Use of Universal Design for Learning in Online Special Educator Preparation

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ABSTRACT

By using principles of Universal Design for Learning (UDL) within online learning environments, teacher education faculty have an opportunity to break down barriers and create purposeful course content that will benefit all learners. The application of UDL helps teacher education faculty recruit learner interest, sustain learner efforts, and provide learners with options to apply knowledge and demonstrate understanding. Examples and strategies for using UDL in online learning environments are provided.

KEYWORDS
Online learning, teacher preparation, universal design for learning

With increasing options for online degree programs and courses, including in teacher preparation (NCES, n.d.), different learning theories are useful for understanding how adults learn within these environments. Student engagement (Kahu, 2013), adult learning theory (Knowles, 1980), and Community of Inquiry (Garrison et al., 2000) provide frameworks for instructional design when creating or improving existing online courses to support adult learning and engagement. More recently, researchers have developed learning theories in response to the shift of instruction to online learning environments. With the understanding that learning takes place in virtual communities, connectivism (Siemens, 2004) recognizes that learners need "opportunities to form connections and make meaning based on information obtained from virtual communities and other non-human objects (e.g., databases or information sets)" (Ornelles et al., 2017, p. 548). Likewise, generativism (Carneiro, 2010) understands that adult learners produce new knowledge by deriving new meaning from social learning within technology-rich environments.

Regardless of the learning theory that drives instruction, many adult learners experience educational barriers to engagement in and access to learning in online environments.

Universal Design for Learning

Educational barriers to learning and strategies to promote student engagement are generally thought of as a concern for PK-12 students and educators. However, postsecondary students in teacher education programs experience similar barriers to learning due to personal factors (e.g., lack of time, family responsibilities) and educational factors (e.g., anxiety, negative self-perceptions, technology barriers). To better support all students, Universal Design for Learning (UDL) calls on educators, including those at the postsecondary level and in teacher education programs, to critically examine their instruction and reduce educational barriers.

UDL includes three essential principles: multiple means of engagement, multiple means of representation, and multiple means of action and expression (CAST, 2018b; Edyburn, 2010; Rose, 2000; Rose & Meyer, 2002). Each offers suggestions to create purposeful and meaningful instruction. First, multiple

means of engagement examines *why* students learn. Within the why, UDL focuses on the role of student interest and engagement in the topic such as through giving choice and making instruction relevant to students' careers. Essentially, to motivate and engage students by showing relevance; students should see a direct connection between coursework and their future careers. Multiple means of engagement also includes purposeful instructional support for self-regulation, self-assessment, and sustained effort through strategies like specific, timely mastery-oriented feedback and setting goals with short-term objectives (CAST, 2018b; Edyburn, 2010; Rose, 2000; Rose & Meyer, 2002).

Next, multiple means of representation examines *what* students are learning. Options and alternatives for how teacher education faculty are presenting the content should be considered, such as providing options to watch or listen to content instead of just using a text-based presentation format. Multiple means of representation also includes strategies specific to comprehension and vocabulary such as reviewing jargon and acronyms like those used in special education prior to instruction, instruction in multiple formats, scaffolding and modeling, and explicit instruction (CAST, 2018b; Edyburn, 2010; Rose, 2000; Rose & Meyer, 2002).

Last, multiple means of action and expression examines *how* the students are demonstrating their knowledge and completing course tasks. Course components may include access to assistive technology or options for physical access, including using and creating materials from the start that are compatible with alternative keyboards, screen reading software, and other assistive technologies. Additionally, teacher education faculty should provide alternatives for expression and communication, for how students are sharing and communicating

their ideas. For example, instead of assigning a standard final paper to evaluate students' knowledge, students may have the option for alternative mediums like creating a blog, infographic, or video to demonstrate that same knowledge. Whatever medium students demonstrate their knowledge still provides students opportunities to develop fluency in that skill through scaffolding with models, non-examples and examples, differentiated feedback, and mentoring. Multiple means of action and expression also includes executive functions, or an individual's ability "to plan and flexibility adjust to changes in their environment" as they complete any number of tasks from an in-the-moment class activity to a long-term project (Vasquez & Marino, 2021, p. 179). Within UDL, teacher education faculty should purposefully include executive function supports such as goal setting then monitoring those goals, and time management strategies by breaking apart a large project over the course of the semester with regular check-ins and due dates for feedback and reflection (CAST, 2018b; Edyburn, 2010; Rose, 2000: Rose & Meyer, 2002).

It is important to consider that UDL is not simply just giving students options of assignments or content presented as a video instead of text, it is a *purposeful* design of a course and instructional components to reduce barriers to learning. Further, the goal of UDL is to create dynamic learning experiences where students become expert learners who are "purposeful and motivated, resourceful and knowledgeable, and strategic and goal-directed" (CAST, 2017, p. 1).

A common task in a special education teacher preparation program is scoring a reading running record. While reading a text-based chapter may provide the information, teacher education students may experience several barriers such as a lack of engagement in the topic, poor

comprehension on how to use a reading running record through text-based instruction, not having a model, and difficulties with vocabulary impacting comprehension. Instead, through UDL, teacher education faculty might first scaffold their instruction through reviewing any key background information or vocabulary to connect the topic with their prior knowledge. Then, implement explicit instruction by video modeling the scoring, followed by working together with the faculty or a peer with purposeful guided feedback, and then independent practice. Video modeling should include the teacher education faculty talking through and demonstrating each step, and a handout with each step explained that includes images and text to reference. To engage students and show relevancy, scoring a reading running record might be anchored to a case study or work with a PK-12 student and lead to sharing the results with a classroom teacher as well as selecting an instructional strategy. Ultimately, for students in special education teacher education programs, UDL provides multiple opportunities to learn academic content, express understanding, and develop skills to become excellent special educators (see Courey et al., 2012; Craig et al., 2019; Israel, 2014). Thus, when designing online courses, teacher educators must integrate strategies and course design elements in alignment with the UDL principles.

UDL Online

Many teacher education programs include online coursework and/or course components. The online format provides a unique opportunity to incorporate UDL through incorporating opportunities for engagement, representation, and expression of understanding in coursework. Adult learners are typically self-motivated to learn (Knowles, 1984) and online coursework must provide

options to recruit and sustain learner interest, and provide multiple options for the organization of assignments, application of learning, and expression of understanding (CAST, 2018b). Thus, what does UDL look like in an online course? While there is no one answer to this question, there are many solutions with or without technology. For example, teacher educators might provide options for engagement beyond text-based discussion boards and recorded Power-Point presentations by giving students purposeful choices for how they interact with content. Or they may opt to watch a video, listen to a podcast, or participate in asynchronous discussions using tools such as Twitter and Flipgrids (see Table 1 for a summary of online instructional strategies and their alignment to UDL).

Online Course Design Elements

Technology use within the UDL framework for all teacher education courses, including online courses, must begin with *purposeful* course design. When online courses are not clearly organized and do not follow a consistent structure, students are more likely to become frustrated and, in turn, become less engaged and experience barriers to simply accessing course content (see Buelow et al., 2018; Joosten et al., 2019). Purposeful course design may include a consistent format for each module with clear organizational structure and labeling that does not rely simply on color coding or a symbol such as a logo of a piece of notebook paper for an assignment. Instead, an assignment link should always clearly be labeled with the module name, topic, and/or that it is an assignment (e.g., Week 1 Assignment: Educational Philosophy). Additionally, purposeful course design includes scaffolds for long-term assignments with deadlines and feedback for portions of the assignments staggered throughout

the semester, expectation reminders, and clear deadlines for course tasks. Checklists, lists of requirements, and other strategies to highlight the instructional goals and tasks are recommended. Such purposeful design aligns to multiple means of action and expression and multiple means of representation with being able to clearly and consistently access the online learning environment and one that supports students' executive functions.

Purposeful, online course design also includes using an online learning platform and materials that are accessible from the start instead of making changes later to accommodate specific students. All students may benefit from accessible formats, especially when the teacher educator may not see their students in a course that is delivered primarily online and asynchronously or may not know of their students' learning needs. Less than one in four college students with disabilities disclose their disability to access accommodations and services (Lindsay et al., 2018). Students may also choose not to disclose a disability, develop a short or long-term condition impacting course access, and/or any other reason to use such features (e.g., turning on captions to watch a video while in a loud). Thus, in alignment with multiple means of representation, effective online learning is accessible not only in that the online learning platform meets accessibility standards, but so also does anything posted in the class. Accessibility considerations include, but are not limited to: instructional videos, video-based meetings with accurate and readable captions, video transcripts, image descriptions in videos, ability to change contrast and resize images or text, and use of alt text and image descriptions. All documents should be posted in an accessible format that is compatible with assistive technology. Tools such as Grackle for Google Docs, Microsoft Word Accessibility

Checker, and the accessibility menus in PDF readers allow teacher education faculty to check for accessibility and then make changes to create an accessible document.

Discussion Options

In online learning environments, it is difficult to replicate the sense of community felt within a face-to-face classroom (Banas & Wartalski, 2019; McInnerney & Roberts, 2004; Sung & Mayer, 2012). Promoting in-depth conversations and exploration of content may be challenging for many special education students who may be busy practitioners themselves. Providing options for how to engage in discussions to demonstrate knowledge is essential to UDL in special education teacher preparation, aligning with both multiple means of action and expression and multiple means of engagement.

Many teacher education courses, both in-person and online, use discussion boards to promote student engagement with content. Lin et al. (2007) found that providing choice of discussion board post format increased student satisfaction with the course. Options include having students share accessible audio or video responses to the questions posted by the teacher education faculty. Seeing and hearing content helps students experience a sense of community, and provides options for busy adult learners, and those with print, visual or hearing challenges (see Kebritchi et al., 2017). By modeling this multimodal conversation format, teacher education faculty can discuss how these strategies may also help students' future PK-12 learners to engage in meaningful conversations and build a sense of community.

Assignment Menus

Teacher education students are a diverse group of practitioners. One way to ensure that online course assignments

TABLE 1: Sample Online Technology-Based Course Tools for UDL

Tool	Strategies to Reduce Barriers	UDL Alignment
Course design	• Course and all course components are accessible (e.g., captions, image descriptions, accessible documents) • Embedded links and videos for students to access for background information • Consistent format • Clear organizational structure and labeling • Checklists for weekly tasks and for longer, multi-step assignments	Action and Expression Representation
Discussion boards	• Choice of discussion format (e.g., text, audio, video, images) posted by the students • Teacher education faculty modeling using a different discussion format in their response to students' posts	Action and Expression Engagement Representation
Assignment Menus	• Applied assignments • Menu of choices to select the assignment format most relevant to the student	Action and Expression Engagement
Feedback and progress monitoring	• Consistent, timely feedback • Feedback posted in a variety of ways (e.g., video, audio, text) Multiple types of feedback (e.g., role playing, video review, peer-review, self-assessment)	Action and Expression
Video modules and models	• Align to explicit instruction by providing a video-based demonstration then guided practice prior to working independently • Allow students to rewatch and pause a video as many times as needed • Supplement text-based content to provide demonstrations and explanations	Engagement Representation
Simulations	• Provide practical experiences in a "low-risk" environment • Provide feedback and self-reflection, then encourage students to practice the instructional strategy as many times as needed to work towards mastery	Action and Expression Engagement

are relevant to their professional roles is by providing a choice of applied assignments. Embedding choice in online course design increases interest and engagement and allows students to choose assignments of most relevance to their careers. This allows students to choose the option that is most applicable to their professional role. Classroom assignment menus have been used across PK-12 grade levels special education

to provide options for organization, demonstration of learning, and content to explore (Cressey, 2020; Delisio & Bukaty, 2019; Edyburn & Edyburn, 2021). These assignment menus may benefit teacher education students in online courses as well. One author of this article, for instance, uses a choice of applied assignments in their Assessment for Students with Severe Disabilities graduate-level online course. Students

are given the option to choose one of the following for their final assignment: (a) an evidence-based practice (EBP) literature review, (b) an interdisciplinary assessment report, or (c) an online parent or teacher training module on one of the assessments learned in the course. Students are encouraged to make their final assignments multi-modal and to include audio and video components to model their EBP, results of the assess-

ment, or to demonstrate a skill for parents in the training module. This aligns with the UDL concept of multiple means of engagement.

Feedback and Progress Monitoring

In addition to assignment menus, students' learning occurs when they are provided individualized feedback to better understand the progress they are making, within a timely manner. Formative feedback is especially important as this type of feedback "allows learners to monitor their own progress effectively and to use that information to guide their effort and practice" (CAST, 2018a, n.p.). There are a variety of customizable feedback options that enhance capacity for monitoring learner progress and support multiple means of action and expression. For example, role playing, video reviews, and peer feedback are opportunities for students to engage in self-assessment strategies. Additionally, assessment checklists, rubrics, video feedback, audio notes, and annotated work samples are examples that guide students' self-reflection.

Video Models

Asynchronous, online courses do not allow for live, in-class demonstrations and monitoring of students while they complete course activities. A lack of demonstration or model can be especially problematic when a concept is new to students, when it includes multiple steps, and/or when students might have misconceptions. Research suggests that an essential component of explicit instruction for all students, including teacher education students, is first demonstration and then guided practice prior to independent work (see Archer & Hughes, 2010; Hughes et al., 2017). Video models provide a powerful learning tool to demonstrate the concept ("I do") and allow students to practice

with the teacher education faculty with embedded practices ("We do") prior to independent work ("You do") within explicit instruction (see Dieker et al., 2009; Gaudin & Chaliès, 2015). For example, in another graduate online course on critical issues in special education and professional writing, students learn how to use and format in-text citations, references, and other components of APA Style. To learn APA style, students first watch a video model, then watch additional video examples with a handout to practice as a low-risk assignment, primarily for feedback. Lastly, students complete an assignment for independent, applied practice.

Essentially, video models present content in a different format than just text-based information to provide students an option for how they access the materials in alignment with multiple means of engagement. Video models also give students the ability to stop and pause a video while working along with it and rewatch a video as many times as needed. When using video models, it is important to consider the format. Videos that show a teacher education faculty member reading the text on the screen, without images or demonstrations, and that present multiple concepts at once, are not as effective as videos with clear examples and purpose.
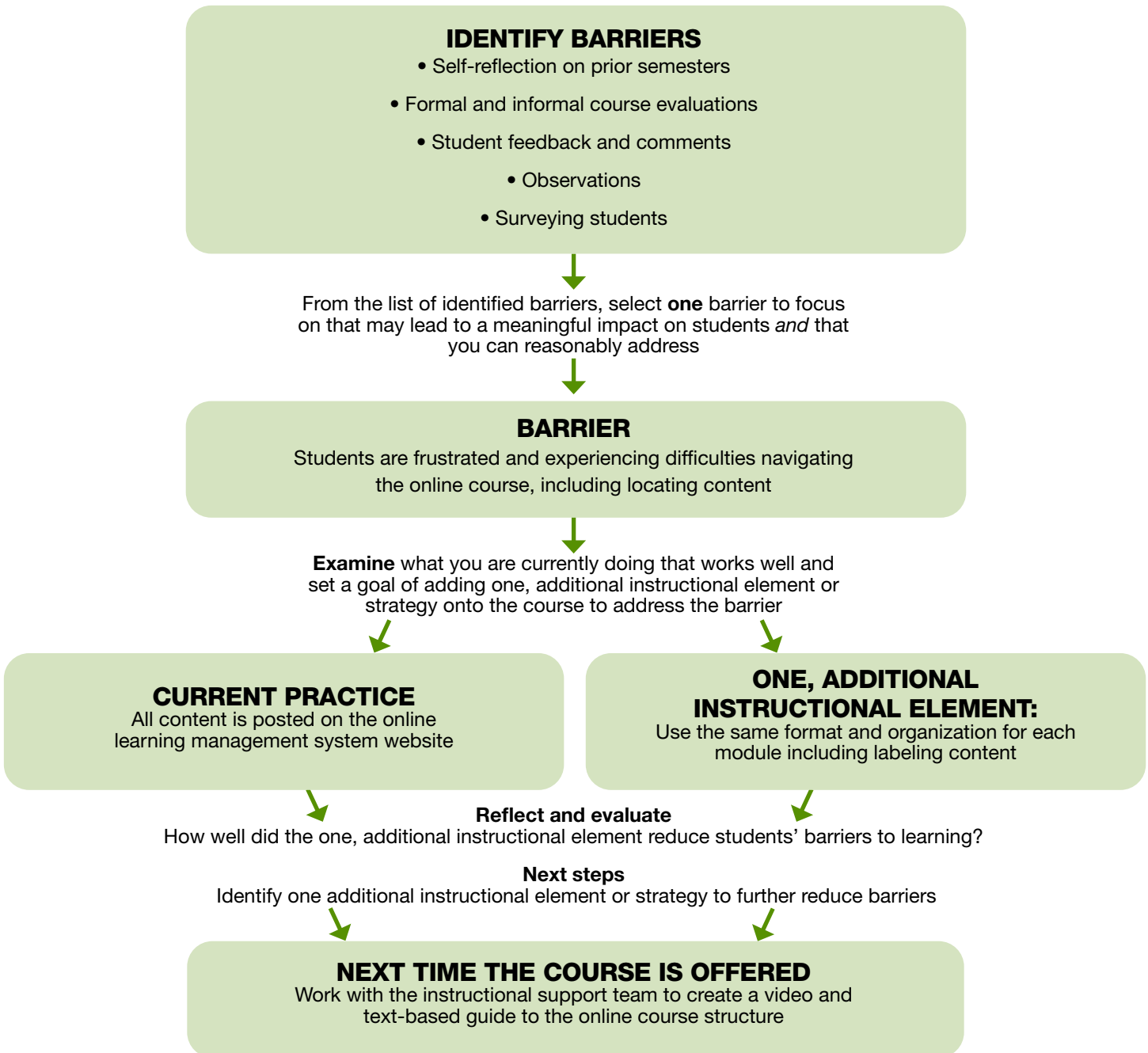
Simulations

The application of teaching theory and methods to practice in real-life classrooms is a seminal stage in the teacher education process. To this point, Billingsley and Bettini (2019) found that teacher preparation graduates who received more intensive and higher-quality student-teaching and practicum experiences are more likely to persist in the field and less likely to leave early in their careers. Although increasing evidence is emerging supporting practice-based experiences to

special educator preparation, teacher education is increasingly shifting toward online and digital technologies that give an alternate means to provide realistic experiences when traditional in-person practicums are not a viable option (e.g., Starkey et al., 2020).

Simulations offer teacher educators a chance to apply and practice in a "safe" low-risk environment where they can actively engage in realistic learning and receive feedback on their application of teaching principles. Simulated teaching applications provide an opportunity for students to self-reflect prior to actual implementation (e.g., practice using an instructional strategy in simulation before practicing with PK-12 students). Simulated teacher education experiences vary from high-tech applications implementing virtual reality to simpler lower-tech applications using role playing among classmates (Leko et al., 2015). Teaching simulations offer several practical advantages over traditional means of practicum including offering multiple practice opportunities to shape special education teachers' behaviors towards mastery. Simulations might also provide a means of tightening the feedback loop between teacher education students and supervisors to provide more timely feedback to refine skills and allow students to practice skills as many times as needed (Dieker et al., 2014). This efficiency in mastering skills within specific contexts could contribute to UDL principles related to generalization of skills to other environments and settings. Thus, while simulations might not replace actual embedded practice in real-time classroom settings, they may provide for multiple means of both engagement and action and expression as students develop critical competencies needed for proficiency in their future roles.

Teacher education faculty should also be mindful of the sustainability of teacher education simulation platforms

FIGURE 1: Sample Plus One Approach

IDENTIFY BARRIERS
- Self-reflection on prior semesters
- Formal and informal course evaluations
- Student feedback and comments
- Observations
- Surveying students

From the list of identified barriers, select **one** barrier to focus on that may lead to a meaningful impact on students *and* that you can reasonably address

BARRIER
Students are frustrated and experiencing difficulties navigating the online course, including locating content

Examine what you are currently doing that works well and set a goal of adding one, additional instructional element or strategy onto the course to address the barrier

CURRENT PRACTICE
All content is posted on the online learning management system website

ONE, ADDITIONAL INSTRUCTIONAL ELEMENT:
Use the same format and organization for each module including labeling content

Reflect and evaluate
How well did the one, additional instructional element reduce students' barriers to learning?

Next steps
Identify one additional instructional element or strategy to further reduce barriers

NEXT TIME THE COURSE IS OFFERED
Work with the instructional support team to create a video and text-based guide to the online course structure

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when considering and selecting virtual practicum options. Technology to simulate and predict human behavior based on complex stimuli such as a classroom is still emerging so many simulation platforms rely on human input through virtual role playing (see Driver & Zimmer, 2022 [this issue], for a detailed discussion of mixed-reality simulation

in teacher education).

Implementing UDL Online

For teacher education faculty, it can be overwhelming to implement UDL by making changes to tasks and assignments, course format, or an entire course. However, the benefits of UDL for teacher education students outweigh

the challenges. Through implementing UDL, faculty not only model an effective practice to support all PK-12 students but provide opportunities for teacher education students to learn and demonstrate their knowledge in a way that reduces barriers to their own learning. When considering UDL, it is important to remember that UDL

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involves *purposeful* changes in course design and content to increase access and decrease barriers to learning. UDL is not just adding technology or any other component to add it without directly connecting the component to UDL and instructional goals.

The Plus One (or, Plus One Design Thinking) approach describes a straightforward, practical way to implement UDL in any course, including for online teacher preparation (Tobin & Behling, 2018). Instead of attempting to address all aspects of UDL at once, the Plus One approach calls for teacher education faculty to first identify students' barriers to learning (see Figure 1). These barriers might be based on trends in course evaluations, informal comments from students, surveying students about their needs, and/or considering instances when students ask more questions, make increased errors on assignments, or misunderstand the content. Next, faculty target just one of those areas to apply UDL that might make the most difference in a course or address the highest need, but that is also manageable and practical for faculty to update or change (see Lieberman, 2018; Tobin & Behling, 2018). For example, if a barrier is students' difficulties finding the needed content in an online course, it is unlikely that a faculty member can change the online learning platform, but a faculty member can examine their course organization and navigation.

Using the targeted area, the next step in the Plus One approach is to set a goal. Using the aforementioned example, a teacher education faculty member might set a goal to use consistent organization across each online module to reduce students' frustrations locating course materials and tasks. Last, select one purposeful change that aligns to UDL to address this goal and reduce barriers to learning. Continuing the example, the faculty

member might purposefully use the same format and organization for each module, clearly labeled content, and/or create a video or text-based guide on how to access the course components. Faculty should consider soliciting formal or informal student feedback to evaluate the change. For each subsequent time a course is offered, repeat this process with one additional instructional element to apply UDL. As faculty are more comfortable with UDL and making changes to a course, they can address several goals simultaneously during a semester, especially if the goals are similar such as providing students an assignment menu and options on how to post a discussion response. Essentially, to implement UDL in an online course using the Plus One approach, teacher education faculty (1) identify barriers to learning, (2) target *one* barrier to address, (3) set a goal for themselves on *one* element in their course to change using UDL targeting this barrier, and (4) implement and evaluate *one* instructional change (see Tobin & Behling, 2018).

Ultimately, UDL supports students' access to engaging content, provides students opportunities to demonstrate their knowledge and understanding in purposeful and meaningful ways, and reduces barriers for all students, including teacher education students enrolled in an online program.

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