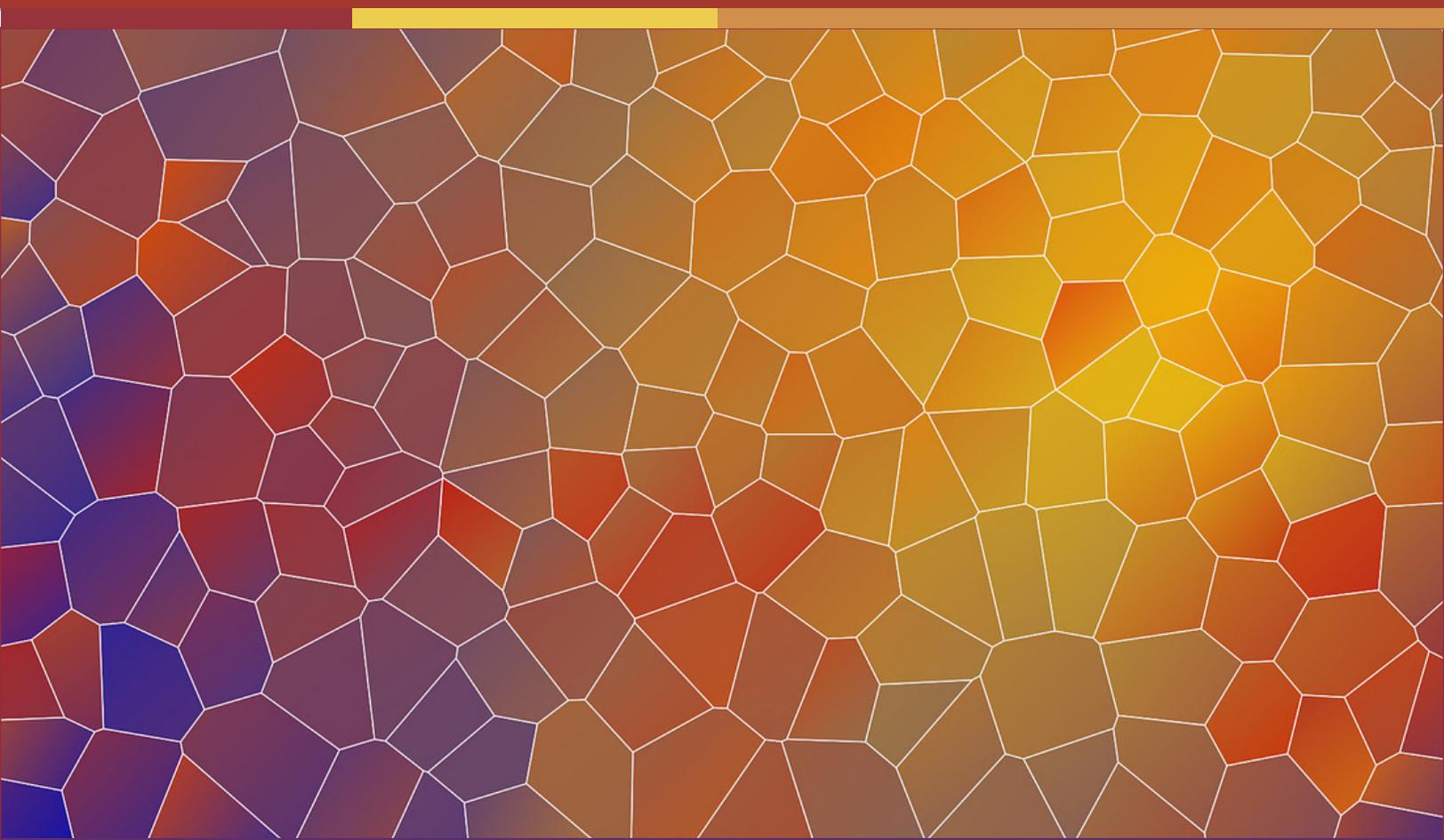


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# TEACHING REPORT

## Has the Pandemic Affected Student and Faculty's Use and Perception of Universal Design for Learning?

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### Abstract

Universal Design for Learning (UDL) is an educational framework to remove barriers from the learning environment to increase success for all (CAST, 2018). With the shift to online due to the COVID-19 pandemic, we wondered whether students' and faculty's perceptions of universal design for learning (UDL) would be affected. This investigation describes faculty's use and students' experiences of UDL in the classroom both before and during the pandemic. We focus specifically on the perceived usefulness of UDL by both these groups as it relates to student learning. Results showed overall strong correlations pre-pandemic compared to during the pandemic, but that the pandemic has encouraged some changes, including faculty to increase their use of some UDL elements (e.g., capturing lectures) and that students consider more of the UDL elements to be beneficial to their learning than faculty do. These findings and their relevance to UDL scholarship are discussed.

### Keywords:

pandemic, universal design, student perceptions, faculty perceptions, accessibility

Universal design for learning (UDL) is an educational framework that has the goal of removing barriers for all students to optimize learning (CAST, 2011, 2018). It recognizes that inter-student variability is the rule, not the exception, providing a framework for building curriculum and learning experiences for various learners. This provides an opportunity for students to cultivate their strengths and bolster relationships. There are three principles that guide this inclusive design: multiple

means of representation, multiple means of engagement, and multiple means of action and expression.

Multiple means of representation refers to the “what” of learning (the content). This principle emphasizes providing students with multiple ways to receive information such as writing, videos, graphs, etc. (CAST, 2018; Rose & Strangman, 2007). It also refers to activating students' background knowledge so that they have somewhere to ‘anchor’ this new knowledge. Combining new information with what learners already know has been shown to increase comprehension (Baker et al., 2016) and retention (Weinstein et al., 2018). Multiple means of engagement refers to stimulating students' interest (the “why” of learning). Essentially, students' interests need to be stimulated and sustained throughout the course, leading to their motivation to learn (CAST, 2018; Rose & Strangman, 2007). Collaboration is one way to engage students in their learning, and has been shown to benefit memory and learning (Cortright et al. 2003; Rajaram & Pereira-Pasarin, 2007). Engagement also includes providing a safe learning environment, free of threats and distractions (CAST, 2018). Encouraging student engagement can improve both actual and perceived learning (CAST, 2018; Hamari et al., 2014; Kennette & Beechler, 2019; Kennette & McGuckin, 2018; Pink, 2009; Willig et al, 2021). Finally, multiple means of action and expression allows students to show how they have learned the course content in multiple ways (the “how” of learning) (CAST, 2018; Rose & Strangman, 2007). For example, as the final assessment, students may choose to write an argumentative essay or present these same arguments in a video format. Similarly, during a test, students

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may be given a choice of answering two of three essay questions. Alternatively, as a final assessment, students may complete either a test or a project that assesses the same learning outcomes. All three of these are examples of the UDL principle of action and expression in that they are giving students some choice or agency in how they demonstrate their learning. Compared to K-12, where curriculum and methodological standards offer less pedagogical discretion, UDL has unique applications and benefits for the higher education environment, a context which has historically been more likely to rely on passive learning. The principles of multiple means of representation, engagement, and action and expression affirm the need for application of knowledge in the college classroom environment (Buckland Parker, 2012). Interested readers may refer to Vukovic et al. (in press) for additional background related to UDL in the Canadian context.

These principles are based on the neuroscience of learning (e.g., Kolb et al, 2000; Zull, 2002; Zull, 2004). Learning is a relatively permanent change in thinking or doing, and, as such, learning brings about (or is a result of) physical, biological changes in the brain (Zull, 2002, 2004). The brain's plasticity allows it to re-wire itself based on what it experiences (i.e., learning), adding or removing neuronal connections (Draganski et al., 2004; Trachtenberg et al., 2002). As we experience the world around us, neurons in our brain are activated, which causes them to reach out and connect with other neurons. This is knowledge in its physical, biological form: a network of neurons.

The best way to learn is to engage multiple areas of the brain. The four primary areas of the cerebral cortex involved in learning, according to Kolb et al. (2000), are the sensory cortex (which allows us to acquire information); the temporal integrative cortex (which plays a role in reflection and meaning-making), the frontal integrative cortex (which processes ideas and abstraction), and the motor cortex (which is involved in actions such as testing). Sequencing learning experiences that involve these distinct brain regions will result in deeper learning than only engaging one or two areas of the brain. This proposal is in line with Paivio's dual coding approach to memory (Clark & Paivio, 1991; Paivio & Clark, 2006; Paivio & Desrochers, 1980), which proposes that we understand better when information is represented in

multiple ways (e.g., verbal + image). This classic idea has more recently been echoed in cognitive and pedagogical publications (Aryanto, 2020; Cruz, 2018; Weinstein et al., 2018). These neuroscience findings help highlight the importance of two of UDL's principles: multiple means of representation and multiple means of action and expression.

Neuroscience also tells us that various states (e.g., reward, fear, peace) produce chemicals that affect neuronal communication/connections in our knowledge networks (Brembs et al., 2002). This emotional connection to learning has important implications for student engagement and motivation (UDL's multiple means of engagement).

Embedding UDL from the beginning (during course design), rather than as an after-thought, means that students will be less likely to require accommodations to course materials for any barriers they may experience and, as such, less likely to feel obligated to self-disclose personal matter with their faculty (Buckland Parker, 2012). From the instructor's point of view, it also means that they will spend less time during the semester modifying content or materials and accommodating students' diverse needs. UDL attempts to remedy the barriers that we have created in education. As such, it is a tool to increase access to learning (CAST, 2011, 2018; Rose & Strangman, 2007). As we create the barriers in our courses by virtue of creating the course itself, it stands to reason that we can also remove these barriers or provide the necessary tools for all students to overcome them.

### The Present Study

It is clear that UDL has value in the context of pedagogy. Consequently, describing what is currently being used by faculty and experienced by students is essential. According to Hutchings's (2000, 2013) Taxonomy of Questions, one of the critical questions in the scholarship of teaching and learning (SoTL) is to describe what learning currently looks like, a "what is" question. To this end, the goal of the present study is to inquire about and describe what is happening in the classroom as it relates to UDL, both from student and instructor points of view. UDL is iterative, so describing the current state of UDL allows us to measure improvements from a baseline, reflect and improve

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our teaching practice, and celebrate achievements in curriculum and design. This description is important, yes, but we also wish to compare whether the pandemic has affected faculty's use and students' reported experience of UDL in the classroom. It is possible, for example, that the pandemic might have made students and faculty more aware of the barriers that exist and therefore better appreciate or notice UDL elements when used. Further, this could lead to a better appreciation of and perception that these elements benefit student learning.

In addition to describing the current state of UDL in the college classroom before and during the pandemic, the present study makes another vital contribution to the field of SoTL in that it explores this question in a 2-year college setting, which is under-represented in research. Since the body of research examining 2-year colleges is much smaller than that of 4-year degree-granting universities, this study contributes important context to the functioning of UDL in various types of learners and institutions.

For the two studies that follow, we sampled from the same student and faculty population at two timepoints—before the pandemic and during the pandemic—which meant approximately a 3-year interval between these studies. This between-group design was inspired as a direct result of the pandemic, as we had originally only intended to recruit students and faculty to provide their opinions about UDL in the classroom. However, when the pandemic began, we saw it as a unique opportunity to compare student and faculty perceptions at these two timepoints. We discuss limitations of this approach later in the paper.

### Study 1: Before the Pandemic

We wanted to examine how often students reported experiencing UDL elements in their classes and how frequently faculty purported using these elements. We were also interested in students' and faculty's perceptions of how useful each of the UDL elements we asked about were for student learning.

These data were collected approximately one year prior to the start of the COVID-19 pandemic, and included students enrolled in fully online courses, fully in-person courses, as well as hybrid courses.

## Methods

### Participants

Both students and faculty participated in this first study and included participants from face-to-face, hybrid, and online courses. A total of 19 full-time and contract faculty participated ( $n = 5$  online;  $n = 11$  hybrid;  $n = 3$  face-to-face), but no demographic data were collected to respect the privacy of our colleagues and reduce the risk of being identified. All instructors taught and were asked about their general education courses.

Student participants ( $N = 36$ ) were enrolled in a general education course ( $n = 23$  online;  $n = 11$  hybrid;  $n = 2$  face-to-face). In terms of age, 51.35% of respondents were 18-21, 16.22% were 22-26, and 32.43% were over 26 years old. Of all the student participants, 56.76% were male, 43.24% were female, 21.62% were registered with our center for students requiring accommodations, while 67.56% were not (and 10.81% provided no answer). Most students were from the School of Business Management and Information Technology (21.62%) and the School of Health and Community Services (21.62%), but most other schools were also represented, including School of Engineering Technology (13.51%), School of Justice and Emergency Services (10.81%), School of Skilled Trades (8.11%), School of Media Art and Design (8.11%), School of Interdisciplinary Studies (8.11%), and the Centre for Food (8.11%). Although we did not ask students which year of their program they were in, the college offers primarily one-year and two-year programs with some advanced diplomas which are three years in length.

### Materials and Procedures

Full-time and contract faculty were recruited via email mid-semester and invited to share their use of, and opinions about, UDL in an anonymous online survey (Appendix A). This survey has previously been used by Kennette and Wilson (2019) to examine student and faculty perceptions of various UDL elements. The items ( $N = 35$ ) were related to each of the three principles of UDL: multiple means of representation ( $n = 11$ ), multiple means of action and expression ( $n = 7$ ), multiple means of engagement ( $n = 17$ ). This survey was originally developed so that it maps on to each of the checkpoints provided by CAST (CAST, 2011) for the three UDL principles (Kennette & Wilson, 2019). Each of these checkpoint items is supported by empirical

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evidence which is published on their site (CAST, 2018). As such, this survey appears to be high in face validity, though it has not been otherwise validated. Which survey items relate to each UDL principle are specified in the appendix next to the survey items, but this information was not shown to respondents during data collection (Appendix A). The number of items related to each principle should not be taken as an indication of its importance, but rather, perhaps, as a measure of the scope of the principle, and/or the variety of elements which fall under it (based on the checkpoints listed by CAST).

Participants were first asked to rate these items on how frequently they use them in their courses and then were prompted with these items a second time and asked to indicate how useful they perceived each element to be for student learning. In both cases, responses were given using a 5-point Likert scale: (1) Not at all; (2) A little bit; (3) A moderate amount; (4) A lot; (5) Unsure.

Students were recruited from their general education courses by their professor posting an announcement in their learning management system (LMS), followed by a reminder 1-week later. Students completed an almost identical questionnaire as their faculty had (with wording slightly updated to reflect the student perspective) and were first prompted to report how often they had experienced each of the elements and then to evaluate how beneficial they perceived each one to be for their learning (even if they had not experienced that UDL element).

## Results and Discussion

### Student Responses

Due to the smaller sample of some of the delivery modes, student data are reported combined in the analyses below. We first analyzed how often students reported their instructor using UDL principles and whether students perceived these elements as beneficial.

***UDL Elements Experienced in Classes.*** A weighted average was calculated for each item and these ranks are reported in Table 1 (left panel), with the rank of 1 indicating the highest weighted score, and therefore the item that the most students reported experiencing.

When two items had the same weighted average, we assigned each one the mean of the ranks (e.g., if the identical scores would be ranked 4 and 5, we assigned a rank of 4.5 to both items). In cases where more than 2 items were tied, we assigned the lowest rank score to all of the items (e.g., if the identical scores would have been ranked 4, 5, and 6, we assigned a rank of 4 to all three items and followed with a rank of 7 for the next item). Below, we focus our attention on the items that were ranked at the top and those at the bottom.

Prior to the start of the pandemic, students reported frequently experiencing the following elements of UDL in their courses: faculty use of the LMS to post handouts (rank = 1), making lecture slides available on their LMS, providing rubrics for assignments, posting grades online so that students can monitor their progress, and including group work. Further, students reported not experiencing many field trips (rank = 35), opportunities to re-submit assignments, choice in course topics, peer-evaluation opportunities, and flexible deadlines in their courses. These seem intuitively to reflect how the majority of faculty conceptualized their face-to-face or hybrid courses, with the LMS playing a supporting (but still important) role in pedagogy.

Additionally, when the items were grouped based on which UDL principle they represented, for the principle of representation, 47.82% of students felt that these items were used “a lot” in class. For the principle of engagement, it was 51.31%, and for the principle of action and expression, students responded “a lot” for 58.33%. So, it does appear that students are reporting experiencing all of the principles of UDL a fair amount in their courses.

***Perceived Benefits of UDL Elements.*** The rankings for students’ perceived value of these UDL elements prior to the pandemic are reported in Table 1 (right panel). Examining the highest-ranked and lowest-ranked items are likely to be the most informative about what students do and do not feel are beneficial UDL elements for their learning. Students perceived the most useful items to be having the opportunity to practice course content (rank = 1), making lecture slides available, providing clear guidelines on major assignments, connecting course content to real world experiences, and providing clear and specific feedback on assignments. At the other end

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of the spectrum, they did not seem to value field trips (rank = 35), peer-evaluation opportunities, having a choice in the course content, using hands-on activities in class, and group work. It is somewhat ironic that students did not value hands-on activities for their learning since Ontario colleges are designed to be practical and promote a more hands-on approach than their 4-year university counterparts, but perhaps students simply had a different understanding of what was meant by this item or rated it low because they recognized learning a great deal from non-hands-on sources such as a textbook.

**Table 1.**

*Students' self-reported experience (left panel) and perceived usefulness (right panel) of UDL elements in classes before the pandemic. Note: The numbers indicate the item's rank based on weighted means and the table has been sorted based on the rank in the "use" column for easier comparison.*

	Use	Usefulness
Post handouts on the LMS (or make them available digitally)	1	8
Make PowerPoint slides available to students	3	3
Provide rubrics for major assignments	3	6.5
Provide opportunities for students to monitor progress (e.g., grades posted on the LMS)	3	11.5
Include group work and collaboration with other students (e.g., discussions)	5	31
Communicate with students (in class, outside of class, via message board or email)	6.5	14
Provide sufficient (or unlimited) time for tests	6.5	16
Present the same course content in multiple ways (graphics, video, text, graphic organizers/concept maps, etc.)	8	11.5
Provide clear guidelines for major assignments (e.g., example/sample assignment)	9.5	3
Connect course content to real world experiences	9.5	3

Allow for some autonomy and/or control in student learning (e.g., options for assignments (topic or format); or choices on tests (choose 1 of 2 essay questions; or pick 5 of the following terms to define)	11.5	11.5
Provide clear and specific feedback on assignments	11.5	5
Answer questions about course content or assignments outside of class (e.g., discussion board, email)	13	6.5
Minimize threats and distractions in the learning environment	14	17.5
Offer interesting and relevant major assignments	15.5	15
Motivate students to do their best work	15.5	11.5
Guide you using increasingly difficult activities or assignments	17	24.5
Guide goal-setting and the development of student learning strategies	18	20.5
Offer an electronic version of the textbook	19	19
Highlight patterns and relationships in the course content	20.5	9
Use gender-neutral language and inclusive examples (race/culture, etc.)	20.5	30
Provide opportunities for self-assessment/self-evaluation and reflection	22	23
Offer ungraded or optional assignments to practice the course content	23	1
Make available a glossary of terms (on the LMS, in the textbook, or other)	24	17.5
Include subtitles on videos (closed captioned)	25	26
Offer alternatives for auditory info (e.g., transcripts of videos) and visual info (e.g., description of images)	26	29
Capture class lectures and made them available to stream after class (video or podcast)	27.5	24.5
Offer a choice of how students want to receive feedback on assignments (e.g., verbal or written feedback)	27.5	22
Use hands-on activities in class	29	32
Upload files can be read using text-to-speech software (e.g., Word documents PDFs)	30	27.5

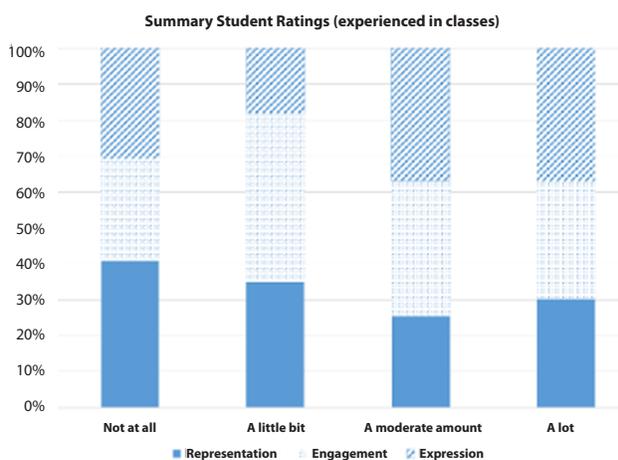
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Flexible due dates on major assignments (e.g., allowed to turn it in late)	31	27.5
Include peer-evaluation as part of the coursework	32	34
Let students decide which topics are covered in the course	33	33
Allow students to re-submit assignments	34	20.5
Include a field trip	35	35

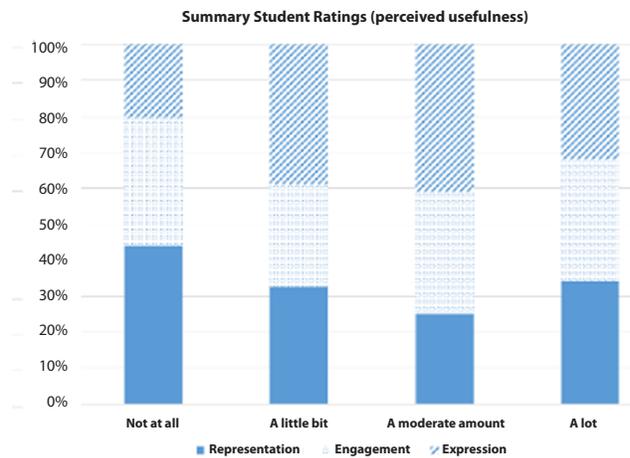
When collapsing data across all items related to representation, 67.55% felt these items were valuable “a lot”. For engagement, it was 66.68%, and for action and expression, students responded “a lot” for 62.95% of the items. Based on these figures, it appears that students perceive all three principles of UDL as beneficial to their learning. Figure 1 illustrates student-reported use and perceptions of usefulness for each of these principles. We can see that students reported many elements of action and expression in their courses (left panel, top portions of the right two bars), but were more neutral in their perception of its value (right panel).

**Figure 1. Comparison of reported use and perceived usefulness by students, grouped by the UDL principles.**

*Comparing Student Use and Usefulness.* In order to examine how consistent students’ rankings of their perceived use and usefulness of UDL elements were in



these pre-pandemic data, we performed a Spearman Rho correlation on the ranked data. This analysis showed that students’ perceived use and usefulness of UDL elements



were significantly positively correlated ( $r_s = 0.69, p < .001$ ). That is, the elements which were present most in students’ courses tended to also be the elements which students found beneficial for their learning and those not experienced often were least valued by students (e.g., field trips held the bottom rank in both).

Although the correlation showed that there was a strong relationship between both lists of rankings, it may be of interest to examine the difference between students’ perceived experience of UDL and the reported usefulness of individual items that deviate from this pattern. For example, students reported experiencing a lot of group work (rank = 5) but ranked its usefulness quite low (rank = 31). One possible explanation for this disparity is that students don’t yet grasp the value of the skills they are learning during group activities, or their contribution to their learning. Alternatively, students’ negative perceptions of groupwork may have caused them to overestimate its use.

Similarly, students reported “offer ungraded or optional assignments to practice course content” as the most beneficial (rank = 1) but did not report experiencing this a lot in their courses (rank = 23). It is possible that students are not recognizing the opportunities given to them to practice (e.g., through third party sources such as the textbook’s website), or that faculty simply aren’t offering those opportunities. To answer this question, we will need to look at faculty responses.

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### Faculty Responses

Given the small sample size in some of the delivery modes (face-to-face, online), we combined the data and did not examine these sub-groups individually. We first analyzed the self-reported actual usage of UDL approaches in the classroom, then the perceived benefits to students. Finally, we examined faculty comments about their rationale for using (or not using) UDL in their courses by way of a content analysis.

**UDL Elements Used in Classes.** The ranked faculty data for use are reported in Table 2 (left panel). Focussing our attention to the top and bottom of the list of rankings, we see that faculty most often report providing opportunities for students to monitor their progress on the LMS (rank = 1), communicating with students, connecting course content to real world experiences, and answering student questions outside of class. At the bottom, we find field trips (rank = 35), offering students a choice of how they receive assignment feedback, letting students determine course topics, allowing students to resubmit assignments, and providing students with a glossary. Overall, before the pandemic, it appears that faculty are in the driver's seat of students' learning experience, and making many pedagogical decisions without necessarily involving students. However, communication and availability to assist students seem to be key components of these pedagogical decisions.

**Table 2.**

*Faculty self-reported use (left panel) and perceived usefulness (right panel) of UDL elements in classes before the pandemic. Note: The numbers indicate the item's rank based on weighted means and the table has been sorted based on the rank in the "use" column for easier comparison.*

	Use	Usefulness
Provide opportunities for students to monitor progress (e.g., grades posted on the LMS)	1	5
Communicate with students (in class, outside of class, via message board or email)	2	5
Connect course content to real world experiences	3.5	1.5

Answer questions about course content or assignments outside of class (e.g., discussion board, email)	3.5	5
Post handouts on the LMS (or make them available digitally)	6	17
Offer interesting and relevant major assignments	6	3
Provide rubrics for major assignments	6	9
Make PowerPoint slides available to students	8	10.5
Motivate students to do their best work	9	7.5
Include group work and collaboration with other students (e.g., discussions)	10	20
Present the same course content in multiple ways (graphics, video, text, graphic organizers/concept maps, etc.)	11.5	10.5
Provide clear and specific feedback on assignments	11.5	7.5
Provide sufficient (or unlimited) time for tests	13	15
Provide clear guidelines for major assignments (e.g., example/sample assignment)	14.5	1.5
Highlight patterns and relationships in the course content	14.5	18
Use gender-neutral language and inclusive examples (race/culture, etc.)	16	29.5
Minimize threats and distractions in the learning environment	17	15
Allow for some autonomy and/or control in student learning (e.g., options for assignments (topic or format); or choices on tests (choose 1 of 2 essay questions; or pick 5 of the following terms to define)	18	12
Provide opportunities for self-assessment/self-evaluation and reflection	19	19
Guide you using increasingly difficult activities or assignments	20	13
Use hands-on activities in class	21	22
Include subtitles on videos (closed captioned)	22	22
Guide goal-setting and the development of student learning strategies	23	15
Offer ungraded or optional assignments to practice the course content	24	24

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Offer an electronic version of the textbook	26	28
Upload files can be read using text-to-speech software (e.g., Word documents PDFs)	26	26.5
Flexible due dates on major assignments (e.g., allowed to turn it in late)	26	32.5
Offer alternatives for auditory info (e.g., transcripts of videos) and visual info (e.g., description of images)	28	22
Include peer-evaluation as part of the coursework	29	31
Capture class lectures and made them available to stream after class (video or podcast)	30	26.5
Make available a glossary of terms (on the LMS, in the textbook, or other)	31	25
Let students decide which topics are covered in the course	32.5	34
Allow students to re-submit assignments	32.5	32.5
Offer a choice of how students want to receive feedback on assignments (e.g., verbal or written feedback)	34	29.5
Include a field trip	35	35

To answer the question raised in the student data, faculty do not report particularly high instances of providing opportunities for students to practice the course content (rank = 24), so this may be an area for faculty improvement. Alternately, this may have been ranked lower by faculty because they themselves are not the ones creating the opportunities for students to practice the course content (or are not keeping track of students' use of them), but instead expect students to make use of practice opportunities available elsewhere such as through the textbook website, or the campus office which provides practice tests and tutoring.

When collapsing data across all items reflecting the UDL principle of representation, 38.89% of respondents felt these items were useful "a lot". For engagement, it was 51.84%, and for action and expression, faculty responded "a lot" for 47.12% of the elements.

**Perceived Benefits of UDL Elements.** Table 2 (right panel) provides the rankings for faculty responses regarding usefulness. What faculty consider to be

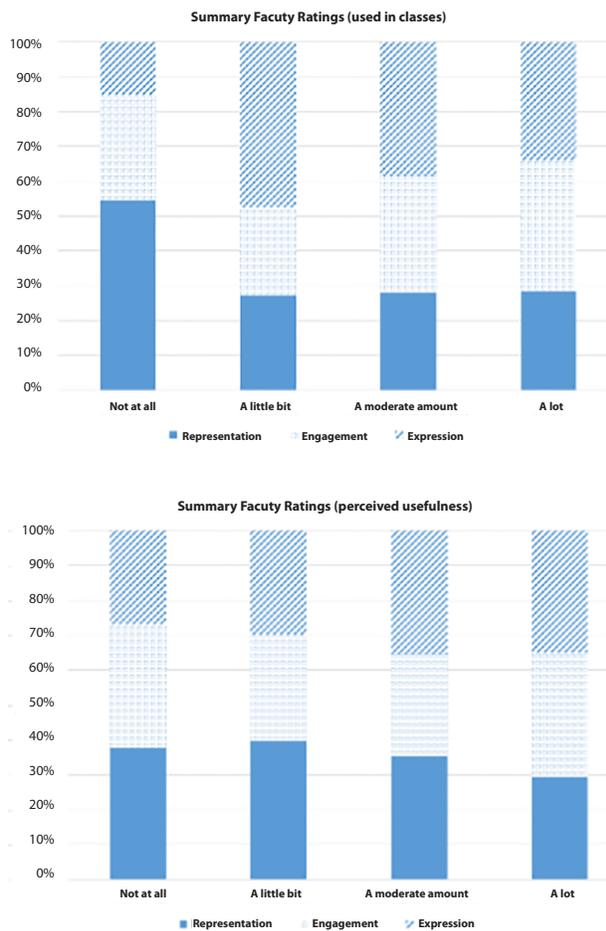
particularly useful for student learning is to connect course content to real-world experiences (rank = 1), provide clear guidance for assignments, offer interesting assignments, provide students with the opportunity to monitor their progress, communicating with students, and answering student questions outside of class. A field trip (rank = 35), letting students decide the topics of the course, offering flexible deadlines, and allowing students to re-submit assignments are perceived to be far less beneficial. We see that communication is viewed as more important for student success and student agency is viewed as less important in this process.

When collapsing data across the items which illustrated the principle of representation, 47.96% felt these items were useful "a lot". For engagement, it was 58.13%, and for expression, faculty responded "a lot" for 57.14% of the elements. Figure 2 illustrates faculty-reported use and perceptions of usefulness for each of these principles. We can see that faculty reported using representation the least (left panel, bottom of the first bar) but had a more distributed belief about its usefulness (right panel).

**Content Analysis.** In order to further probe the rationale of faculty for using (or not using) UDL in their courses, we analyzed their answers thematically to that open-ended question ("Please share with the researchers the reason(s) you have made the decision to implement (or not implement) UDL principles in your GNED courses. For example, your motivation could be from your own experience with challenges in learning, due to increased awareness of best practices from training or resources available on campus, etc."). The data reported are the number of distinct faculty who expressed a given theme in their response (i.e., we did not count a theme twice if the same person included it twice in their response). Our rationale is that we are interested in knowing for what proportion of faculty this theme was relevant, as opposed to how strongly relevant it is (especially since that type of information was provided in the Likert-type items reported above). Although we asked faculty to report their use of UDL (i.e., from the faculty's point of view), it was interesting to see that 26.67% of respondents also included the student's perspective in a portion of their explanation. For example, "...no matter what we tell students, many of them still regard GNED [a general education course] as a burden." This could be interpreted to show that faculty care about the student experience a

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**Figure 2. Comparison of reported use and perceived usefulness by faculty, grouped by the UDL principles.**



great deal and try to put themselves in students' shoes when designing curriculum.

We received 15 responses, which totalled 854 words (with an average response of 56.93 words per participant). Two responses were coded by two coders to establish inter-rater reliability. This represented 13.33% of total responses, which exceeds the recommended minimum of 10% (Riffe et al., 1998). The overall percent agreement was 100%, so we proceeded with our thematic assessment.

In the responses, no faculty reported not using any UDL at all. However, a few reported themes related to having courses that employed all of the UDL principles

for three main reasons: (1) some UDL approaches were not relevant for their content or did not align with their desire to prepare students for the real world (26.67%), (2) they had not yet had enough time to create some of the UDL approaches they wanted to add to their courses (6.67%), or they acknowledged that UDL could be difficult to implement (20.00%).

Three primary themes were discovered during the analysis: best practices, student success, and faculty perceptions. Within each of these themes, several related themes were identified that contributed to, or resulted from, these major themes. For example, it appears that faculty are aware that UDL is a best practice in pedagogy, and this awareness comes from their own experience, feedback from students, and professional development. As it relates to student success, faculty report that being inclusive in the classroom and allowing students to plan their time contribute to student success, which is beneficial for students. Finally, faculty acknowledge their perceived limitations of UDL (not always relevant or appropriate and can be challenging to implement) while also advocating for its benefits and wanting to use more (when time permits).

A summary is provided in the table below (Table 3), followed by a graphic representation (Figure 3) of the proposed relationships between the themes extracted from the data.

**Comparing Faculty Use and Usefulness.** To examine how consistent the reported use and usefulness of UDL elements by faculty were, we performed a Spearman Rho correlation on the ranked data. This analysis showed that the perceived use and usefulness of UDL elements were strongly positively correlated ( $r_s = 0.86, p < .001$ ). In other words, the elements which faculty used in their courses tended to be the ones they perceived as most beneficial to student learning. Perhaps not surprisingly, many of the elements that teachers perceived as most valuable to student learning were also the elements teachers reported including in their courses. Two exceptions stand out in these pairwise rankings. First, faculty don't report a high ranking for the use of providing students with clear guidelines on major assignments (rank = 14.5) but they do see it as highly valuable for student learning (rank = 1.5). This appears somewhat contradictory, but could reflect that faculty are aware of their shortcomings and

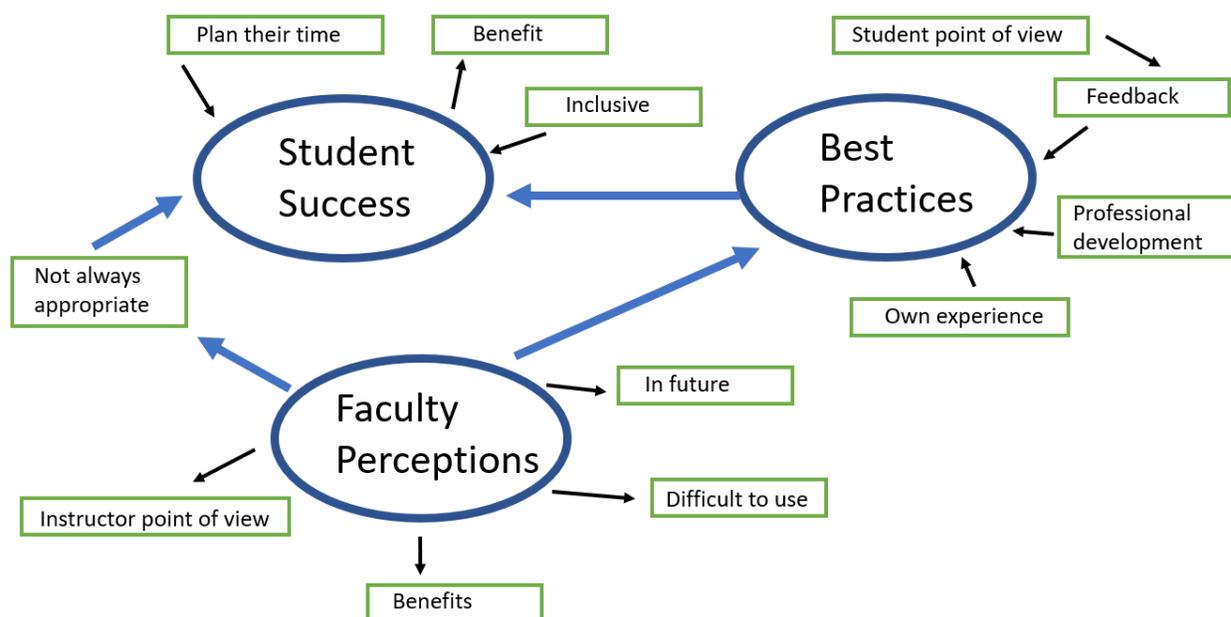
## Has the Pandemic Affected *continued*

**Table 3.**

*Summary of themes/sub-themes and examples from the data. Percentages refer to the proportion of faculty whose responses included that theme.*

Theme/sub-theme	%	Example
Best practice	53.55	"The principles do inform best practices in my teaching."
Student success	46.67	"Increase the likelihood of student success."
Professional development	33.33	"My awareness ...originated from professional development through the CAFE [Centre for Academic and Faculty Enrichment]."
Personal or professional experience	33.33	"I have additional motivation as someone who faced significant hurdles in the education system due to disability."
Inclusive	26.67	"Now my online courses are set up so that no further accommodations are needed."
Not always relevant	26.67	"...allowing them to choose the due dates and skills that best suit them."
Student feedback	20.00	"My students tip me off to their needs and that helps me learn, too."
Student time management	20.00	"With these adjustments, students can plan their semester out and choose which of my assignments to complete and when."
Better learning environment for students	20.00	"Permits me as professor be to creative and creates better learning environment."
Can be difficult to implement	20.00	"But time or my technological limitations are sometimes an issue."
Benefits faculty	6.67	"Win [students]-win [faculty]."
More planned for the future	6.67	"Some of the UDL points I intend to include when time permits. "

**Figure 3. Proposed relationship of themes in faculty participants' responses pre-pandemic, as analyzed by content analysis.**



## Has the Pandemic Affected *continued*

where they would like to improve their teaching practice. Second, faculty reported high use of posting digital handouts on the LMS (rank = 6), but they did not perceive this to be particularly valuable to students (rank = 17). Explaining this difference is perhaps to due faculty following an institutional policy requiring that material be posted on the LMS, rather than engaging in this behaviour with the goal of supporting student success.

### Comparing Student and Faculty Responses before COVID

To examine the agreement across students and faculty perceptions on the use and usefulness of UDL elements, we performed Spearman Rho correlations on the ranked data between groups. These analyses showed that the perceived use ( $r_s = 0.81, p < .001$ ) and usefulness ( $r_s = 0.64, p < .001$ ) between students and faculty were significantly positively correlated. These analyses show consistent perceptions from both students and faculty with both reporting the same elements are used in courses, and, to a slightly lesser extent, agree on which elements are beneficial for student learning.

Overall, there is a great deal of consistency across responses. However, examining the difference in scores between the rankings highlighted a few differences which stood out. First, with respect to the perceived use, the differences in ranks were much smaller than they were with usefulness, so students and faculty mostly agree with what is present in the classroom; but there is more disagreement between the groups in terms of which are most beneficial to learning. Specifically, faculty perceived that they communicated more with students than students perceived them to (faculty rank 3.5 vs. student rank 13) and faculty thought they offered more interesting assignments than students thought they did (ranked 6 vs. 15.5). In terms of usefulness, students perceived having the opportunity to practice course content as much more important than faculty did (ranked 1 vs. 24). Similarly, faculty considered interesting assignments to be far more important for learning than did students (ranked 3 vs. 15).

Furthermore, faculty report using (and consequently students report experiencing) a good representation of all three principles of UDL, rather than primarily relying

**Table 4.**

*Summary and comparison of reported use and perceived usefulness by students and faculty grouped by the UDL principles. Numbers indicate percent of respondents.*

		<b>Students</b>				
		<b>Not at all</b>	<b>A little bit</b>	<b>Moderate</b>	<b>A lot</b>	<b>Unsure</b>
<b>USE</b>	Representation	20.04	7.64	11.18	47.82	13.32
	Engagement	14.10	10.27	16.60	51.31	7.72
	Expression	15.08	3.97	16.27	58.33	6.35
<b>USEFULNESS</b>	Representation	10.51	8.25	11.70	67.55	1.99
	Engagement	8.46	7.18	15.84	66.68	1.84
	Expression	4.91	9.82	19.20	62.95	3.13
		<b>Faculty</b>				
		<b>Not at all</b>	<b>A little bit</b>	<b>Moderate</b>	<b>A lot</b>	<b>Unsure</b>
<b>USE</b>	Representation	26.85	11.16	18.31	38.89	4.78
	Engagement	14.86	10.37	21.67	51.84	1.26
	Expression	7.52	19.59	24.98	47.12	0.79
<b>USEFULNESS</b>	Representation	5.88	17.71	25.20	47.96	3.24
	Engagement	5.58	13.69	20.87	58.13	1.73
	Expression	4.20	13.45	25.21	57.14	0.00

## Has the Pandemic Affected *continued*

on one area (Table 4, top panel). Both faculty and students also perceived elements from all three principles to benefit their learning (Table 4, bottom panel). From the content analysis, it also appears that faculty are well aware that their choice to implement UDL elements into their courses is essential to student learning and has a direct impact on student success. This awareness and the agreements among faculty and student reports are encouraging from both a student-success perspective and a pedagogical one.

### Study 2: During the Pandemic

Approximately one year after our data collection for Study 1, the COVID-19 pandemic was declared. So, we wondered whether being forced online would affect teachers' and students' perceptions of the use and benefits of UDL. We undertook additional data collection to investigate this question. We used the same recruitment methods as Study 1 and from the same student population. At the time of recruitment, the pandemic had been going on for at least 7 months, so both students and faculty had some time to adjust to their courses now being online, and we were past the initial pivot and uncertainty of the winter 2020 semester when the pandemic was originally declared. Almost all of the courses at the institution continued to be delivered online when we collected the data for Study 2, but it is possible that some of the courses that student respondents were enrolled in (e.g., in healthcare programs) could have been offered in hybrid or in-person formats (though we did not collect this information explicitly). However, students were recruited from and asked to respond to the survey specifically about their general education courses, all of which continued to be delivered online.

### Methods

#### Participants

Student and faculty respondents were recruited in the 2020-2021 academic year, where the majority of the courses were still online, and all of the general education courses (the sample from which we collected our data) were being taught entirely online. We collected responses from 9 faculty and 24 students. Again, no demographic information was collected from faculty, but the student sample was similar to the characteristics described in Study 1. Specifically, the student sample was 66.67%

female, mostly aged 19 (37.50%) or over 26 (29.17%), and two-thirds were not registered to receive an accommodation through the college. Students were from a number of schools across campus: 20.83% from the School of Justice and Emergency Services, 16.67% from the School of Health and Community Services, 16.67% from the School of Education Technology, 12.5% from the School of Business and IT Management, 12.5% from the School of Interdisciplinary Studies, 12.5% from the School of Media, Art, and Design, and finally, 8.33% from the School of Skilled Trades.

### Materials and Procedure

Full-time and contract faculty were recruited via email mid-semester and invited to share their use of, and opinions about, UDL in the same anonymous online survey used in Study 1 (Appendix A). The 35-item survey first asked participants to rate the items on how frequently they use them in their course design and then to respond to those same 35 items to indicate how useful they perceived each element to be for student learning. Both of these used the same 5-point Likert scale as in Study 1.

Student participants were recruited from their general education courses by their professor posting an announcement. Students answered the same questionnaire as faculty, with the phrasing only slightly changed to reflect the student perspective (i.e., if they had experienced the item and perceived it was beneficial for their learning, even if they had not experienced that UDL element).

### Results and Discussion

#### Student Responses

*UDL Elements Experienced in Classes.* Examining the ranked student data (Table 5, left panel) we will focus our discussion on the top and bottom items in the list. Students reported frequently being able to monitor their progress in the course (rank = 1), receiving rubrics for assignments, being given some autonomy and/or control in their learning, being provided with clear and specific feedback on assignments, having access to digital handouts on the LMS, connecting the course content to real life, and faculty motivating them to do their best work in their classes. These items in particular seem to point to the perception of a more supportive role by

## Has the Pandemic Affected *continued*

faculty and indicate a greater focus on digital access, which is in line with the pivot to remote delivery which occurred during this period of time. Field trips and being allowed to resubmit assignments were very infrequently experienced by students (both of which were tied for the bottom rank), as were being offered a choice of how they want to receive feedback on assignments, peer-evaluation, and the use of flexible deadlines.

**Table 5**

*Student self-reported experience (left panel) and perceived usefulness (right panel) of UDL elements in classes during the pandemic. Note: The numbers indicate the item's rank based on weighted means and the table has been sorted based on the rank in the "use" column for easier comparison.*

	Use	Usefulness
Provide opportunities for students to monitor progress (e.g., grades posted on the LMS)	1	5
Allow for some autonomy and/or control in student learning (e.g., options for assignments (topic or format); or choices on tests (choose 1 of 2 essay questions; or pick 5 of the following terms to define)	2.5	17
Provide rubrics for major assignments	2.5	2
Connect course content to real world experiences	5	8.5
Provide clear and specific feedback on assignments	5	6.5
Motivate students to do their best work	5	8.5
Post handouts on the LMS (or make them available digitally)	8	13.5
Provide clear guidelines for major assignments (e.g., example/sample assignment)	8	1
Answer questions about course content or assignments outside of class (e.g., discussion board, email)	8	13.5
Offer interesting and relevant major assignments	10	3
Present the same course content in multiple ways (graphics, video, text, graphic organizers/concept maps, etc.)	12	10.5

Communicate with students (in class, outside of class, via message board or email)	12	10.5
Make PowerPoint slides available to students	12	6.5
Minimize threats and distractions in the learning environment	14	20
Highlight patterns and relationships in the course content	15	13.5
Provide opportunities for self-assessment/self-evaluation and reflection	16.5	25
Use gender-neutral language and inclusive examples (race/culture, etc.)	16.5	21.5
Guide goal-setting and the development of student learning strategies	18	18
Include group work and collaboration with other students (e.g., discussions)	19	32
Provide sufficient (or unlimited) time for tests	20	13.5
Guide you using increasingly difficult activities or assignments	21	21.5
Make available a glossary of terms (on the LMS, in the textbook, or other)	22	16
Offer an electronic version of the textbook	23	26.5
Capture class lectures and made them available to stream after class (video or podcast)	24	4
Include subtitles on videos (closed captioned)	25	31
Offer alternatives for auditory info (e.g., transcripts of videos) and visual info (e.g., description of images)	26.5	19
Offer ungraded or optional assignments to practice the course content	26.5	30
Use hands-on activities in class	28	28.5
Upload files can be read using text-to-speech software (e.g., Word documents PDFs)	29	26.5
Let students decide which topics are covered in the course	30	33
Flexible due dates on major assignments (e.g., allowed to turn it in late)	31	23.5
Include peer-evaluation as part of the coursework	32	34

## Has the Pandemic Affected *continued*

Offer a choice of how students want to receive feedback on assignments (e.g., verbal or written feedback)	33	28.5
Include a field trip	34.5	35
Allow students to re-submit assignments	34.5	23.5

**Perceived Benefits of UDL Elements.** The student usefulness ranks for all items are in Table 5 (right panel). Students perceived the following items as being particularly useful to their learning: being provided clear guidelines for assignments (rank = 1), receiving rubrics for assignments, being offered interesting and relevant assignments, capturing lectures and making them available after class, and being able to monitor their progress on the LMS. These items centre around assessments and digital access, which is not surprising given the shift that had occurred. Of least perceived value were field trips (rank = 35), peer-evaluation, letting students decide which topics are covered in the course, group work, and closed captioning videos. Overall, students reported that all three principles of UDL contributed to their learning, with 61.16% of students responding “a lot” for the group of items that fall under the principle of representation, 58% for engagement, and 61.04% for expression.

**Comparing Student Use and Usefulness.** To examine how consistently students perceived the use and usefulness of UDL elements, we performed a Spearman Rho correlation on the ranked data. This analysis showed that their perceived use and usefulness of UDL elements were strongly positively correlated ( $r_s = 0.78, p < .001$ ). That is, students reported experiencing to a high degree the same elements that they perceived as beneficial for their learning. There were two instances where a great discrepancy existed between students’ reported experience of an item and its perceived usefulness. In the case of capturing lecture for later viewing, students did not report this being available to them very much (rank = 24) but expressed that it was quite valuable for their learning (rank = 4). This might reflect a period of time when faculty (and institutions more generally) were still adapting to online technology and learning how to use them. Conversely, students reported being given a lot of autonomy and control in their learning (rank = 2.5), but did not perceive this as particularly useful (rank = 17).

### Faculty Responses

**UDL Elements Used in Classes.** The ranking data for faculty use of UDL elements are in Table 6 (left panel). The top elements that faculty reported using during the pandemic were: providing rubrics, posting electronic handouts on the LMS, offering interesting and relevant assignments, providing sufficient time for tests, and providing students the opportunity to monitor their progress (all five were tied with the highest rank). Faculty rarely offered a choice of how students preferred to receive their feedback (rank = 35), field trips, allowing students to re-submit assignments, or letting them decide the topics covered in the course. It appears that faculty focus on supporting student learning by providing information and transparency in their teaching choices rather than sharing that agency with students.

**Table 6.**

*Faculty’s self-reported use (left panel) and perceived usefulness (right panel) of UDL elements in classes during the pandemic. Note: The numbers indicate the item’s rank based on weighted means and the table has been sorted based on the rank in the “use” column for easier comparison.*

	Use	Usefulness
Post handouts on the LMS (or make them available digitally)	3	6
Offer interesting and relevant major assignments	3	9
Provide sufficient (or unlimited) time for tests	3	19.5
Provide rubrics for major assignments	3	1.5
Provide opportunities for students to monitor progress (e.g., grades posted on the LMS)	3	22.5
Connect course content to real world experiences	7	6
Communicate with students (in class, outside of class, via message board or email)	7	3
Make PowerPoint slides available to students	7	6
Include subtitles on videos (closed captioned)	10	12

## Has the Pandemic Affected *continued*

Answer questions about course content or assignments outside of class (e.g., discussion board, email)	10	6	Offer alternatives for auditory info (e.g., transcripts of videos) and visual info (e.g., description of images)	29	26.5
Motivate students to do their best work	10	19.5	Make available a glossary of terms (on the LMS, in the textbook, or other)	30.5	29.5
Minimize threats and distractions in the learning environment	12	12	Include peer-evaluation as part of the coursework	30.5	33
Present the same course content in multiple ways (graphics, video, text, graphic organizers/concept maps, etc.)	14	6	Let students decide which topics are covered in the course	32	29.5
Provide clear guidelines for major assignments (e.g., example/sample assignment)	14	1.5	Allow students to re-submit assignments	33	29.5
Provide clear and specific feedback on assignments	14	12	Include a field trip	34	34.5
Upload files can be read using text-to-speech software (e.g., Word documents PDFs)	16.5	19.5	Offer a choice of how students want to receive feedback on assignments (e.g., verbal or written feedback)	35	34.5
Guide you using increasingly difficult activities or assignments	16.5	12			
Highlight patterns and relationships in the course content	19	16.5			
Allow for some autonomy and/or control in student learning (e.g., options for assignments (topic or format); or choices on tests (choose 1 of 2 essay questions; or pick 5 of the following terms to define)	19	24.5			
Include group work and collaboration with other students (e.g., discussions)	19	22.5			
Offer ungraded or optional assignments to practice the course content	21	24.5			
Use gender-neutral language and inclusive examples (race/culture, etc.)	22	29.5			
Provide opportunities for self-assessment/self-evaluation and reflection	23	26.5			
Use hands-on activities in class	24	19.5			
Offer an electronic version of the textbook	25.5	15			
Capture class lectures and made them available to stream after class (video or podcast)	25.5	16.5			
Flexible due dates on major assignments (e.g., allowed to turn it in late)	27	32			
Guide goal-setting and the development of student learning strategies	28	12			

**Perceived Benefits of UDL Elements.** The data are in Table 6 (right panel). Faculty perceived the most useful items to be providing rubrics and clear guidance on assignments (tied for the top rank), and communication with students. Of least value were offering a choice of how students would receive their feedback and including a field trip (both of which were tied for the last position), peer-evaluation, and flexible due dates for assignments. Communication and assessments appear to be driving faculty perceptions of what is valuable to student learning. Faculty reported that they believed that all three principles of UDL contributed to some extent to their students' learning, with 53.54% responding "a lot" for the group of items that fall under the principle of representation, 41.01% for engagement, and 49.21% for action and expression.

**Content Analysis.** In order to explore whether the reasons reported by faculty for using (or not using) UDL might have changed as a result of COVID, we again examined the themes in the comments they left using a content analysis. The open-ended question they responded to at the end of the survey was "Please share with the researchers the reason(s) you have made the decision to implement (or not implement) UDL principles in your GNED courses. For example, your motivation could be from your own experience with challenges in learning, due to increased awareness of best practices from training or resources available on campus, etc." We report the percentage of different faculty members who included that particular theme in their response, so even if they mentioned it more than

## Has the Pandemic Affected *continued*

once, that is not reflected in these data. This is to see how many faculty find the theme relevant and not the extent to which they find it important.

We received 9 responses, totalling 435 words (with an average response of 48.33 words per participant). Two raters rated one randomly-selected response (11.11% of total responses), and the overall percent agreement was 86% which is well above the recommendation of 70-80% (Frey et al., 2000; Watt & van den Burg, 1995). Additionally, the Cohen's Kappa ( $k = .70$ ) *confirmed adequate inter-rater reliability agreement to proceed* (Cohen, 1960; Landis & Koch, 1977; McHugh, 2012).

None of the faculty members reported not using any UDL at all, and even the one respondent who was very critical of the UDL approach reported using some elements of UDL in their classes. The faculty respondent who critiqued UDL as an approach felt that it reduced students' responsibility and did not mirror the eventual realities of the working world ( $n = 1$ ; 11.11%).

The same three themes were present as with the pre-pandemic data—best practices, student success, and

faculty perceptions—but there was much less depth and richness or responses within each of these themes. For example, faculty are aware that using UDL is a best practice, but none mentioned student feedback as a reason they used it as they did in Study 1; instead, their motivation and knowledge of it being a best practice came from their own experience and professional development. Regarding student success, faculty primarily reported that students benefitted from planning their time and focusing on their strengths. Finally, faculty acknowledge that, although it may not always be appropriate to use, it can benefit faculty in addition to students. A summary of these themes is in Table 7, and an image of the relationships between themes is in Figure 4.

**Comparing Faculty Use and Usefulness.** To examine whether faculty showed a consistent perception of the use and usefulness of UDL elements, we performed a Spearman Rho correlation on the ranked data. This analysis showed that their perceptions were strongly positively correlated ( $r_s = 0.78$ ,  $p < .001$ ). Faculty reported using elements that they perceived to be beneficial for student learning. However, the difference scores between the rankings showed three obvious deviations from this

**Table 7.**

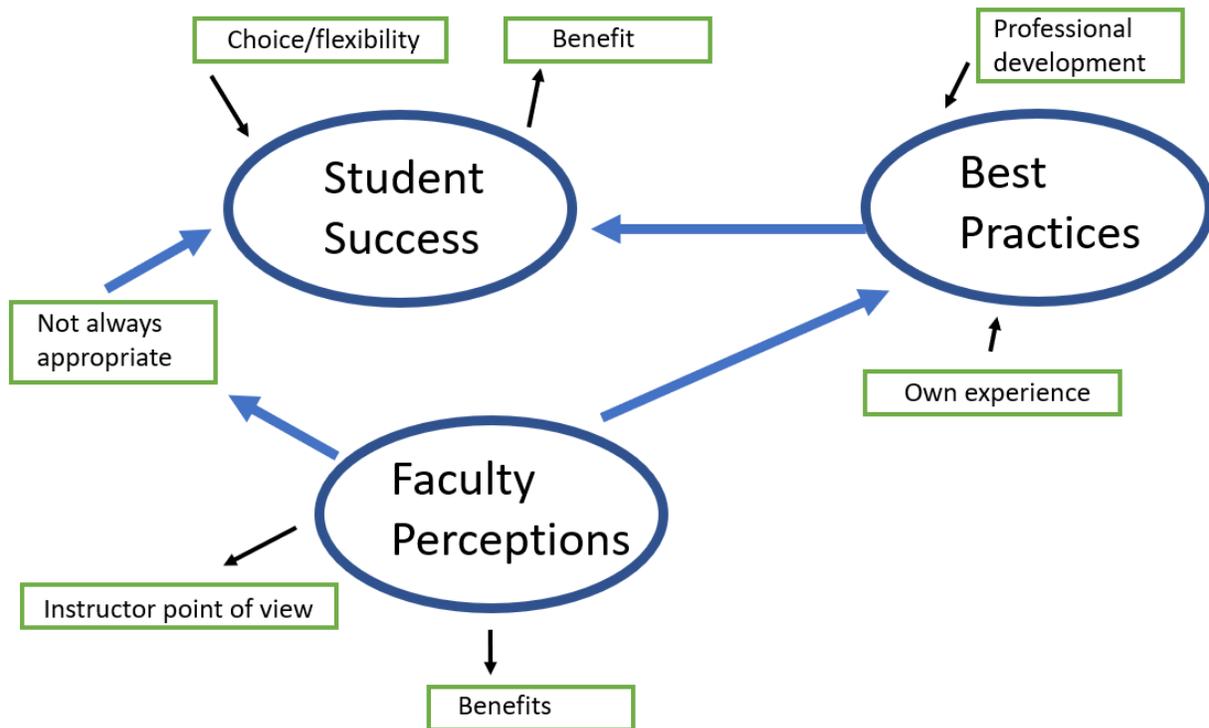
*Summary of themes/sub-themes and examples from the COVID data. Percentages refer to the proportion of faculty whose responses included that theme.*

Theme/sub-theme	%	Example
Best practice	33.33	"While some UDL practices are actually good teaching practices..."
Student success	33.33	"increase their skills and build their confidence"
Student choice/flexibility	33.33	"...to allow students to use their strengths...providing them choice can help do that"
Personal or professional experience	33.33	"...comes from my own experience"
Better learning environment for students	33.33	"student engagement and enjoyment improve after implementing some UDL principles"
Benefits faculty	22.22	"Using UDL makes my life easier"
Professional development	22.22	"...in training available through DC [Durham College] and Fleming [college]"
Not always relevant	11.11	"...it is not good for student success in the real world"

## Has the Pandemic Affected *continued*

**Figure 4.**

*Proposed relationship among themes and codes in faculty participants' responses during the pandemic (as analyzed by content analysis).*



pattern. First, faculty perceived clear guidelines for major assignments as very important for students to learn (rank = 1.5) but reported not providing these opportunities as much (rank = 14). Second, faculty reported providing students with many opportunities to monitor their progress on the LMS (rank 3) but did not rate it as particularly valuable (rank = 19.5). Third, faculty reported providing sufficient time for tests (rank = 3), but did not see it as particularly important for student success (rank = 19.5).

### Comparing Student and Faculty Responses during COVID.

To examine the agreement across students and faculty perceptions on the use and usefulness of UDL elements during COVID, we performed Spearman Rho correlations on the ranked data. These analyses showed that the perceived use ( $r_s = 0.78, p < 001$ ) and usefulness ( $r_s = 0.67, p < 001$ ) across students and faculty groups were significantly positively correlated. Both students and faculty agree on which elements are present in

their courses, and which ones are beneficial to student learning. Again, focussing our attention on the perceived differences between the groups, especially at the upper and lower ends of the ranks, we see that there is a great deal of consistency between students' and faculty's perceived use of UDL elements. This likely reflects the accuracy of the collected data in that it is an accurate representation of reality since both groups agree in their reported frequency of these elements.

Students reported experiencing far more autonomy and/or control in their learning than faculty reported providing them with (student rank 2.5 vs. faculty rank 19). Faculty also typically perceived that they provided sufficient time for tests, but students did not (ranked 3 vs. 20). Similarly, students reported encountering closed captioned videos much more often than faculty reported providing them (though this discrepancy could be explained by students turning on their own captioning on YouTube for example).

## Has the Pandemic Affected *continued*

In terms of perceptions of usefulness, there was also a difference between student and faculty perceptions about closed captioning videos in that faculty found it more valuable for student learning than did students (ranked 12 vs. 31). Also, students ranked being able to monitor their progress on the LMS as far more useful for their learning than did faculty (ranked 5 vs. 22.5), though this could be a question misunderstood by students who equated their learning as directly related to their grades rather than grades being an estimation of their learning.

Students and faculty also both reported experiencing similar amounts of items that fall under the principle of representation, engagement, and action and expression, along with similar perceived value. A summary of the frequency of these responses is in Table 8

### Comparing Pre-COVID responses with responses during COVID

We were particularly interested in examining whether student and faculty perceptions of use and usefulness were

consistent or different during the pandemic compared to prior to it. To this end, we conducted Spearman correlations on the ranks. Specifically, we looked at whether students' experience of UDL elements or their perceived usefulness changed, as well as whether there were any changes in faculty perceptions of their use or perceived usefulness of these elements. The correlations showed that all of these pairwise comparisons were significantly positively correlated indicating that the overall picture appears to be consistent pre-COVID and during the pandemic. Specifically, there were strong positive correlations in students' perceived use ( $r_s = 0.85$ ,  $p < 001$ ), and usefulness ( $r_s = 0.71$ ,  $p < 001$ ) as well as faculty's use ( $r_s = 0.80$ ,  $p < 001$ ) and usefulness ( $r_s = 0.71$ ,  $p < 001$ ) before the pandemic and during the pandemic. This is in line with the more qualitative findings we reported earlier, with many of the elements consistently appearing at a similar rank across conditions. These results seem to indicate that faculty continued to offer UDL elements in their courses even with the shift to online, that students continued to perceived the existence

**Table 8.**

*Comparing student and faculty use and usefulness during COVID. Numbers indicate % of respondents.*

		<b>Students</b>				
		<b>Not at all</b>	<b>A little bit</b>	<b>Moderate</b>	<b>A lot</b>	<b>Unsure</b>
<b>USE</b>	Representation	14.82	6.82	19.81	44.80	13.75
	Engagement	10.05	8.13	20.65	49.89	11.27
	Expression	6.55	13.69	26.19	45.24	8.33
<b>USEFULNESS</b>	Representation	7.02	7.85	20.66	61.16	3.31
	Engagement	8.82	13.10	18.74	58.00	1.34
	Expression	2.60	10.39	25.32	61.04	0.65
		<b>Faculty</b>				
		<b>Not at all</b>	<b>A little bit</b>	<b>Moderate</b>	<b>A lot</b>	<b>Unsure</b>
<b>USE</b>	Representation	14.27	14.39	12.37	54.67	4.29
	Engagement	11.11	15.77	17.73	53.43	1.96
	Expression	1.59	22.22	14.29	61.90	0.00
<b>USEFULNESS</b>	Representation	7.07	8.08	26.26	53.54	5.05
	Engagement	5.23	15.69	32.84	41.01	5.23
	Expression	9.52	14.29	26.98	49.21	0.00

## Has the Pandemic Affected *continued*

of these elements, and that both faculty and students' perceived usefulness of the UDL elements remained consistent. In many ways, this is encouraging. It could have negatively affected student success if faculty had decided, in their pivot to online, to strip their courses and teaching practices of these UDL components. Neither student or faculty reports seem to indicate that this occurred, further supporting the content analysis results and highlighting the focus that faculty continue to have on student learning and student success.

Although the correlations were strong, indicating general overall agreement across conditions, a visual inspection of the rankings across conditions identified a few interesting changes which stood out and may have been a direct result of the adaptation to the pandemic. Comparing student use data pre-pandemic and during the pandemic, students during the pandemic identified being assigned less group work and less likely to have sufficient time for tests which likely reflects a shift to online where group work is more challenging (or at least occurs less organically), and the challenges of a new way of taking tests. Additionally, students reported experiencing more encouragement or motivation from faculty, which was not prominent in the pre-pandemic data, and may reflect faculty's increased awareness of the struggles that everyone, including students, were facing during the pandemic and the pivot to remote delivery.

In the usefulness data, students perceived having opportunities for practicing course content as the single most useful factor to their learning pre-pandemic but this dropped to the rank of 30 during the pandemic, possibly reflecting the difficulty of translating hands-on learning to the online environment<sup>1</sup>, and perhaps students noticed that they were learning nonetheless, thus seriously altering their perceptions overall. Additionally, student data during the pandemic identified capturing lectures and making them available after class as well as providing interesting assignments as far more important than they had been in the pre-pandemic data. This increase in importance during the pandemic makes sense as interesting assignments likely increased student motivation which might have been harder to maintain in the online environment. Also, pre-pandemic students

were far less likely to be exposed to lecture recordings since it is much more complicated to record in-person classes than it is to record an online class, so a change in the perceived value of this also makes intuitive sense. Or at least this appears to be the reality at our institution, as we are not aware of any faculty who were recording their synchronous lectures prior to the pandemic. It might also be the case that students were increasingly trying to juggle the additional (non-academic) burdens placed on them (e.g., childcare for their children or siblings) due to the pandemic and consequently could better appreciate the flexibility that a recorded lecture provided.

Looking at the faculty data, they reported more use of videos with closed captioning, providing enough time for tests, and uploading accessible files compared to their pre-pandemic practices. Their perception of usefulness also changed for some items. Most notably, providing an eBook was perceived as more useful to student learning during the pandemic, as was providing digital handouts. It is likely that both of these increased in perceived usefulness because paper copies of either of these were no longer practical. Finally, faculty perceived that students being able to monitor their progress was less useful during the pandemic than it had been pre-pandemic.

### General Discussion

The purpose of these studies was to examine students' and faculty's perceptions of UDL elements in the classroom, both pre-COVID and during the COVID-19 pandemic. In doing so, we found surprising consistency in these perceptions. With a few exceptions, discussed below, student and faculty perceptions of UDL were not greatly impacted by the pandemic. The detailed data provide insight into the frequency that many UDL elements are occurring in college classrooms as well as the perceived value that both students and faculty place on these elements. Even though perceptions may not be an objective measure of behaviors, perceptions do form people's realities, making them valuable, especially for a topic such as this one.

While correlations were consistently high for both groups in terms of use and usefulness, it is worth

<sup>1</sup> Note: All of the elective courses where students surveyed during the pandemic (Study 2) were fully online, but it is possible that some students were enrolled in certain courses which maintained an on-campus presence due to the nature of their program (e.g., health care programs). Survey instructions asked students to respond only about their general education courses, which would have all been online.

## Has the Pandemic Affected *continued*

discussing where the most divergence occurred and the possible reasons for these differences. The weakest correlations occurred in the usefulness data, comparing students' and faculty's perceptions. Before COVID, the weaker correlation shows that students and faculty agree less about which UDL elements are present in the classroom, for example. Specifically, faculty believed interesting assignments were more useful than students did, and students perceived having opportunities to practice course content as more beneficial than faculty did. This tells us that pre-pandemic, students and faculty experienced some disagreement on the elements that were most beneficial to learning.

During COVID, the correlation between students' and faculty's perceived usefulness was also weaker (though quite similar to the same comparison in the pre-COVID Study 1). However, during COVID, faculty perceived closed captioning as more useful than students did, and students reported that monitoring their grades on the LMS was more useful than faculty did. Clearly, the items upon which the two groups diverged in terms of usefulness changed from pre-pandemic to during COVID, which could indicate either an increased awareness of or more frequent use of digital technology than before the pandemic. Students clearly gained an appreciation for monitoring grades on the LMS while immersed in online learning during the pandemic and faculty also gained a greater appreciation for the benefits of using closed captioning during this time. Perhaps faculty's perceived usefulness of closed captioning increased due to professional development related to online learning (which often recommend closed-captioning as an easy way to integrate UDL principles and accommodation practices) or gained an appreciation of the benefits of closed captioning by experiencing this in various ways themselves (e.g., live captioning button during video meetings). Previously, Kennette and Wilson (2019) reported that faculty tended to focus their UDL efforts on including those elements which they perceived as most useful rather than elements that they did not perceive to be particularly useful for student learning such as field trips, and capturing lectures to view later. The present study does appear to mirror these results in that there were significant positive correlations between use and usefulness.

One major shift during the COVID pandemic was

the number of people who responded to the survey with reductions of at least 30% despite sharing our survey invitation with approximately the same number of people (both faculty and students). Specifically, faculty responses went from 15 to 9, and student numbers reduced from 36 to 24. This could point to potentially lower engagement. The response rate has previously been reported as an indication of engagement (de la Rocha, 2015), so extending it to this context, having fewer respondents could indicate less engagement. For example, one of the often-cited issues with virtual learning is survey fatigue (Porter et al., 2004). This mirrors the response patterns for the faculty content analysis as well, with fewer words per response resulting in a less detailed outcome. Although most faculty had a favorable view of UDL, one respondent during COVID had a very negative view, proposing that providing elements that are aligned with UDL principles promotes student laziness and reduces accountability and therefore gives students an unrealistic expectation for the future as the real world does not accommodate as readily (though they did acknowledge that some aspects of UDL reflect good pedagogy such as closed captioning videos). This aggressive view of UDL was not present in the pre-COVID data.

Overall, when comparing pre-pandemic data to the data collected mid-pandemic, strong correlations were discovered in perceptions of use and usefulness of UDL for both faculty and students. This demonstrates that there was a great deal of consistency reported by these groups, perhaps more than expected, given the jarring shift from learning experiences taking place mostly in class to a learning environment that was entirely online. These results confirm that many faculty were able to adapt their courses into online formats without sacrificing important UDL elements in the process. Given the drastic change of context, it should also be noted that students were still able to identify the use of UDL elements and report their usefulness in the online environment. This may suggest several things. First, it is worth noting that digital literacy has played an important role in education during the last several years. Had this pandemic occurred at an earlier time technologically, perhaps students and faculty would not have been as easily able to convert their classrooms from in-person to online. Most institutions were already using an LMS, and our results perhaps speak to their existing

## Has the Pandemic Affected *continued*

usefulness and functionality. Next, the consistently high correlations across the two studies reflect the durability of Universal Design for Learning and the scholarship that supports it. Clearly, UDL principles of multiple means of engagement, representation, and action & expression are enduring characteristics that can survive a radical change of context (at least at our institution). Relatedly, it is clear the faculty surveyed were familiar with UDL, which perhaps speaks to the availability of PD encouraging its use and therefore prioritized its continued presence when shifting online. Finally, some of faculty's familiarity with UDL principles might stem, at least in part, from the fact that Ontario is one of the few provinces with legislation related to accessibility (Accessibility for Ontarians with Disabilities Act (AODA), 2005), requiring those working in the education sector to complete mandatory training on this topic.

In terms of trends, it seems that the pandemic increased the perceived value of technology for both students and faculty, specifically with faculty perceiving electronic textbooks and online handouts as beneficial and students valuing recorded lectures. Additionally, it likely resulted in students seeing greater value in having the flexibility of how and when they received the course content (e.g., recorded lectures) and how they demonstrated their learning, specifically with being assigned interesting assignments. Students and faculty alike could have benefitted from added flexibility in their schedules during the pandemic, which recorded lectures provided, so this appears self-explanatory. Perhaps the relevant assignments are perceived as much more beneficial because they have been shown to increase motivation (Frymier & Shulman, 1995; Pink, 2011), something which students may have been lacking during the pandemic (Boardman et al., 2021). One way that faculty can create more engaging and relevant assignments is by including more “non-disposable” (also called “renewable”) assignments that are authentic instead of the traditional term papers or tests (Seraphin et al., 2018). Indeed, there has been a lot of literature supporting the tangible benefits that these types of assignments have for student learning for various reasons, including motivational aspects (Chalofsky & Krishna, 2009; Chen, 2018; Farzan & Kraut, 2013).

### Future Directions

In addition to examining these patterns with more extensive and more varied samples (different types of institutions, different countries, etc.), a number of other investigations would be beneficial to understanding

the patterns reported here. For example, there may be differences between the perceived usefulness of UDL elements from instructors who are designing their courses with UDL in mind versus those who are creating courses that include UDL elements accidentally (or unintentionally). Presumably, the intention behind these elements could be perceived by students not only with the availability of the UDL elements themselves, but also with the climate of the class or other interactions with the teacher. It may be possible that faculty at this Ontario college were particularly aware of UDL and were consciously engaged in including these elements in their courses. This is because Ontario is one of the few Canadian provinces which has legislation mandating accessibility training (AODA), meaning that all faculty would have had to complete some mandatory training on how to be compliant with this legislation, so they may have been acting intentionally. Specifically, the AODA Education Standards specifically recommend that students have more access to “Accommodations in higher education, through a universal design for learning (UDL) approach” (Accessibility for Ontarians with Disabilities Act, 2021).

Because students report more of these UDL elements as valuable than faculty, perhaps it would be beneficial for faculty to consider including more of the elements that students perceive to be useful for their learning, or as many of the elements as possible (as appropriate for their courses), because even if faculty do not perceive the benefits, students may. However, it may also be important to ensure that these perceptions are based in a quantifiable reality. That is, to experimentally manipulate the elements which students perceive to be beneficial, to see if they actually are beneficial to their learning (in some meaningful way such as grades). Future directions might include investigations of whether faculty use, student preference, or perceived usefulness for UDL elements translate into more tangible benefits such as reduced stress, increased grades, etc. Based on previous work, one would expect to see measurable benefits to using UDL in the classroom. For example, Hattie (2018) found that specific instructional strategies such as teacher clarity, evaluation, and reflection affect student achievement, and these strategies, in particular, align quite well with UDL guidelines. A recent content analysis by Al-Azawei et al. (2016) also showed positive outcomes for students experiencing UDL in their courses, which would also point to a likely correlation between learning outcomes and the self-reported experience of UDL in the classroom.

## Has the Pandemic Affected *continued*

Given the unique qualities of students attending 2-year institutions such as those who participated in these studies, compared to the 4-year universities where many previous studies on UDL have taken place (e.g., Basham et al., 2020; Hills et al., 2022; Pearson, 2015; Schelly et al., 2011; Schreffler et al., 2019), these results may reflect the more practical nature of these students and faculty. Canadian colleges in Ontario are post-secondary institutions that focus on preparing students for a certain career path, like nursing, computer programming, dental hygiene, or welding, so they are more similar to American “community colleges.” These learners differ from 4-year university students in that there is less focus on traditional academic scholarship and more focus on procedural or skill-based training. As such, our results offer a new angle for examining the use and usefulness of UDL in a more hands-on learning environment, and also raise important questions about the differences in the frequency of use and perceptions of usefulness between students and faculty at colleges versus 4-year universities which will require further investigation. In the same vein, our results were derived from students and faculty in General Education classes, which capture students from all departments across the college making it a representative sample. However, it may be worth considering how our results may have differed by department and thus, how UDL is perceived by students in different fields of study.

### Limitations

As with all scientific inquiries, certain limitations need to be acknowledged. First, the between-subjects design was not ideal for some of the questions we posed, but it was not possible to engage in a pre-post design given the sudden and unexpected nature of the pandemic. To try to make our samples at the two timepoints comparable, we sampled the same population, but it is certainly possible that students who elected to attend online during the pandemic could be different in some important ways from the typical college student (which we recruited pre-pandemic in Study 1) and/or from those students who chose to defer entering higher education until after the pandemic was over and classes returned to in-person. We also did not ask students which year of their program they were in, and the college offers, one-, two-, and three-year credentials, so students’ experience in higher education could also affect their perceptions of UDL. Future studies might wish to explore this

question. With faculty, although the faculty surveyed taught general education courses, they may not all have been equally comfortable or have equal experience with online delivery across the two timepoints which could have affected their perceptions. As such, these differences could have affected our comparisons between pre-pandemic perceptions (Study 1) and those during the pandemic (Study 2). Future research should examine the same students’ and faculty’s perceptions longitudinally to answer some of these questions and shed some light on these results.

Another limitation relates to the delivery format of the course. In the pre-pandemic data (Study 1), students were recruited from a mix of fully online, hybrid, and fully in-person general education courses (most of whom were in hybrid courses), while the students who provided the pandemic data were all taking fully online general education courses. Due to the small sample size, we could not examine the online students’ responses separately in the pre-pandemic data (Study 1) to be able to better match the sample in terms of delivery mode to the post-pandemic sample. Similarly, the small sample size limits our interpretation and generalization of these data as a small sample’s responses may not be representative of the greater population from which it was drawn, so future studies would benefit from replicating these findings with a much larger sample. Although the correlational analyses reported here are based on enough data (the ranking of the survey items) to be able to detect a relationship (Hulley et al., 2007; Lachin, 1981; May & Looney, 2020), it is important to acknowledge that more student and faculty would provide greater confidence in the rankings and thus greater overall generalizability. Finally, the survey developed by Kennette and Wilson (2019) has not been psychometrically validated and is based on an incomplete list of UDL items provided by CAST (2011) in the form of checkpoints. A more comprehensive list of UDL elements could be used to develop (and validate) a more comprehensive survey of UDL elements in the future. However, caution should be used that a comprehensive survey is not too long and consequently be impractical/time prohibitive.

### Conclusions

Online learning has unique barriers, and the most frequently reported by students is typically the perception (whether accurate or not) of the lack of

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social interactions (Adnan & Anwar, 2020; Britt, 2006). Nevertheless, perceived barriers decrease as experience with online learning increases, with a considerable drop after taking just one online course (Muilenburg & Berge, 2005; Talbert, 2020). Consequently, students' pandemic experiences with online learning may benefit them in future online courses, regardless of the presence of UDL elements. Researchers and practitioners should continue to monitor the progress made with UDL in academia, with the ultimate goal of providing a completely barrier-free learning environment inclusive of all learners.

In answering one of Hutchings' "what is" questions within our college, we continue the iterative tradition of Universal Design for Learning in order to better understand its operation. Over the past several years, a bounty of "what is" questions have arisen within our individual institutions and within SoTL more generally. While many of these questions are still unanswered (for example, what *long term* impacts will the pandemic have on teaching and learning?), our results hint at a promising level of stability during an otherwise tumultuous time. Perhaps we can thank UDL for providing an anchor to faculty and students during the rough storms of the pandemic. The authors have great faith that the global SoTL community will offer powerful insights into this collective shift, illuminating novelty and innovation that will strengthen pedagogy for the post-pandemic future.

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### Appendix A- Survey Items

#### PART 1 -

Faculty instructions: For each item, indicate how much you use it in your General Education course(s)

Student instructions: For each item on the list, indicate how much you have experienced this in your General Education course(s). (see items below)

#### PART 2

Faculty instructions: For each item, indicate how useful you think these things are in helping your students learn in your General Education course(s). Please answer for each item, *even if you do not use it in any of your courses*.

*Student instructions:* For each item, indicate how useful you think these things would be in helping you learn in your General Education course(s). Please answer for each item, *even if you did not experience it in any of your courses*. (see items below)

**ITEMS:** *Note that for the parenthetical letters after each question: R refers to the principle of Representation, A refers to Action and Expression, and E to Engagement. These indicators were not included in the survey text presented to participants.*

1. Present the same course content in multiple ways (graphics, video, text, graphic organizers/concept maps, etc.) (R)
2. Offer an electronic version of the textbook (R)
3. Post handouts on DC Connect [LMS] (or make them available digitally) (R)
4. Include subtitles on videos (closed captioned) (R)
5. Upload files can be read using text-to-speech software (e.g., Word documents PDFs) (R)
6. Provide clear guidelines for major assignments (e.g., example/sample assignment) (R)
7. Include a field trip (R)
8. Capture class lectures and made them available to stream after class (video or podcast) (R)
9. Make available a glossary of terms (on DC Connect [LMS], in the textbook, or other) (R)
10. Offer alternatives for auditory info (e.g., transcripts of videos) and visual info (e.g., description of images) (R)
11. Highlight patterns and relationships in the course content (R)
12. Offer interesting and relevant major assignments (E)
13. Allow for some autonomy and/or control in student learning (e.g., options for assignments (topic or format); or choices on tests (choose 1 of 2 essay questions; or pick 5 of the following terms to define) (E)
14. Let students decide which topics are covered in the course (E)
15. Use hands-on activities in class (E)
16. Connect course content to real world experiences (E)
17. Communicate with students (in class, outside of class, via message board or email) (E)
18. Provide clear and specific feedback on assignments (E)
19. Offer a choice of how students want to receive feedback on assignments (e.g., verbal or written feedback) (E)
20. Allow students to re-submit assignments (E)
21. Include peer-evaluation as part of the coursework (E)
22. Make PowerPoint slides available to students (E)
23. Include group work and collaboration with other students (e.g., discussions) (E)
24. Provide opportunities for self-assessment/self-evaluation and reflection (E)
25. Answer questions about course content or assignments outside of class (e.g., discussion board, email) (E)
26. Use gender-neutral language and inclusive examples (race/culture, etc.) (E)
27. Minimize threats and distractions in the learning environment (E)
28. Motivate students to do their best work (E)

## Has the Pandemic Affected *continued*

29. Flexible due dates on major assignments (e.g., allowed to turn it in late) (A)
30. Offer ungraded or optional assignments to practice the course content (A)
31. Provide sufficient (or unlimited) time for tests (A)
32. Provide rubrics for major assignments (A)
33. Guide you using increasingly difficult activities or assignments (A)
34. Guide goal-setting and the development of student learning strategies (A)
35. Provide opportunities for students to monitor progress (e.g., grades posted on DC Connect [LMS]) (A)