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Exploring the Implementation of Lesson-Level UDL Principles

through an Observation Protocol

Introduction

The landscape of the general education classroom has dramatically changed over the last two decades. To date, approximately 62 % of students identified with a disability are included within the general education classroom within the United States (NCES, 2016). General and special education teachers alike, are faced with the daily challenge of meeting the unique needs of all students regardless of their ability or disability. Though the content standards set a high bar for "what" to teach, they do not prescribe "how" to teach, nor do they define interventions or supports needed for students who are either below or above grade level expectations. Emerging research on Universal Design for Learning (UDL) provides a framework to help teachers match research-based instructional methods with students' specific strengths and challenges (CAST, 2007).

UDL principles have evolved from a theoretical framework grounded in findings from neuroscience that are meant to provide "all individuals equal opportunities to learn" (CAST, 2015). More recently, the UDL guidelines and checkpoints have emphasized addressing learner variability in predictable and systematic ways by knowing key facts about learning and the brain, particularly the concept of "neuro-variability" (p.1), which means there is no average brain (CAST, 2018). Three principles of the UDL framework can guide educators to consider learner variability in the classroom environment through: (a) multiple means of representation, (b) multiple means of action and expression, and (c) multiple means of engagement (Meyer, Rose & Gordon, 2014). Essential to addressing learner variability is also designing clear learning goals, incorporating formative and summative assessments, employing many different teaching methods, and using varied and flexible materials.

UDL principles are named within the Common Core State Standards (CCSS) (2010) and assessments and the framework of the Individuals with Disabilities Education Act (IDEA) as a way to provide successful access to the general curriculum for students with disabilities. On an international scale, UDL principles are embodied in the Salamanca Statement, which indicates educators must take into account the diversity of student characteristics and needs (UNESCO, 1994). UDL is also named as recommended practice for k-12 school-wide transformation for inclusive education (SWIFT Center, 2016) and Doolittle-Wilson (2017) asserted that UDL remedies obstacles encountered by students without out disabilities in higher education contexts. Empirical studies including literature reviews support the claim that UDL improves the instructional process for diverse learners yet research that UDL improves learning outcomes for all students is mixed and limited (Capp, 2017; King-Sears et al., 2015; Ok, Rao, Bryant & McDougall, 2017). For example, King-Sears et al. (2015) conducted a study with students with and without high-incidence disabilities (HID) following a pre-post design and utilizing a self-management graphic organizer based on principles of UDL for chemistry instruction on molar conversions. Students with HID in the UDL comparison group did outperform students with HID in the control group on post-tests but those results were not stable over time and students without disabilities in the UDL comparison group performed more poorly than students without disabilities in the control group on those same measures.

Though robust literature exists to promote the implementation of UDL for inclusive education and to underscore its effectiveness in improving the learning process, research evidence to support that UDL promotes achievement for students with learning disabilities in general education has been said to be "severely lacking" (p. 69, King-Sears, 2014). This gap is compounded by the different ways UDL is operationalized and implemented in research studies

and the need for observational data on UDL implementation, which has been recommended as a much-needed step toward examining meaningful access to Common Core (King-Sears, 2014; Peterson, 2014; Timberlake, 2014). In a recent systematic review of the literature that examined studies where an intervention applied component(s) of the UDL framework, Ok et al. (2017) discovered that researchers applied UDL interventions in different ways through intervention materials that aligned with UDL principles and instructional methods based on UDL principles whereas some researchers made the intervention connection to UDL principles explicit while others did not. Similarly, in Capp's (2017) meta-analysis of the literature between 2013-2016 examining the effectiveness of UDL, applications of the principles within the interventions varied with their alignment to UDL principles ranging from alignment to only one principle to alignment to all three principles. Capp (2017) asserted that a lack of pre- and post-test methodologies may explain the findings and reported that of the three UDL principles, significantly fewer studies focused on the action and expression principle.

Researchers have suggested that teachers can address learner variability by intentionally designing lessons that build in flexibility, choice, and engagement to support all learners and they can use the UDL framework to design and adapt interventions to target individual needs (Cook & Rao, 2018; Meyer, Rose & Gordon, 2014). Cook and Rao (2018) propose clearly articulating how UDL principles are applied in lessons and systematically measuring the applied practices. Meyer, Rose and Gordon (2014) describe how educators can choose a few guidelines to incorporate into their lessons as a starting point for UDL implementation. Observations of UDL-based lessons is a critical component to the implementation and fidelity in addressing learner variability as lesson observations have been shown to increase teachers' use of flexible grouping and differentiated instruction in a Canadian context (Katz, 2013). Unlike general

differentiation techniques that include addressing learning style preferences (Tomlinson, 2017), UDL principles address the complexity of the learning brain and the integration of many parts of the brain working together within a given context as opposed to an isolated learning style (CAST, 2018). However, to date, there is a varied interpretation of UDL applications for intervention and currently, consensus on how UDL principles are to be applied effectively in daily instruction in any context is only beginning to emerge (Rao et al., 2018).

The purpose of this study was twofold. First, the researchers were interested in exploring the specific ways that current classroom teachers are addressing learner variability through daily lessons by identifying their specific pedagogical techniques aligned to the UDL principles and checkpoint strategies. Second, the researchers wanted to examine the perceptions that teachers have regarding the specific UDL principles and checkpoint strategies they are using to address learner variability within their daily lessons to assess levels of agreement with an outside observer and help establish content and social validity of the tool. The researchers conducted observational research within a sample of general education and inclusive classrooms to discover both the observed and self-reported UDL strategies teachers use within a typical lesson by designing and implementing an observation protocol aligned to the 31 checkpoints of the UDL Framework version 2.0 (CAST, 2011). Other protocols have recently been developed to examine how practitioners apply UDL in the design and implementation phases (Rao et al., 2018). However, it is important to note that at the time of this study, the researchers were examining how existing instructional practices aligned to UDL checkpoints. We did not examine how teachers used UDL during the planning and design process. A more complete, broader scope of UDL implementation requires an understanding of both the planning/design process and implementation process. The observational protocol used in this study only captures the

alignment of existing pedagogical practices to the UDL checkpoints. The research questions that guided our investigation are:

a.   What specific UDL strategies aligned to explicit instruction are a sample of UDL-trained general and special education teachers using during daily instruction?

b.   To what degree do UDL-trained general and special education teachers' self-reports of UDL strategies used during daily instruction align with UDL strategies observed during daily instruction?

Conceptual Framework & Rationale

The conceptual framework guiding our investigation was Cooperrider and Whitney's (2007) Appreciative Inquiry (AI) Theory, which is a theory of organizational change. The central tenet of AI is a focus on organizational strengths with the assumption that something is working well in the organization and a focus on strengths can lead to positive change. Similar to a focus on strengths-based versus deficit-based thinking about students with disabilities, AI identifies an organization's strengths as a starting point for change (Doggett & Lewis, 2013). We used this positive inquiry-based approach to frame our investigation of UDL in practice as a strategic effort to both involve our district partner administrators and teachers in the change process toward district-wide implementation of UDL and to strengthen collaboration between the partner district and the IHE.

The district in which the research took place had been selected as leader in a state-wide effort to scale up multi-tiered systems of support (MTSS) by implementing UDL principles. We justified our a priori assumption that at least some of recommended strategies within the UDL checkpoints (CAST, 2011) would be observed because of the MTSS work and because they have an established research base of High Leverage Practices by the Council for Exceptional Children

(CEC) (e.g., graphic organizers, explicit instruction, flexible grouping) (McLeskey et al., 2017). We also operated under the assumption that pre-service training on implementing UDL principles at the lesson level would have likely occurred within introductory special education methods courses through an existing lesson template that used elements of explicit instruction (Courey, Tappe, Siker & LePage, 2012). We anticipated that our findings could better inform the way we prepare pre-service and in-service teachers to implement UDL principles and strategies during the planning/design phase with more intentional consideration for learner variability in contrast to planning lessons using only general differentiation techniques. Thus, we created an observation protocol within an explicit instruction framework in anticipation that observational data collected could help illuminate those specific UDL principles teachers are already using daily instruction.

Positionality

Both researchers are presently coordinators of special education credential programs in the US in the Southern California region at one private and one public institution. We both teach methods level courses that include foundational level knowledge and application of UDL and we both supervise special education teacher candidates during their clinical practice (i.e., student teaching). Our conceptualization of this project, as well as our initial draft of the observation protocol, stemmed from our similar backgrounds and experience as special education teacher leaders and curriculum experts at the district level as well as our current research interests in pedagogical applications of UDL. The initial draft of the protocol was created collaboratively by both researchers with input from the field through a joint presentation to special education teachers and service providers at state-level professional conference. The district where this study was conducted is a strong district partner of the IHE of the lead researcher.

Methods

District Demographics

Classroom observations using the observation protocol were conducted in an urban

school district in Southern California in the United States with the support and assistance of three

district-level administrators. Total enrollment was 11,138 with 1,489 students with disabilities

enrolled district-wide. Demographics included the following: socioeconomically disadvantaged

students at 53%; English language learners at 11%. As noted, the district was identified as a lead

district in a statewide initiative focused on scaling up MTSS (i.e., SUMS), which is an initiative

that has some overlap with UDL implementation and requires that the district provides technical

assistance to other districts. Because of the SUMS initiative, the district administrator and

superintendent were supportive of this research and planned to use findings to augment their

professional development efforts. The lead researcher worked in partnership with one lead

district administrator and two teachers on special assignment (TOSAs) who coordinated all

classroom observations occurring during the 2017-2018 academic year. Visitations occurred in

two phases. The observation protocol was piloted during Fall 2017 where eight classrooms and

ten teachers were observed. During phase two, which was during Winter 2018, a total of eight

classrooms and ten teachers were observed.

Participating Teachers

A total 12 teachers were recruited to participate in the project over the two phases.

Recruitment of potentially interested and willing teachers was handled internally by the lead

administrator who then shared the contact information with the lead researcher so that

Institutional Review Board (IRB) procedures could be followed and consent was then obtained.

The lead researcher observed ten teachers in phase one with the initial draft of the observation

protocol and observed eight teachers in phase two with the final draft of the observation protocol. Six of the teachers observed during phase two completed the self-assessment survey. Five teachers were general education teachers and one was a special education teacher. Years of experience for the participants ranged from two years to 21 years. Two of the participating teachers were also lead members of the district's GET-SET-GO (i.e., general education teacher, special education teacher, go) initiative and three were identified as "learning innovation leads", who were teachers on assignment leading and coaching other teachers on instructional innovations with technology. Teachers participated in four full days of GET-SET-GO training, which focused on topics such as neurodiversity, co-teaching, and UDL strategeis. Each site in the district had also received a foundational overview of the UDL framework and checkpoints 2.0 available on the CAST website.

Classroom Demographics

Teachers were observed in one elementary school, one junior high school, and one high school. Grade levels and content areas observed were as follows: one grade five class (Math), two grade seven classes (Science), two grade six classes, and one nine/ten high school Algebra class. Class size ranged from 20-36 students. The elementary math class was co-taught and both teachers were present during the observation. The high school math class and one grade five math was also co-taught but only one instructor was observed during the scheduled observations as the co-teaching partners were TOSAs and not scheduled in the classroom at the time of the observation. Format of instruction included whole group and small group, with rotating small group (i.e., center instruction) used predominantly in both of the co-taught elementary math classes. A blend of whole group and small group instruction was used in the other classes. Reported total students within the classrooms that had identified disabilities was 23, which

included learning disability and hearing impairment. All identified students were receiving

special education services through the resource specialist program (RSP).

Observation Protocol

To develop and pilot the observation protocol, we followed development steps suggested

by Mertens (2015). We began by consulting the literature on explicit instruction and UDL to

make format decisions. In the first version, we created a table and listed the elements of explicit

instruction into a sequential three-part lesson sequence (i.e., opening, body, closing) on the left

side, with aligned elements of UDL from the UDL checkpoints 2.0 on the right side, with

additional room to record observation notes. Essential features of explicit instruction were the

anchor practices of interest during the daily lessons. We used the five essential "pillars" of

explicit instruction as reported by Hughes, Morris, Tharrien and Benson (2017) as anchors for

the lesson flow as they had the strongest research findings and provide a foundation for research,

replication, and adaptation (Cook & Rao, 2018). These five essential components of the explicit

instruction model are: (a) segment key information, b) provide models and demonstrations using

think-alouds, c) engage students using systematic fading (e.g., scaffolding) of supports and

prompts, (d) provide immediate and ongoing corrective feedback, and (e) provide ample,

purposeful practice opportunities. Additional elements for the flow of instruction were

supplemented with explicit instruction practices described by Archer and Hughes (2010). A

small space for notes was incorporated, however, we did not build in extensive opportunities for

observational notes in anticipation that the key instructional practices used would be captured

quantitatively with the scoring system. We used the tool in digital format via Google docs, so

that any extensive observer notes could more easily be taken to supplement the tally and describe

actual strategies used. The draft observation protocol was field-tested by the lead researcher

during phase one to help establish content validity. As noted, we obtained input from in-service teachers and district administrators and we drew from our own expertise with curriculum development to refine elements of our initial draft. Copies of the revised and final UDL observation protocol were shared with all participants prior to the observations and teacher and administrator input on the protocol was collected via email. The final version used in this study is in figure one below.

[INSERT FIGURE ONE]

A simple table listing UDL practices hyperlinked on the UDL Educator Checklist (CAST, 2011) was created on a separate, complementary document. This checklist identified applicable strategies for UDL, but it is limited as it does not capture the what teachers do during intentional planning, so it is no longer widely used in the UDL field. At the time of this study, the checklist was used as a reference for noting the discrete UDL checkpoint strategies teachers were using within their lessons. It was also the basis for the follow up UDL Checkpoint survey that was created to establish inter-rater reliability of the observations.

UDL Checkpoints Survey

The UDL Guidelines Educator Checklist version 2.0 (CAST, 2011) was used to create a Google form survey that was sent to participating teachers after the close of the observation to self-report the UDL principles used. Google forms was chosen intentionally as the teachers use the G-suite tools and the district is one-to-one with Chrome books for students. For each UDL practice, teachers were asked to self-report all of the practices they used during the lesson and support their response by indicating the specific sub-checkpoint example practices that they implemented with a checkmark. For example, a global checkbox statement read, "I offered ways of customizing the information (check point 1.1) such as…" and sub-checkbox options followed

such as: (a) use flexible format and vary features such as text size, images, graphics, tables, or other visual content, (b) vary contrast between background and text or image, (c) vary color used for information or emphasis, (d) adjust volume or rate of speech or sound, (e) adjust timing of video, animation, sound, simulation, etc., (f) vary layout of visual or other elements, or (g) vary font used for print materials.

<div align="center">**Data Collection and Analysis**</div>

Observational data was collected by the lead researcher during classroom observations that ranged from approximately 20 to 50 minutes. Lesson content area and goals were as follows: (a) science: frequency of waves, (b) science: flowering plant pollination; (c) math: equations and inequalities; (d) math (review): equivalent fractions, order of operations, solving simple equations; (e) math: graphing equations; (f) math: multi-step equations, (g) math: representing and simplifying fractions; and (h) science: plate tectonics (volcanoes).

The lead researcher used both the observation protocol and the UDL Educator Checklist simultaneously, to ensure a specific UDL practice observed was accurately captured on the protocol as defined in the Educator UDL Checklist. However, this process became problematic. First, although the 31 checkpoints of the UDL educator checklist were aligned with specific elements of explicit instruction, there were instances where the teachers did not follow a whole-group instructional sequence as delineated on the observation protocol. Second, some of the UDL checkpoint strategies on the Educator Checklist were listed in multiple categories. For example, using a graphic organizer in order to provide multiple means of representation is a checkpoint strategy example for: 1.2: offer alternatives for auditory information, 3.2 highlight patterns, critical features, big ideas, and relationships, and 3.4 maximize transfer and generalization. Graphic organizer is a recommended strategy for providing multiple means of

action and expression for 6.3 facilitate managing information and resources (CAST, 2011). This raised a methodological issue that is addressed in the discussion section.

Practices on the UDL Educator Checklist were tallied and scored for each teacher according to the individual checkpoint guideline and sum of the sub-checkpoints observed. Next, each individual teachers' survey results were tallied according to the checkpoints and sub-checkpoints that were self-reported. A table was created for teacher results "T" and researcher results "R" using a score of + if the practice was observed and a score of – if it was not observed. All + scores for each checkpoint were totaled and compared to examine level of agreement and inter-rater reliability. The second researcher served as a third rater and reviewed the results from both researcher observations and the teacher surveys separately. Level of agreement between the lead researcher and second researcher was 100%.

Results

The results of levels of agreement of UDL practices observed and self-reported as implemented by the teachers are reported in the Table 1 below.

[INSERT TABLE 1]

Levels of agreement between the researchers and teachers on checkpoint strategies implemented ranged from 64%-84%. There were two instances where the level of agreement was above 80% on checkpoint strategies implemented during the lesson. Using a visual analysis of results, four checkpoints were observed in all cases: 2.1 clarify vocabulary and symbols; 3.1 activate or supply background knowledge; 3.4 maximize transfer and generalization; and 8.3 foster collaboration and community. Two checkpoints were observed the least at less than 50% of all cases: 4.2 optimize access to tools and assistive technology and 9.2 facilitate personal coping

skills. Finally, teachers' self-reported total number of UDL checkpoint practices used ranged from 21-29 out of 31 total checkpoint practices.

With deeper examination of the data from the observation protocol and the UDL Educator Checklist, three checkpoints were observed most frequently by both the researchers and the teacher participants. These three checkpoints included: 3.0 Options for Comprehension, 5.0 Expression and Communication, and 8.0 Options for Sustaining Effort and Persistence, representing each of the three UDL Principles respectively. These three UDL practices are unpacked in this section.

Options for Comprehension

Comprehension of material is crucial to the student's ability to retain content knowledge. Checkpoint 3.0 examines the extent to which each teacher provides opportunities to develop comprehension skills throughout their lesson. These opportunities include: activating prior knowledge, highlighting patterns to the big ideas, opportunities for processing and maximizing transfer of knowledge. Four participants had 100% observed agreement of employment of checkpoints. Two of the six participants had a 75% observed agreement. Verifying that students have prerequisite skills and background knowledge is defined as a content component feature of explicit instruction (Hughes et al., 2017).

Expression and Communication

Expression and communication are two essential components to every lesson. Checkpoint 5.0 examines the ways in which the teacher provides multiple opportunities throughout their lessons to ensure that students are able to communicate and express their understanding of content and it can include the use of digital tools/assistive technology. Five participants had a 100% agreement with the researcher on the observed practices that included multiple means for

communication, multiple tools for construction and composition, and building fluencies with graduated levels of support for practice and performance. One participant had a 67% agreement whereby the researcher did not note multiple tools for construction and composition observed.

Options for Sustaining Effort and Persistence

Within a lesson, providing options for effort and persistence are discrete strategies that need to be intentionally addressed by the teacher within their lesson. Checkpoint 8.0 focuses on the overarching lesson goal and objectives and the ways in which the instructor creates an environment that allows for collaboration, community, and mastery. Both prioritizing instruction systematically toward a specific goal and using strategies such as cooperative learning to promote active student engagement are also HLPs (McKleskey et al., 2017). For checkpoint 8.0, two participants had a 75% observed agreement, three with a 100%, and one with 50% agreement. In examining the data, heightening the salience of goals and objectives was a checkpoint that three teachers indicated was explicit within their lesson however, it was not observed by the researcher.

Discussion

The researchers piloted the employment of an observational protocol to examine the UDL principles and checkpoint strategies currently being used in daily instruction and assessed its content and social validity with a small sample of general and special education teachers within an urban school district in the US. Similar to existing literature on UDL-based instructional methods, results of this study explored the application of UDL principles at the lesson level (Ok et al., 2017). Within our sample, all teachers guided information processing, visualization, and manipulation, which is an essential feature of explicit instruction (Hughes et al., 2017). Fostering collaboration and community through cooperative learning groups was another practice that was

observed across all settings, which is an HLP indicator and supports characteristics of inclusive classrooms and a fully integrated classroom setting (McKleskey et al., 2017; SWIFT Center, 2016). Optimizing access to tools and assistive technology and facilitating personal coping skills were checkpoints that were observed the least frequently of the 31 checkpoints. That the intentional use of assistive technology (AT) was observed least frequently is interesting because all teachers within this sample were using Chromebooks with students at some point during their lessons. For example, in the elementary co-taught math classroom that included students receiving RSP services, headphones were used by students at the computer/independent station, which could be considered an example of UDL 2.0 checkpoint 4.2: optimize access to tools and assistive technologies. Yet the researcher did not observe students taking advantage of other features such as text to speech or enlarged print. It is possible that the teachers were not familiar with the types of accessibility features that could be used with students with G-suite tools or that they did not realize that some of the accessibility features embedded into common applications would be considered assistive. The use of digital reading environments that enables access to support features such as text-to-speech, dictionaries, glossaries, highlighting, bookmarking where teachers can easily modify the level of support a student receives has been studied as an effective UDL practice when combined with curriculum-based measures for progress monitoring (Hall, Cohen, Vue, & Ganley, 2015). However, assistive technology is but *one* feature of universally designed learning environments, not an exclusive feature (Edyburn, 2010).

A point of discussion that bears mentioning is the sheer volume (i.e., 3 guiding principles, 31 checkpoints) of UDL strategies that are intended to help teachers operationalize the UDL framework to reduce barriers and increase flexibility within a lesson. Although there are similar checkpoints across the UDL framework 2.0 (2011), it is important to note that these should be

applied to lessons thoughtfully and intentionally to address learner variability within the learning environment. For example, we discovered that using visuals/pictures is listed as an example strategy for three different checkpoints (i.e., 1.2, 2.5, 5.1), graphic organizers is listed as an example strategy for four different checkpoints (i.e., 3.1, 3.2, 3.4, 6.3), and prompting/cueing a student to apply a strategy is listed as an example strategy for nine different checkpoints (i.e., 1.3, 3.3, 3.4, 6.1, 6.2, 6.4, 8.1, 8.3, 9.1). Prioritizing visuals and the use of graphic organizers as an element for all lessons would address multiple barriers at once. Nonetheless, these findings assert that UDL is complex and nuanced and educators need to intentionally unpack what it means to implement essential pedagogical elements during instruction including defining learner variability, considering barriers within the environment, and planning proactively to address the barriers throughout a lesson (Edyburn, 2010; Meyer, Rose & Gordon, 2014; Rao et al., 2018).

Implications for Practice

Districts across the United States are actively engaging in school-wide and district-wide transformation through MTSS and by implementing UDL principles across all settings. As teachers are being trained in MTSS and UDL, understanding *how* to implement such principles remains daunting and overwhelming if they are expected to simply follow the UDL checkpoints without considering a more scaffolded approach for implementation according to a teacher's foundational knowledge, expertise, and experience. The observation protocol can assist with self-assessments of lesson-level implementation of specific principles. For example, graphic organizers are proven to be effective at improving content learning for students with learning disabilities (Ciullo, Falcomata, & Vaughn, 2015) and graphic organizers support multiple UDL checkpoints. Thus, perhaps teachers can ensure they are using this fundamental tool during daily instruction as one first step in implementing UDL.

Administrators are faced with the challenge of ensuring that these newly adopted principles and strategies are executed with fidelity and integrity, but site administrators may not fully grasp UDL principles themselves so that they know what to look for during lesson observations. The UDL observation protocol is a tool that was developed as a systematic and concrete way for teachers to "put into practice" UDL strategies and supports. Districts and site administrators may utilize the UDL observation protocol and educator checklist with their teachers to help support them in thoughtfully reviewing and implementing such practices within a common, known lesson structure. In order to help teachers build and expand on their UDL expertise, the protocol can highlight practices firmly in place. Used in this way, administrators can discover what's working well and identify their teachers' pedagogical strengths (Cooprider & Whitney, 2007; Doggett & Lewis, 2013), while teachers can begin to incorporate additional principles as they become more familiar and comfortable with using them (Meyer, Rose & Gordon, 2014).

Teachers may perform a pedagogical self-assessment using the protocol to carefully consider the variability and diversity of their learners and capture how are intentionally integrating instructional strategies aligned to UDL principles and checkpoints to reach all learners within a common lesson structure. It may assist them in discovering more sophisticated ways to incorporate UDL into daily instruction than the approach learned in introductory pre-service courses (Courey et al., 2012). To foster collaboration around the implementation of UDL, grade level teams can actively use the tools to both highlight their own strengths with implementing UDL principles and identify lesson-level ways to reduce barriers to ensure that all learners regardless of their (dis)abilities are accessing content within daily instruction.

Strengths & Limitations

There are several strengths and limitations to this study to acknowledge. One strength of this study is that it is the first within the literature to examine observational data collected on the implementation of UDL practices at the lesson level within daily instruction, which addresses several calls within existing literature and situates it as one part of the picture of understanding UDL implementation (Capp, 2017; King-Sears, 2015; Ok et al., 2017). Another strength of our study is within the content validity of our protocol in that there were multiple areas where the researcher's observation of UDL principles and suggested UDL 2.0 checkpoint strategies and the teacher's own self-report of UDL principles and UDL 2.0 checkpoint strategies were in complete agreement. Content validity is essential to determine if the items on the observation protocol adequately measure the pedagogical domain of skills. We included practitioners in the content validation process throughout the initial conceptualization of the tool and within the revision process for the final version. The collaborative development of the tool between the researchers in the IHE and administrators and teachers in the district enhances the protocol's social validity and underscores the Appreciative Inquiry process for positive organizational change (Cooprider & Whitney, 2007).

This study was limited to one school district located in Southern California in the United States and therefore serves as a limitation. The district serves 11,000 students spanning grades K-12 across 14 schools. Approximately 11.1% of the population identifies as an English Language Learner, 51.6% low income, and 13.4% receiving special education services. Because this study took place with one district, the student population served may not be representative of other public districts across the United States or in international contexts. The sample size of participating teachers was small (n=6). The participants were identified by the district as department leads, and thus may not be representative of all the teachers within the district.

Teachers observed in this study received training on UDL, but we did not establish the baseline knowledge of UDL of each teacher before beginning our observations as we anticipated the protocol would help define their foundational pedagogical understanding of the application of UDL principles within instructional delivery. Further, teachers knew in advance that the observations were occurring. Additional observation research across more educational settings and contexts is needed for the continued validation of the UDL observational protocol during typical daily instruction. In addition, due to scheduling conflicts and schedule changes, interrater reliability could not be established simultaneously with multiple observers during the classroom observations.

Last, there are certain limitations inherent within the tools used in this study. It is necessary to stress that the observation protocol did not capture any of the teachers' intentional planning for UDL; the protocol only captured implementation of UDL. Secondly, the UDL Educator Checklist is no longer used widely in the UDL field as it does not capture the intentional planning process, which is a piece that would support a more complete and thorough understanding of the way teachers implement UDL. Regarding the UDL checkpoint strategies, there is significant overlap among the checkpoints and professional judgement by the researcher was used at times when assigning a specific strategy to a discrete checkpoint by referring to the explicit instruction element in the observation protocol. The total number of UDL checkpoints (n=31) and additional example strategies with which teachers are expected to be familiar is daunting and nuanced, making it difficult to capture implementation of discrete checkpoints due to example strategies that may pertain to more than one checkpoint. Future research studies should aim to paint a more complete picture of UDL implementation by examining how teachers design lessons proactively and intentionally as well as why they choose and use specific

strategies aligned to the checkpoints. Future studies should also seek to include multiple districts, pre-post longitudinal analysis of UDL checkpoints implemented within classrooms, and teacher interviews to capture the narratives and voices of the teachers navigating through meeting the needs of all learners through UDL.

Conclusion

As the landscape of education continues to move towards inclusive classrooms, understanding UDL applications in the classroom is critical to ensuring that the need of *all* students are being met in the least restrictive environment and to ensure new teachers are prepared to teach inclusively. Given that there is such a varied interpretation of UDL applications for intervention and emerging consensus on how UDL principles are applied effectively in daily instruction, the UDL observation protocol provides one exploratory method to sample UDL principles and aligned high-leverage practices that are being employed across inclusive classrooms through the anchor of a common lesson structure: explicit instruction. Implementation of UDL strategies must be used with fidelity and integrity. The results of this study indicate that there is some level of agreement between teachers' self-reported use of UDL strategies and observations of UDL strategies utilized within explicit instruction models, which is encouraging. Yet calls for the provision of universally designed instruction without agreement on what full implementation looks like in daily lessons is problematic for the pre-service and in-service teachers who are expected to deliver it. Findings from this UDL observation protocol research suggests that the essential features of universally designed lessons could be prioritized as a first step of implementation at the instructional level. While teachers adopting a UDL approach to learning must be thinking about learner variability "from the start" during the lesson planning/design process and with regard to materials and assessments, the UDL observation

protocol is a tool that can help teachers identify and reflect on the implementation of UDL

strategies used in daily instruction to help sustain and improve upon the implementation of UDL

strategies as gaps are identified.

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