education seems to have lost its' 'innocence'. Who determines what is taught? […] What is the goal of education in these countries? Is the system designed to liberate, subdue, hegemonize or maintain the status quo? Who benefits from these educational policies? […] How are reforms implemented? Is there a genuine desire for reform or is it a check the box exercise? Are the teachers adequately trained and are their needs effectively addressed? Were key stakeholders engaged? These are some of the questions I shall be asking as I think of educational systems around the world moving forward. (PSR, Session 12)

Another student reflected:

> When I started the program, I expected to deepen my understanding of education, teaching, pedagogy, and curriculum, from an international and cross-cultural perspective. At every point along the way, my prior knowledge and understanding was challenged, as I thought I knew what teaching meant (I was wrong), I thought I knew what learning meant (I was wrong), I thought I knew what science, education, curriculum, even knowledge meant (I was wrong on all of them).
> I can safely say that I am much less certain about my knowledge than I have ever been. (PSR, Session 12)

Concluding Remarks

In conclusion, students appeared to benefit from cross-pollinating UDL and dialogic teaching in the process of approaching deep learning. However, there is room for the course to improve. Firstly, the variety of activities in the online setting seemed to be overwhelming in some sessions, especially with the unfamiliar topics. It may be beneficial to maintain a consistent mode of discussion before introducing new activities, thus providing more time for addressing key concepts and common questions. Secondly, the absence of structured lectures was not always effective, particularly for the students with limited background knowledge in the topic under discussion. Incorporating such lectures or relevant podcasts could help address this issue in the difficult sessions. Lastly, the balance between assigned group readings and student autonomy in choosing readings needs reconsideration. In future courses, we will consider students' research interests and provide them more freedom in selecting their reading assignments.

For future research, it is essential to explore and reflect on course design and practices, but this alone is not adequate to foster desired changes in the classroom. Collecting data from more

sources, such as interviews and focus group discussions, could provide a deeper understanding of students' learning experiences, especially for those who are less active in posting reflections. Understanding the experiences of these seemingly inactive students in approaching deep learning in the online setting is crucial. Also, conducting a self-evaluation at the end of the course could improve our understanding of the learning process, particularly for less active participants. Additionally, future research could involve designing a survey to analyze students' evaluations on instructional and pedagogical practices in UDL and dialogic teaching cross-pollination, using tools like Likert scale questionnaires for statistical analysis of the relationship between deep learning and the implementation of these teaching approaches.

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