EFFECTIVENESS OF TEACHER TRAINING ON THE USE OF UNIVERSAL DESIGN LEARNING STRATEGIES WITH SPECIAL EDUCATION STUDENTS IN MIDDLE SCHOOL

By

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ABSTRACT

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In inclusive classrooms, the framework of Universal Design for Learning (UDL) presents a viable schema to inform instructional materials, lesson design, and teaching practices to meet the needs of diverse groups of learners. UDL principles and guidelines emphasize using multiple means of representation, action, and engagement to employ different learning networks and address the multitude of learners in the classroom, with the hopeful outcome of benefiting all students. Current literature has yielded inconclusive results about the concrete effects of the UDL framework, including an ongoing challenge in defining UDL practice in the classroom. This quantitative study explored UDL practices in an inclusive California middle school as reported by teachers in a survey, and investigated how UDL training effects the use of UDL strategies and technology in the classroom. It found significant correlations between UDL training and the use of UDL strategies in the classroom overall as well as total number of UDL strategies used. Further correlations were found between social-emotional learning in the classroom and use of UDL strategies as well as links between UDL training, UDL use, and the use of teaching tools that target visual modalities.

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INTRODUCTION

Increasing numbers of pre-service and working teachers are receiving training in Universal Design for Learning (UDL) from a variety of sources, including growing numbers of offerings from prestigious universities such as the Harvard School of Graduate Education. Trainings tout the benefits of UDL's ability to allow student participation in the general education classroom in new and ever increasing ways (Harvard Graduate School of Education, Professional Education, 2016). Special education teachers are reminded daily of the requirements of the Individuals with Disabilities Act (2004) to safeguarding students' legal right to have "access to the general education curriculum to the maximum extent possible (Individuals with Disabilities Education Act 20 U.S.C. 1400, c)." The task of supporting students with a wide variety of complex and pervasive learning differences in the general education setting requires curricular tools and strategies that can systematically promote access for all students. Acclaimed as empirically and scientifically based, UDL appears to meet the criteria of an approach that has merit for use by both special education and general education teachers to promote student access to curriculum. With new UDL tools and trainings on the rise, one important research question is whether increases in UDL teacher training create positive educational outcomes and greater uses of UDL strategies and technologies in the classroom.

Thesis Overview

The research in this thesis provides a picture of the UDL strategies and technologies general education and special education teachers report using in their classrooms at the middle school level. It analyzes the link between teachers' previous training and their use of UDL. Chapter Two contains a literature review investigating previous studies and published research about Universal Design for Learning in public education, including the history of UDL in education law, its key principals and components, and what it looks like in practice in classrooms serving general education and special education students. Chapter Three provides a summary of methods used in the survey of general education and special education public middle school teachers to collect information about technology use in the classroom, UDL practices in the classroom, and previous familiarity and training in UDL. Chapter Four examines results of the study and offers analysis of survey responses. Chapter Five discusses relevant findings and indications for future research. Chapter Six concludes the thesis and reviews limitations of the study.

LITERATURE REVIEW

Introduction

Technological learning tools are becoming more pervasive in public schools every year; in 2009, according to the most recent published data from the US Department of Education (2010), 97% of teachers had access to one or more personal computer(s) permanently located in their classroom. Increasing digital technologies in the classroom have the potential to universalize access to curriculum for students with disabilities, creating a new and unexplored educational landscape. Yet, even when technology is present, inadequate design of academic courses may create access barriers (Burgstaler, 2004). "The technology alone is not flexible or accessible—we build those sorts of environments only through deliberate design that includes universal design and accessibility as part of the framework" (Moore, 2007, p. 523). It is essential for the educational community to develop frameworks for teaching that promote educational access for students with disabilities to participate and progress in the general education curriculum as mandated by the Individuals with Disabilities Education Act (Dymond et al., 2006; Individuals with Disabilities Education Act, 2004). Universal design for learning is one such framework.

This review will explore the connection between Universal Design for Learning (UDL) and educational outcomes of kindergarten through twelfth grade public school students with disabilities. Federal law, academic journals, and teacher education courses

have frequently cited UDL over the past two decades as an exciting new path for curriculum, instruction, and lesson design in the public-school classroom. Advocates of UDL principles claim that UDL helps students with disabilities overcome barriers to education by promoting access to curriculum through equitable use of instructional materials using technology (King-Sears, 2009). This review of the relevant literature seeks to determine if research corroborates the proposed academic benefits of UDL. Beginning with the history and development of UDL, this review will examine the key principles of UDL, including scaffolding and technology, and discuss current applications, connections to inclusive classrooms, and current law. Next, UDL research will be analyzed through the lens of student academic outcomes, lesson plan and assessment design, and student and teacher perceptions. The review will conclude with an analysis of significant limitations of the UDL design, alternative universal design frameworks, and suggestions for future research. The central question for this study will be proposed: how does training UDL training/professional development impact the use of UDL strategies in the classroom with special education students?

Universal Design Learning: History and Defining Principles

Universal design was conceived in architectural and environmental design for the purpose of removing obstacles, and ensuring people with disabilities and older individuals equal access to buildings and environments (Courey, Tappe, Siker & LePage, 2013; Rao, Ok & Bryant, 2014). Retrofitted buildings with wheelchair ramps and fire alarms with blinking signals are common examples of universal design in architecture.

Sometimes referred to as inclusive design, or barrier free design, the concept of universally accessible design was championed by architect and creator Ronald Mace in 1989 when he testified for Congress in support of the Americans With Disabilities Act: "The architectural provisions of the ADA alone will vastly increase opportunities for disabled people by eliminating subtle but pervasive discrimination that prohibits many disabled people from fully participating in society," (Should The Senate Approve the Americans with Disabilities Act, 1989, p. 304).

In 1990, David Rose, Anne Meyer and other researchers and educators at the Center for Applied Special Technology (CAST) began asking questions about student access to curriculum and instruction, and applied the principals of universal design to education, culminating in the universal design for learning (UDL) framework. The heart of the UDL framework is the idea that students may struggle to learn a concept because of problems with the learning systems themselves, such as inequitably designed materials, or teaching strategies that do not adequately address the needs of all learners (Moore, 2007). A legal definition of UDL commonly cited in research articles comes from the Higher Education Opportunity Act of 2008. UDL is defined as a scientifically researched instructional framework that maintains high expectations for learners, provides flexibility in student learning and response, and emphasizes equal access for all learners by lowering barriers to instruction and providing accommodations, supports, and flexible learning environments to all students, including English language learners and students with disabilities (Alnadhi, 2014; Basham, Meyer & Perry, 2010; Higher Education Opportunity Act, 2008; King-Sears et al., 2015). Three common principles of UDL

initially proposed by Rose and Meyer are widely discussed in the literature (King-Sears et al., 2015; Marino, et al., 2014a).

Three key principles

Universal design for learning framework is guided by the three primary principles of multiple means of representation, multiple means of action/expression, and multiple means of engagement (CAST, 2011; Meyer, Rose & Gordon, 2014; Meyer & Rose, 2000). UDL is based on these three key principles and also incorporates the concepts of neuroscience, scaffolding, and technology. As detailed by CAST (2011), UDL starts with the principle of representation, presenting multiple options for student comprehension, perception, and language access. Through representation, teachers make content accessible by presenting information using a variety of auditory and visual content. One example of representation is defining vocabulary words using pictures during a lesson. Different auditory, visual, and kinesthetic modes of learning may occur using diverse forms of representation. Teachers may represent lesson content by using digital media, books modified with larger text or interactive features.

The second UDL principle is multiple means of expression, in which students are able to interact with material and communicate what they have learned in a variety of ways. Expression includes action, and students may utilize a variety of tools or assistive technologies for communication and construction, with the goal of creative progress monitoring (CAST, 2011). Examples of flexible modes of expression include using whole body learning or physical responses during lessons. Teachers may provide options for scaffolding in lesson planning, and students with diverse needs can access a variety of

scaffolds at different points in the lesson. Teachers may focus on promoting executive function skills by teaching goal setting or progress monitoring to enhance student expression of learning.

The final UDL principle of engagement is achieved by encouraging purposeful learning, allowing opportunities for self-regulation, promoting student interest in subject matter, and encouraging high levels of effort (CAST, 2011). Multiple means of engagement involves authentic interaction with subject matter in a way that maintains autonomy and encourages collaboration between students (Meyer, Rose & Gordon, 2014). Opportunities for engagement include students in the learning process by building lessons that familiarize students with content by building prior knowledge, repeating core concepts different ways, building in opportunities to reteach, and providing opportunities to respond (Spooner, Baker, Harris, Ahlgrim-Delzell & Browder, 2007). Teaching strategies that encourage engagement include teaching self-regulation and modeling coping strategies.

The UDL paradigm challenges educators to change their assumptions in order to build new curricula, and expand their capacity to teach and learn by viewing learning differences as part of a continuum. Teachers who adopt the UDL approach challenge their beliefs by adjusting learner outcomes for all students, embracing digital technologies in the classroom, and viewing curriculum as flexible and evolving (Meyer & Rose, 2000). UDL is not solely about access, but is intricately tied to specific educational goals of students and teachers, and seeks to provide substantial, consistent supports. Access to information and materials in and of themselves are not a sufficient condition

for UDL. According to Rose (2000), UDL is constituted by access to learning and expansion of knowledge led by clear goals. Flexibility in goal writing, instruction and curriculum design are essential for allowing access for different learners in any given classroom. Diverse pathways to ensure learner success are put in place to support students in meeting their goals. UDL support strategies are based on three foundations that promote learner accessibility: neuroscience, technology and scaffolding techniques.

Neuroscience

In their most recent book *Universal Design, Theory and Practice*, Rose, Meyer and Gordon (2014) give a broad and comprehensive articulation of the foundations and principles of UDL and their links to neuroscience. Modern cognitive neuroscience views the brain as a system of overlapping networks with individual variability or systemic variation. The brain is an organ in which learning differences are seen through diversity in specialized neural pathways, evident in the individual variations in brain scans of children with and without autism (Rose, Meyer & Gordon 2014). Known as neuroplasticity, the interconnectivity of neural networks is not static, and can be affected and heightened by learning (Masson & Foisy, 2014). Neuroplasticity and systemic variation mirror the variety of learners and minds in a classroom. These facets of neuroscience inform education by highlighting the nature and cause of learning variability. Effective teaching requires the development of alternative teaching and learning strategies to suit every unique learner's strengths and differences (Rose, Jiménez & Graf, 2007). The foundations and principles of UDL as applied by schools are designed to ensure that educational practices address the needs of all learners.

The three UDL key principles of flexible representation, expression and engagement are based on cognitive research into the learning networks of the brain (Schelly, Davies & Spooner, 2011). UDL specifies three non-hierarchical, specialized learning networks: recognition (the "what" network), strategic (the "how" network) and affective (the "why" network") (McGuire-Schwartz & Arndt, 2007). According to Meyer, Rose and Gordon (2014), the recognition learning network perceives sensory input and transforms it into useable information, the strategic network plans and initiates action, and the affective network monitors the environment to engage the learner. The three learning networks are highly influenced by the learning environment, and reveal a dynamic and elastic relationship in which neurological variation is ever-changing and adapting to the environment (Meyer, Rose & Gordon, 2014). UDL utilizes the idea of brain variability to develop flexible learning tools and strategies that can support individuals' unique neurology as they move toward their learning goals. Student progress and neurological development in the UDL classroom is also furthered by scaffolding and technology.

Scaffolding

Students are supported to reach educational goals by the use of scaffolding. Scaffolding is a set of supports that allow student access to learning objectives by enhancing learner's abilities to develop skills, strategies, and understanding of content (Rose, Meyer & Gordon 2014). In education, scaffolding is defined as static supports to guide the learner in learning tasks beyond their initial capability. Scaffolding is linked to child development theorist Vygotsky's Zone of Proximal Development (ZPD) (Tzu-

Xhaing, Ying-Shao, Shu-Sheng & Changlai, 2012). The ZPD is summarized as the gap between actual development and potential development when supported by someone who has a better understanding of the subject being learned, referred to as a more knowledgeable other (Vygotsky, 1978). A more knowledgeable peer, adult, or even computer supported learning system can scaffold a learner in the ZPD to promote effective student learning (Sundararajan, 2010).

Scaffolding is continuously adjusted and slowly decreased as the learner's level of need changes, moving toward independence. In the context of UDL, scaffolding is a tool used to shape the dynamic learning process, as students become expert learners. According to Meyer, Rose and Gordon (2014), expert learning is an ongoing process of growing and improving in a learning environment, and represents a continuum of learning skills in areas such as executive function, self-efficacy, self-regulation, and comprehension. In UDL, it is the learning environment that acts as a scaffold; through effective design of curricula and instruction based on the principles of engagement, representation, and expression, educators craft flexible learning environments that support all learners in developing learner expertise.

Technology

Assistive and augmentative communication technologies (AAC), defined as alternative communication devices used by individuals who are limited in their use of verbal communication, are critical tools in building accessible classrooms for students with disabilities. Availability, funding and proliferation of AAC low-incidence support technologies are presupposed in UDL classrooms. AAC is a necessary but not a sufficient

condition to ensure adequate curricular access and effective learning environments for students with disabilities who require it to access curriculum, however, UDL classrooms must go further and design learning environments that mitigate barriers before learning even begins (Rose, 2001). Beginning in the 1980's with the inception of UDL, the CAST organization sought learning technologies that could provide alternative forms of learning from the print medium (Rose, Meyer & Gordon, 2014). Digital books and graphic programs can be used with students with disabilities who experience access barriers to print, and can be put in place in regular classrooms to scaffold student learning and promote access to curriculum.

Digital technology is a helpful tool when building effective UDL classrooms, but is not essential. Effective teachers can build comprehensive lesson plans without using expensive or elaborate technology when they have proper UDL training, using low tech modifications such as leveled communication boards, large print books, and varied opportunities for student response (Spooner et al., 2007). From word processors and spell checkers to digital books and digital media, UDL capitalizes on the ability of new technologies to provide a more universally designed learning environment because of the inherent flexibility and versatility of these technologies, as well as their ability to be marked and networked (Rose & Meyer cited by Moore, 2007). However, Moore (2007) points out that potential UDL technology supports such as websites do not inherently contain universal design traits and need to involve conscious design to provide accessibility to all learners. She advises that the discipline of instructional design can further inform the framework of UDL by providing systematic design models that

promote flexible materials and infrastructure to further the goals of UDL environments (Moore, 2007). Technology presents an opportunity to address learner variability by attending to students' different strengths and weaknesses in an adaptive, user-friendly way that can be applied in general education and special education classrooms.

Application of UDL

UDL principles have been applied in diverse classrooms with students from pre-school to college. Nationwide, general education teachers and special education teachers who work with students with all levels of disabilities often use UDL principles to design instruction, write curriculum, and present educational materials and assessments to students, though teachers may not always label them as UDL (Meier, 2013). Particularly, UDL has been applied to teaching special education and general education students in inclusive classrooms (Katz, 2013). Students with learning disabilities have frequently been the subjects of UDL research on technology, such as podcasts and video games that convey educational content, and students with learning disabilities in general education settings may especially benefit from UDL practices (King-Sears, 2014). Science curriculum and science classes at both elementary and high school levels have been targeted as effective areas to involve UDL principles into design and implementation (Dymond et al., 2006). Students with more significant disabilities, specifically intellectual disabilities, have been participants in studies using UDL for reading instruction (Browder, Spooner, Mraz & Number, 2009; Coyne, Pisha, Dalton, Zeph & Smith, 2012). While a range of disabilities have been studied, analysis of sources of previous UDL literature reviews and keyword searches (*autism and * universal design for learning)

yielded only one paper written by researchers in Singapore that investigated the feasibility of using UDL-based virtual reality interventions with students with autism to promote learning (Chia & Kee, 2014).

UDL principles are taught in many pre-service teacher training courses for general education and special education teachers, and are also the subject of professional development trainings for practicing teachers across all grade levels and disciplines. Many universities across the U.S. embed UDL principles into their coursework for teaching students with special needs, and Internet modules about UDL proliferate on-line. Particularly, UDL principles are used for teacher lesson planning for inclusive classrooms that cater to students with and without disabilities (Courey, Tappe, Siker & LePage, 2013; McGhie-Richmond & Sung, 2012). UDL principles have also been used as guidelines for gathering instructional materials and learning tools for interactive student lessons and project based learning (Basham, Meyer & Perry, 2010). Computer-based assessments grounded in UDL principles that include options for text-to-speech and other accessibility features are becoming more commonplace, as exemplified by the new annually required California Assessment of Student Progress and Performance (CAASPP). The CAASPP contains universal design elements such as embedded and non-embedded universal tools, designated supports, and accommodations for students with disabilities (California Department of Education, 2015). To date, research on computer based testing with text-to-speech based on UDL principles has occurred in only high school settings (Dolan et al., 2005). The majority of research on UDL has been conducted in inclusive classroom settings.

Connection to Inclusive Classrooms

The Individuals with Disabilities Education Act (IDEA), an amendment to the landmark 1975 Education for All Children with Disabilities Act enacted in 1997, developed programs and services to extend the educational rights of kindergarten through twelfth grade students with disabilities in public schools nationwide. IDEA expanded the original legislation's legacy to include provisions for federally mandated free and appropriate public education (FAPE) for all children with disabilities. IDEA holds schools accountable for the quality and progress of all students' educations and mandates that students with disabilities be educated in the least restrictive environment (LRE) (Individuals With Disabilities Education Act Amendments of 2004). The courts have interpreted the LRE to be the environment that provides a satisfactory education to general and special education students together as much as possible (T.R. E.M.R., on Behalf of Their Minor Child, N.R. ***v.*** Kingwood Township Board of Education, 2000). This interpretation means that students have a right to be educated in general education classrooms with their peers in inclusive settings.

IDEA's emphasis on the integration of students with disabilities into the public school environment has created a movement toward inclusive classrooms in schools around the country. Yet, there is an inherent tension between the IDEA requirement that students with disabilities be educated in the LRE and the mandate that students receive a Free and Appropriate Public Education (FAPE) (Kavale, 2013). It is required that all students with disabilities be given FAPE, generally defined by the courts to mean that students have access to what is referred to as educational benefit through specialized

instruction and related services delivered in a special education program (Board of Education of the Hendrick Hudson Central School District v Amy Rowley, 1982). To meet IDEA requirements, special education programs became faced with the responsibility of ensuring students received personalized educational programing while in the general education setting to the maximum extent possible (Individuals with Disabilities Education Act Amendments of 2004). To make adequate progress in inclusive settings, students with disabilities need meaningful access to the general education curricula. According to the National Center for Educational statistics, in the fall of 2011, 95% of students with disabilities were educated in general education schools (U.S. Department of Education, 2013). Further, since the enactment of IDEA, inclusion of students with disabilities in the general education setting has become a national priority; 57% of students with disabilities spend at least 80% of their school day in the general education classroom (Duncan, 2012). Given these demands, schools need to have access to programs and guidelines that promote maximum educational benefit in the general education setting. UDL is one such set of guidelines.

Links to Federal and State Law

In the past two decades, UDL has been cited in numerous state and federal statutes, as well as discussed in congressional hearings and court cases. Beginning with consideration for UDL applications of assistive technology, the US Department of Education's Office of Special Education (OESP) and the Center for Applied Special Technology (CAST) jointly formed a technical panel specifically to discuss educational technology for students with disabilities in 2002. The panel generated a set of

recommendations using UDL principles to guide the development of accessible curricular materials, particularly for blind, visually impaired, or print impaired students (National Center on Accessing the General Curriculum, 2004). The panel's recommendations for the availability and timely delivery of print materials to students with disabilities culminated in the National Instructional Materials Accessibility Standard (NIMAS), and in 2006 was established as a federal regulation that meets the requirements under IDEA federal law (Gesser, Tax, & Bureau, 2006).

In 2008, the U.S. Congress broadened their concept of UDL beyond technology, and included a bipartisan definition of UDL in their reauthorization and amendment of the Higher Opportunities Act of 1965. This bill is considered the authorizing statute for nearly all of the programs administered by the US Department of Education's Postsecondary Education, and it includes the three key UDL principles of multiple means of representation, expression and engagement in its definition (Higher Opportunities Act, 2008). In 2010, the federal government addressed the issue of technology again and created a national plan for technology that utilized many UDL principles, including cognitive neuroscience and multimedia tools, but the plan did not specifically name UDL as the instructional framework (U.S. Department of Education, Office of Educational Technology, 2010). The use of recognizable UDL principles without specifically calling them UDL may reflect the government's hesitation to prescribe specific instructional tools for educators, or their hesitation to endorse UDL specifically.

In 2010 Maryland Governor signed the Universal Design for Learning Bill into law, creating the first state task force to require UDL in state education systems and

consider effects on student outcomes. It is notable that the original draft of the bill included the statement "to incorporate the principles of UDL into the policies, practices and curriculum of the educational system of Maryland" but was edited to state "to *explore* the incorporation of the principles of Universal Design for Learning into the education systems in Maryland" (Universal Design for Learning Bill, 2010, emphasis added). Again, we see the hesitation of government officials to fully endorse UDL as a statewide program. However, by its inclusion in education law at the state and federal levels, UDL has become a fixture of education policy and life in the classroom, and it is worth asking what the research shows as to its effectiveness in improving the academic progress of students with special needs.

Effects of UDL on Special Education Student Outcomes

By designing curriculum and instruction with accommodations built in, UDL strategies tout a variety of potentially positive outcomes for students with disabilities. Flexible curricular materials and digital media can be customized to meet individual student needs. The accessibility barriers that students with disabilities and other diverse learners encounter may be removed by the application of UDL principles to instruction and curriculum. We look to the research to determine to what degree UDL shows significant effects for student academic and social learning.

Effects on student academic progress

Student academic progress and UDL have been studied with general education students, students with mild disabilities in inclusion classrooms, and students with

significant disabilities in small group special education instructional groups. In a review of thirteen UDL research studies conducted by Rao, Ok and Bryant (2014), only two studies specifically considered the academic achievement of participants in their main research question. These studies looked at the effects of UDL reading instructional strategies on students with significant intellectual disabilities (Browder, Mims, Spooner, Ahlgrim-Delzell & Lee, 2009; Coyne, Pisha, Dalton, Zeph & Smith, 2012). Both studies found statistically significant effects on student outcomes after using UDL strategies for reading instruction. Both research teams used different experimental designs and focused on different UDL instructional strategies. Browder et al. (2009) conducted single-subject research utilizing a prompting system with sensory materials to enhance reading comprehension, while Coyne at el. (2012) utilized a quasi experimental design with a control group using researched e-books containing embedded supports for reading decoding, fluency and comprehension. While both studies asserted that the interventions incorporated UDL strategies, it is unclear specifically how UDL was linked to the interventions. Both studies lacked details that showed specifically how UDL principles were operationalized (King-Sears et al., 2015), although Coyne at al. (2012) indicated that e-books were a form of digital scaffolding, consistent with UDL principles. Limitations in both studies include small sample size, and Browder et al. (2009) did not utilize pretest data or a control group for comparison, making it difficult to isolate UDL as the influential variable.

Four more recent studies have been published that measure the academic outcomes of students after the use of UDL instructional strategies. Three of these studies

involve UDL strategies in science instruction, showing mixed results in student academic outcomes (King-Sears et al., 2015; Marino et al., 2014b; Rappolt-Schlichtmann et al., 2013). Two out of three studies showed no gains in academic outcomes in quantitative data, but all studies showed positive student perceptions in the qualitative data collected. In a quasi experimental study by King-Sears et al. (2015), quantitative data overall showed no significant gains for fifty-nine high school chemistry students with and without disabilities taught in classes using UDL strategies incorporating video and interactive student workbooks. Despite the lack of evidence, quantitative social validity data showed students of all abilities believed UDL strategies improved their learning. Disaggregated data found that students with disabilities in the experimental group improved on posttest scores under the UDL condition, however, students without disabilities were shown to perform more poorly in the UDL condition, pointing to a possible barrier to adoption of UDL strategies in general education classrooms that merits more research. Difficulties with the fidelity of implementation of UDL strategies due to technical problems may have affected student outcomes (King-Sears et al., 2015).

A quasi experimental study by Rappolt-Schlichtmann, et al. (2013) using digital science notebooks showed academic gains as compared with traditional paper-pencil notebooks for over 600 fourth grade students, 10% who were classified as students with disabilities. Students who exhibited low reading, writing and motivation levels at the pretest made improvements in scores, but data were not disaggregated specifically for students with disabilities. This study was notable because students made academic gains using a technology-enhanced UDL strategy for only four weeks. The study did not rule

out novelty of the intervention as a possible cause for the significant increase in scores. A third mixed methods study by Marino et al. (2014b) included fifty-seven middle school science students with learning disabilities in inclusive classrooms using video games and UDL supplemental text over fourteen days of instruction. This study showed no significant gains at the posttest compared to traditional curricular materials, suggesting that game enhancement does not improve topical knowledge in science for students with disabilities over a fourteen-day period. However, qualitative data showed UDL strategies were effective at providing students with multiple means of representation and expression, and heightened levels of student engagement (Marino et al. 2014b).

One final quasi experimental study considering academic outcomes by Kennedy et al. (2014) investigated to what extent high school students with and without learning disabilities could improve vocabulary performance in social studies classes using Content Acquisition Podcasts (CAPs). CAPs are evidence based teaching tools for vocabulary instruction built with valid instructional design principles including UDL. Curriculum-based measures showed students with and without learning disabilities learned world history vocabulary more effectively and at a faster rate utilizing CAPs as compared to the control group, which did not use CAPs. Students with disabilities in the treatment group were able to close gaps on students without disabilities in the control group. The researchers considered whether student observable gains could be attributed to UDL principles, evidence based vocabulary practices, or other design principles used to build CAPs, and concluded that “Because the principles of UDL are intentionally broad, and do

not inherently lend themselves to checks of fidelity or empirical measurement, there is a need to bolster precision in both of these domains" (Kennedy et al., 2014, p. 83).

It is notable that this review of UDL academic outcomes literature yielded no studies specifically in the area of mathematics. The overall conclusion is that the literature is narrow and interventions were often conducted briefly or with lack of fidelity, demonstrating little concrete benefits in using UDL to promote greater academic outcomes for students with disabilities. To improve, more rigorous methodology focused on the effects for students with disabilities in a wide variety of curricular areas is still needed.

Effects on social-emotional development

The Center for Appropriate Special Technology (CAST) distributes a list of UDL check-points that included several items related to social-emotional learning in their document Universal Design for Learning (UDL) Guidelines: Full-Text Representation, 2.0 (CAST, 2011). The principal of multiple means of engagement links to student affect, or how students emotionally connect with their learning environment, and impacts on learning. Guideline 7 encourages UDL classrooms to address student affect by promoting options for individual choice and autonomy, allowing for authentic experience, and decreasing threats and risks in the learning environment (CAST, 2011). Further, Guideline 9 specifically denotes that teachers allow for self-regulation practices to be developed in the classroom, including personal coping skills and self-assessment, to build foundational emotional regulation skills that support learners in coping with different feedback encountered in the educational environment.

Other benefits beyond academic achievement have been formally studied and written about using UDL models. One research study examined whether implementing UDL in the classroom increases levels of social and academic inclusion and engagement in kindergarten through twelfth grade students. Katz (2013) applied a UDL framework including a specific focus on social-emotional learning, and instructed students and teachers in how to build learning communities based on compassion and respect for diversity. Classrooms were designed to promote student inclusion and autonomy for both students with and without disabilities. Students at all grade levels showed significant increases in student academic and social engagement after the intervention as measured by observation and self-report measures, with high school groups showing the most significant increases. In qualitative measures, students reported perceiving higher levels of social and academic inclusiveness and autonomy, however, they reported that classroom climate and student sense of belonging did not increase. The inclusion classrooms studied involved an unknown number of students with unspecified mild-moderate disabilities and data was not disaggregated by disability type, making an interpretation of the results for students with disabilities difficult (Katz, 2013).

Researchers from Christian universities have applied universal design to social skills development for people with disabilities through the concept of "social ramping" and advocate using multiple means of communication to develop meaningful social relationships with people with disabilities based on Christian principles (McNair & McKinney, 2015 p. 43). Many social-emotional learning curricula use UDL principles in their design, such as flexible modes of expression and engagement using role-play and

visualization techniques. Johnson-Harris and Mundschenk (2014) make the case that students with behavioral disabilities may be easily integrated into inclusion settings that use UDL principles to embed behavior supports and enhance academic learning. Increased opportunities to respond to academic and behavioral requests reduce student frustration and promote learning of students with emotional and behavioral disabilities (Sutherland & Wehby, 2001). Similarly, UDL multiple means of expression strategies promote increased opportunities to provide a variety of response modalities in the classroom for all students. To draw conclusions about how UDL classrooms develop social-emotional learning skills for students with disabilities, more research is needed in the area of UDL strategies and social-emotional learning.

Effects of UDL on Curriculum, Training and Teacher Perceptions

From teacher training to lesson planning, UDL principles can have a wide variety of applications inside and outside the classroom. It seems pertinent to investigate how teacher training in UDL principles effects curriculum and assessment design, and the role UDL plays in helping pre-service and experienced teachers create and implement successful learning and assessment materials for students. Student perception and engagement have clear implications for quality and breadth of learning. It is worth considering student and teacher perceptions about UDL in classroom curriculum and assessments.

Curriculum and assessment design

One study investigated the effects of incorporating UDL principles into assessment design and accommodations with ten high school students with disabilities (Dolan et al., 2005). Lead by the question of whether speech-to-text accommodations used in multiple choice computer-based testing provide effective scaffolding for students with learning disabilities, quantitative data in this mixed methods study showed speech-to-text supports to have significant effects when used with reading passages greater than 100 words. There was no statistical effect for shorter reading passages. When extrapolated for reading level, low readers did better with text-to-speech in long passages, and qualitative data showed positive student attitudes toward the UDL accommodation. Only students with a special education primary classification of learning disability were included in this study, and one student with a concurrent emotional disability was disqualified due to inability to follow directions, suggesting further studies would be useful investigating the experience of students with emotional disabilities using UDL technology. The small sample size of ten students is a limitation on the external validity of this study.

Four studies were found investigating curriculum design and lesson planning effectiveness with UDL strategies; three studies employed qualitative or mixed methods research and one study used quantitative methods. The qualitative case studies vary in scope from investigation of the effectiveness of single lessons to considering course wide effects after long-term implementation of UDL strategies. A limitation of research on UDL and lesson planning is how to gather data that demonstrates an effective lesson plan

without considering student academic outcomes. Qualitative studies instead analyzed participation and attitudes of participants to determine the effectiveness of UDL-based lesson plans and curriculum. Three qualitative case studies in curriculum design and UDL will be considered.

The first qualitative case studied one specific curriculum and analyzed its use with three high school student teams with mixed abilities. Basham, Meyer and Perry (2010) designed and implemented a digital backpack containing foundational technology supporting multiple means of engagement and response, modular technology to enhance differentiated instruction, and instructional support materials. Throughout three cycles of study, teams of students used the digital backpack to create digital media. Students in Cycle One and Two were unable to create a cohesive project, revealing limitations of students' effective use of UDL technology without significant support, and highlighting improvements that could be added to the backpack and overall lesson process. Cycle Three was the only student group to complete a movie, an unexpected result because students in this group had the least amount of previous technology experience. The study concluded that significant scaffolding was needed to support student use of UDL technologies: however, previous background in technology did not seem to have bearing on achieving learning outcomes. This study included students with disabilities but did not specifically consider performance or effects with these students. The small participant size and scope of this study highlighted strengths and weaknesses of the digital backpack, but provided limited conclusions for curriculum planning with UDL broadly.

Dymond et al. (2006) completed a second qualitative case study using a participant action research approach (PAR) investigating the effects of redesigning a high school science course with UDL strategies over the span of one school year. A collaborative research team of general and special educators implemented changes in instruction, curriculum, course organization, materials and assessment. Broad data collection of interviews, minutes, biweekly lesson plans, and a focus group allowed for deeper understanding of complex forces within the classroom. Qualitative data showed educators took more responsibility for training paraprofessionals and teaching students with disabilities as they participated in the course redesign process. This resulted in significant gains in work completion, test scores, and subsequently, the grades of students with disabilities. Data showed social relationships between students with cognitive disabilities and general education students were strengthened. The study did not clearly link instructional strategies directly to UDL principles. It is unclear whether UDL strategies were responsible for outcomes or if other competing factors created the effect. It is possible that any collaborative team of educators taking the time to thoughtfully redesign a course over the span of the year would see positive impacts on student academic and social outcomes. Further, researchers stated their greatest concern was the length of time it took to create significant course wide change.

McGuire-Schwartz and Arndt (2007) combined two research studies into a single paper using mixed method design. Research conclusions relied primarily on coding patterns in qualitative self-reported data through interviews, surveys and questionnaires. After completing UDL practicums and training developed by the Center for Applied

Special Technology (CAST), forty-one participating pre-service teachers from pre-kindergarten to third grade teaching programs wrote and implemented UDL lesson plans in classrooms and after school programs. Lesson plans included the three UDL key principles of flexible representation, expression, and engagement from the beginning of the planning process to effectively meet the needs of all students. Teachers from both studies reported that UDL benefited classroom academics and behavior, as well as improving inclusive educational settings for all students. In Likert Scale surveys, participants reported that UDL frequently or almost always improved lesson plan design, and often met the needs of students with disabilities.

The three qualitative studies considering UDL and curriculum application by Basham, Meyer and Perry (2010), Dymond et al. (2006), and McGuire-Schwartz and Arndt (2007) generally contained a lack of specific information about how UDL principles were explicitly applied to lesson plans. They relied heavily on self-reported data that was not corroborated by outside measures. In sum, the studies drew connections to UDL in a limited fashion, making it difficult to attribute research outcomes to the UDL framework alone. Further, more rigorous methodology including outside verification of participant claims may strengthen future research.

In a quantitative study investigating student use of UDL curricular tools, Marino (2009) used quasi-experimental pre-post test design to analyze how over 1,000 middle-school science students with reading difficulties utilized technology-based cognitive tools with UDL supports, interactive text and visual representations of key concepts. The study found that students with severe reading difficulties were able to perform as well as

proficient readers using technology supports. Low ability readers were found to use the UDL tools significantly less than their high achieving peers, despite having been explicitly trained in their use and exposed to daily classroom discussion about the tools. These findings support the use of UDL technology-based tools with students with severe reading difficulties when a teacher monitors use and provides on-going direct instruction.

Marino (2009) also reported conflicting data that suggests possible limits of the use of UDL: UDL tools had a significantly negative effect on overall student posttest science scores, despite self-reports stating students found the tools to be beneficial. This suggests that UDL tools and strategies may be distracting from key lesson objectives, such as acquisition of specific vocabulary terms and concepts (Marino, 2009). This study had the limitation of not having a control group that would allow comparison of posttest results from the UDL treatment group to traditional science teaching methods. In conclusion, the research shows curriculum design and lesson plans implemented with UDL strategies have inconclusive effects. As we will see, several research studies investigating the effects of UDL teacher training also used lesson plans to measure outcomes.

Teacher training

The following three studies utilized quantitative and mixed method designs to investigate the effects of pre-service UDL teacher training on lesson plan design. In a true experimental design pre and post-test study, Spooner at al. (2007) researched how UDL training effects lesson plan design with 72 pre-service general and special education teachers by comparing treatment and control group lesson plans before and after a one-

hour UDL training. Using a rubric constructed for the study and multiple raters, researchers found significant differences between treatment and control groups in the amount lesson plans involved students with disabilities by including the three key UDL principles of representation, expression and engagement with multiple clear examples of modifications. Participants in the intervention group demonstrated significant lesson plan improvements from the pre to post-test.

In a study based on research by Spooner et al. (2007), Courey at al. (2013) used a true experimental design to examine the effects of UDL training on the lesson plans of forty-five students enrolled in a special education credential program. An important difference of this study was that student teachers received a three-hour UDL training designed to be more rigorous and interactive, with the goal of preparing special education teachers to train general education teachers in inclusive settings. Using the same rubric designed by Spooner et al. (2007), similar results were found, including significant improvements in lesson plan writing with UDL after the training, as well as maintenance of lesson plan writing skills over time. Researchers noted that they were unsure if the lesson plans would be able to be implemented in actual classrooms (Courey et al., 2013).

McGhie-Richmond and Sung (2012) used mixed methods design to study the effects of a multi-day training about UDL technology and inclusion on thirty-six pre-service teachers' and ten experienced teachers' lesson plans. Teachers were asked to revise a lesson plan using UDL strategies after attending the training. Revisions were coded according to the use of the three key principles of UDL. Quantitative analysis showed teachers made significant revisions to their lesson plans that included UDL

principles. Teachers were also asked for written feedback about the process. Qualitative analysis of teacher responses revealed themes of "learning for all" and "transformative practice," showing that teachers felt UDL provided them with tools to promote inclusive practices for all students (McGhie-Richmond & Sung, 2012, p. 50-51).

The first two studies by Spooner et al. (2007) and Courey et al. (2013) did not rule out possible threats to validity from the pretest effect as a competing cause for the measurable increases in lesson plan quality. In the third study by McGhie-Richmond & Sung (2012), uneven groups of experienced teachers and pre-service teachers made results difficult to interpret. Overall, the studies show that teacher training in UDL effects lesson plan design. However, the limitation of not using the lesson plans in the classroom leaves open the question whether lesson implementation is feasible or what the actual effects of UDL lesson plans on students would be. Further, these studies demonstrate somewhat weak research questions with predictable results, showing the effectiveness of particular UDL trainings rather than UDL as a whole. Considering studies on student perceptions of the use of UDL principles can further elucidate the effectiveness of UDL lesson plans.

Student perceptions

Two studies were located investigating student perceptions of UDL as measured by survey data. Abell Jung and Taylor (2011) posited the question whether student perceptions of classrooms equipped with UDL strategies such as scaffolded curricula and project-based learning were effected by grade level or teacher gender. In a quantitative study with 867 fifth through twelfth grade participating students from fifteen teachers,

classroom instructional environment was analyzed using a survey tooled modified with UDL components. Variables analyzed included personalized learning, participation, independent decision-making and problem solving. High school students in UDL classrooms reported significantly higher levels of personalized learning and participation. Students at all grade levels reported higher levels of personalized learning when taught by a female teacher in a UDL setting. The study did not rule out gender bias as a cause for student perceptions that female teachers personalized lessons more often. The study did not report how it was determined that teachers were adequately using UDL principles or their prior knowledge of UDL. Therefore, confounding factors involving teacher personality could have influenced student responses. Due to lack of disaggregated data, no conclusions about the perceptions of students with disabilities were possible.

A mixed-methods study by Kortering, McClannon and Braziel (2008) compared the reported perceptions of 253 high school students with disabilities with thirty-seven general education students in algebra and biology classes over a ninety-day period. Teachers had the option of attending up to ten full-day trainings in UDL, where they were paid $125 per training. Students completed surveys with Likert style and open-ended questions after attending one class where a UDL intervention took place. Both groups of students reported high levels of engagement, satisfaction and teaching effectiveness when compared to their other classes that did not employ the UDL intervention, with 90% of both groups requesting more UDL instruction. Researchers noted the inability of the study to separate out teacher quality as a confounding factor. The researchers stated that the challenge of recruiting willing teachers prompted the financial incentive in this study,

concluding that further research is merited on how to best engage teachers in learning and utilizing UDL in their classrooms over time. All told, the research shows student perceptions to be very positive, showing the potential for UDL to heighten engagement in the classroom, particularly with high school students. Methodological concerns call into question some of these studies' conclusions, and broader research with more sound methods is warranted in this area.

In sum, studies considering UDL effects on kindergarten through twelfth grade students with disabilities have been conducted in a wide variety of academic areas such as curriculum, assessment, accommodations, teacher training, and student perceptions. Researchers have explicitly tied UDL strategies to interventions and effects inconsistently, causing difficulty in analysis of the overall results (Rao, Ok & Bryant, 2014). Studies frequently included strong definitions, background and justification for using UDL. Overall, the research showed UDL strategies and training had significant effects in participant engagement and satisfaction in every study that sought to measure these variables. Many academic studies showed positive effects on student outcomes, though UDL was not conclusively shown to be the cause of academic or social gains in students. Therefore, research seems to generally support the use of UDL. However, the varying types of research designs and questionable methodologies mean these results should be interpreted with caution. Further, in many studies, confounding variables could not be ruled out as effecting validity. Studies frequently did not disaggregate data for students with disabilities, leading to difficulty in interpreting results for this group. UDL

presents challenges to broad scale implementation due to lack of a clear definition, questionable scientific merit, and poorly operationalized examples in the research.

Limits of UDL

One of the main challenges of UDL is a lack of agreement on the definition. UDL is often used to mean the specific definition espoused by CAST, but some authors use UDL to refer to general universal design practices present in the classroom. This inconsistent use of terminology is a barrier to research (Rao, Ok & Bryant, 2014). The legal definition in the Higher Opportunities Act of 2008 considers UDL to be a scientifically researched instructional framework, however, the emergent body of UDL research means that analysis of the effectiveness of UDL is not possible until more substantial literature is available (Edyburn, 2010). Therefore, the claim that UDL is scientifically validated seems premature.

Another limitation is that researchers have not effectively operationalized the UDL concept and often do not include clear applied examples with explicit descriptions in their studies (Edyburn, 2010; Rao, Ok & Bryant, 2014). Researchers would benefit from going beyond the basic definitions of UDL principles and including specific examples of interventions and practices to operationalize UDL in a way that can easily be recreated by future research teams. In an article critiquing UDL titled "*Would you recognize UDL if you saw it*?" Edyburn (2010) points out that UDL may not have in much in common with universal design in architecture as was previously surmised; the dynamic and changing classroom relationships between teacher, learner, and educational

setting present complex interactions that require special consideration when implementing UDL. Teachers may struggle to put effective the frameworks in place without the ability to define, operationalize and implement UDL.

UDL has captured the imaginations of educators, researchers and lawmakers globally as a way to bring accessible design into education classrooms for people with disabilities. There is an intuitive appeal to bringing conscious design into lessons and instructional planning before planning begins. UDL strikes at the heart of an area where we often see our most challenged students failing in classrooms: accessing curriculum. Education law itself mandates this access, and stakeholders gravitate toward a framework claiming to address the problem. UDL research has not clearly communicated explicit instructional methods or practices in a way that is usable by the day-to-day educator. UDL has brought attention to the importance of valuing diverse learners proactively by including their needs in the instruction and lesson-planning phase. Due to inconclusive and sparse research on the measurable effects of UDL, it may be too early to tell if UDL is more than merely a catch phrase based on empty claims. While not yet established in the research community, other educational programs containing universal design principles may hold equal promise to solving problems students with disabilities face.

Other Universal Design Programs: How do they Compare?

Three alternative universal design strategies grew out of the current proliferation of digital materials and the federal legislative climate requiring accessible educational environments: universal design for instruction, universal design in education, and

universal instructional design. These educational programs are collectively based on adaptations of the seven principles of Universal Design (UD) in architecture: equitable use, flexible use, simple and intuitive, perceptible information, tolerance for error, low physical effort, and size and space for approach (McGuire, 2014). Designed primarily to be utilized in post-secondary educational settings, these UD frameworks focus on proactively designing teaching strategies and environments in a way that is responsive to the diverse needs of college students, including flexible accommodations such as accessible study guides, multimodal presentations, and extended test time (McGuire, 2014; Parker, Robinson & Hannafin, 2008). Clearly, many postsecondary institutions and researchers have taken interest in this expanding domain in education, and interested readers can consult the *Journal of Postsecondary Education and Disability* for a plethora of articles on the subject. As the main application of these frameworks is in college settings, it is difficult to compare them to UDL in kindergarten through twelfth grade environments, and puts them out of the scope of this review.

Looking to the Future

This literature review shows a shortage of research on the effects of using UDL with students with autism, a surprising finding given the significant effectiveness technology-based intervention has been shown to have with people with autism (Grynszpan, Weiss, Perez-Diaz & Gal, 2014). There was also no research found using UDL strategies in math instruction. This review shows that further investigations into using UDL to promote social-emotional learning are also warranted; little to no

information was found about UDL and students with emotional and behavioral disabilities. Further research is needed to lay a foundation of empirical evidence concerning the effectiveness of UDL practices.

Research about UDL and student educational outcomes is in its infancy. Barriers to clear and effective research include lack of a clear definition of UDL, and ineffective operationalization and measurement of UDL variables. Research design is clearly affected by terminology, and the concept of UDL is muddled and often combined with other UD frameworks such as universal instructional design and universal design instruction (McGuire, 2014). Further research needs to address areas where there is a lack of research and bolster areas that have begun to accumulate evidence, such as student outcomes in science and language arts (Kennedy et al.; 2014. King-Sears et al., 2014; Rappolt-Schlichtmann, et al., 2013). McGuire (2014) recommends using a systematic research agenda that seeks to incrementally build the research base using clearly defined methods such as UDL checklists or a specific list of accommodations. If the research community came together to define a measurable, concrete set of criteria that constitutes UDL, the indeterminate nature of much of UDL research could be mitigated. The promise of UDL, its promotion of usable frameworks in inclusive instructional environments, should not be lost due to nebulous terminology and bleary definitions.

The body of research shows the beginnings of investigating into student academic outcomes, with preliminary investigation into the effects of UDL on social-emotional learning and development. Studies on curriculum and assessment design as well as student perceptions of UDL have come into circulation. Researchers have begun to

investigate the effects of UDL training on UDL lesson plans and teacher perception. This researcher was interested in conducting a study investigating the effects of teacher training on daily classroom practices and use of UDL, including what technology practicing teachers are using with students with disabilities, as well as overall UDL use strategies and patterns. A guiding research question was posed: how does training UDL training/professional development impact the use of UDL strategies in the classroom with special education students?

METHODS

Introduction

The current research was designed to investigate how general education and special education teachers use UDL strategies and technology in their classrooms. This descriptive study examined the effects of professional development on a range of the UDL principles and related technologies used by classroom teachers. This chapter explains the quantitative and qualitative methods of research used to gather data for this study.

Setting

The study took place in a small, suburban public kindergarten through eighth grade school district in the affluent county of Marin, California. The district was selected as a convenience sample being available to the teacher-researcher, who has worked there for two years as a special education teacher between 2015-2017 when the study was conducted. The district is a high performing school district. Serving 1,548 students, it is a full-inclusion school district that serves students with disabilities primarily in the general education classroom. Pupil spending is $12,416 per student and funding sources such as the local parcel tax, SPARK and the district's Foundation help with visual and performing arts, science specialists and a robust technology presence in the classroom. The district's schools (two elementary, one middle school) have been approaching one-to-one technology implementation in their classrooms. The prevalence of technology in

this school district made it appear to be a useful environment for studying the use of UDL technology and strategies in the classroom. The target population for this study was certificated public school teachers both in general education and special education settings. The pilot survey was sent to 50 elementary school teachers as a convenience sample resulting in 13 completed surveys (26% participation rate). For the revised survey, the population of teachers surveyed was a middle school staff of 30 teachers who had not participated in the pilot. The middle school serves over 500 sixth, seventh and eighth grade students. Seventeen teachers participated out of thirty who were emailed the survey for a response rate of 57%. Seven participants were male (41%) and ten were female (59%). Most participants were general education teachers (59%), with the remainder specialist teachers (29% art, PE, music, dance) and special education teachers (12%). Of the fourteen participating teachers who answered the item that asked about number of years teaching, the majority were veteran teachers who had more than ten years teaching experience (59%), with the next largest group between the five to ten-year range (18%) and the smallest group the newer teachers who had taught for five years of fewer (12%). See the Results section for more detailed analysis. Teachers were first made aware of the study and asked to participate at a bi-weekly staff meeting. A follow-up email was sent containing details about the study, encouraging teachers to participate along with the survey itself. A second reminder email was sent two weeks later and a final reminder email was sent. The researcher believes that rapport building with the staff over the course of working at the school for four months helped motivate participation.

Survey

An online survey was designed to collect both quantitative and qualitative data. The survey was based on an instrument created by Meier, B. (2013) in her doctoral dissertation, *Strategies that teachers implement to help students access the general education curriculum: Investigating the instructional strategies of universal design for learning* and midwifed to fit the current study through an analysis of the relevant literature. The databases used to collect research articles were primarily ERIC and OmniFile through the Humboldt State University Library's website (see Appendices for Survey).

The final survey design consisted of thirty-one quantitative items interspersed with four short-answer qualitative items, five demographic questions and two informational questions about interest in further participation, totaling 43 items in all. The survey contained twenty-three quantitative Likert Scale frequency questions collecting information about the frequency of use of specific types of UDL strategies and technologies using a 0-3 Likert Scale consisting of responses: daily, weekly, monthly or do not use. Five quantitative items using a four point Semantic Differential Items collected a variety of information about UDL teaching strategies such as when teachers develop tools and accommodations for special education students and how many levels of challenge teachers use with students. Four additional questions prompted participants to select from multiple choice items, including three question in yes/no format, including the two consent questions. The four qualitative questions interspersed throughout the

survey were designed to allow participants to provide more in depth, personal information about a specific quantitative item. There were five demographic questions such as gender, years teaching, educational background, grade levels taught and teacher type (general education, special education or specialist). The final two questions asked if respondents were interested in participating in an observation or interview and allowed respondents to leave their names if they were interested in further participating in the study.

The survey was broken up into six parts: Informed Consent, Classroom Practices, Technology Use, Student Feedback and Coping Skills, Familiarity with UDL and Demographics. The survey began with the informed consent page, requiring teachers to provide consent to participate and asking teachers to agree or disagree to have their (anonymous) direct quotes used from qualitative survey items. Classroom practices consisted of Semantic Differential Items, multiple choice questions and frequency questions about general UDL practices and teaching strategies in the classroom. The second part, Technology Use listed specific types of UDL technology and asked teachers to indicate their frequency of use in Likert Scale format. It contained one qualitative question to allow teachers to include more detailed examples of the types of multimodal teaching strategies they employed in their classrooms. The third part, Student Feedback and Coping Skills included two quantitative items and one qualitative item to collect corollary information about how teachers get feedback from their students, how often respondents teach personal coping skills to their students and what strategies they use. This section was included because the research suggests that the UDL principal of

multiple means of engagement includes supporting the learner in the development of social-emotional strategies such as self-regulation; this strengthens the affect domain where flexible lessons in goal setting and coping skills may benefit the variability of skills different learners possess (Meyer, Rose & Gordon, 2014). The fourth section of UDL familiarity was designed to collect information about the level of exposure participants had to UDL, including how many hours of training respondents have had. One qualitative item prompted respondents to state in their own words what they thought UDL meant as an external check on participant's response to the previous quantitative item stating their familiarity with UDL. The Demographics section was the final section of the survey.

Process

After receiving permission to complete the study from the district superintendent during the Spring of the 2015-16 school year, a pilot study was conducted surveying elementary teachers via email using Google Forms. The data from the pilot study was analyzed and the results were reviewed by professionals within the graduate education program at Humboldt State University resulting in minor modifications to the final survey instrument. Among these changes, several items were shortened to achieve alignment of survey items, including standardizing numeric scales to reflect a uniform 0-3 Likert scale to determine frequency (never, monthly, weekly, daily) and shortening Semantic Differential items to scales of 1-4. Due to the volume of items, the first thirteen technology items were placed at the beginning of the survey. To break up the lengthy

frequency Likert Scales, several multiple choice and semantic differential items were placed before the second Likert Scales group of seven UDL tools IRB amendments were secured in approving the revised survey (IRB Number 15-212).

Teacher participation was encouraged through two methods: in-person staff-meeting reminders given twice during the month the survey was open and the use of the Dillman Method to increase response rates. The final survey was released to the Middle School and who had from November 14 to December 16, 2016 to complete them.

The online survey was distributed through Google Forms using the teacher's professional emails. As per the Dillman Method, participants were emailed an introductory letter one week prior to the survey being emailed to them, containing background information about the survey and encouraging them to participate. All participants were given a reminder email after the survey was open for two weeks with another link to the survey. Another reminder email was sent two weeks later, 24 hours before the closing of the survey. In addition, two verbal reminders were provided by the researcher at bi-weekly staff meetings.

RESULTS

Introduction

This chapter will include an overview and analysis of responses provided by participants in the survey, including quantitative and qualitative items in which teachers provided information about use of UDL technology and UDL classroom strategies, practices for teaching self-regulation, and training and familiarity with UDL. In addition, the chapter will include the demographics of survey participants and response rates for each item. Quantitative survey data was analyzed using Minitab Statistical Software. The alpha level for this study was set at 0.1 rather than 0.05 due to the small number of participants and exploratory nature of the work. Qualitative responses were coded for themes, patterns, and deviations. For organizational purposes, the data will be arranged into four categories that mirror the survey categories: demographics, technology use and classroom practices, student feedback and coping skills, and familiarity with UDL. The demographics section will present basic information about participants such as years teaching, subject, grade level and gender. The technology use and classroom practices section will review descriptive statistics, frequency of use of UDL technology and use, and correlations between different types of UDL technologies used by teachers with special education students in the classroom. This section will also analyze survey responses to Likert style questions about UDL strategies used in the classroom, including analyzing correlations between responses to demographic questions such as years

teaching and teacher training, and reported uses of technology. The student feedback and coping skills section will review responses to semantic differential items measuring student choice and several questions about social-emotional learning (SEL). Other items investigate the types of SEL strategies used, and correlations between use of SEL and use of UDL. The familiarity with UDL section assesses participants' previous UDL knowledge, previous UDL training of participants, and qualitative interpretations about the meaning of UDL; this section will analyze correlations between previous UDL training and reported UDL technology use and strategies in the classroom.

Demographics

The survey was emailed to all teachers who work at the middle school through teacher work email. The sampling frame included twenty-seven general education teachers, a certificated school counselor, and two special education teachers. Seventeen teachers completed the survey out of thirty teachers who were emailed the survey at Hall Middle School, a 57% participation rate. Of participating teachers, 59% of respondents reported as female (10/17), and 41% reported as male (7/17). Ten participants were general education teachers (59%), five were specialist teachers (29% art, PE, music, dance) and two participants were special education teachers (12%). When asked what grade level they currently taught, thirteen participating teachers taught multiple grade levels between 6th and 8th grade (76%), and four teachers reported that they taught a single grade including three 6th grade teachers (18%) and one 8th grade teacher (6%). Figure 1 provides a representation of the grade levels taught by respondents.

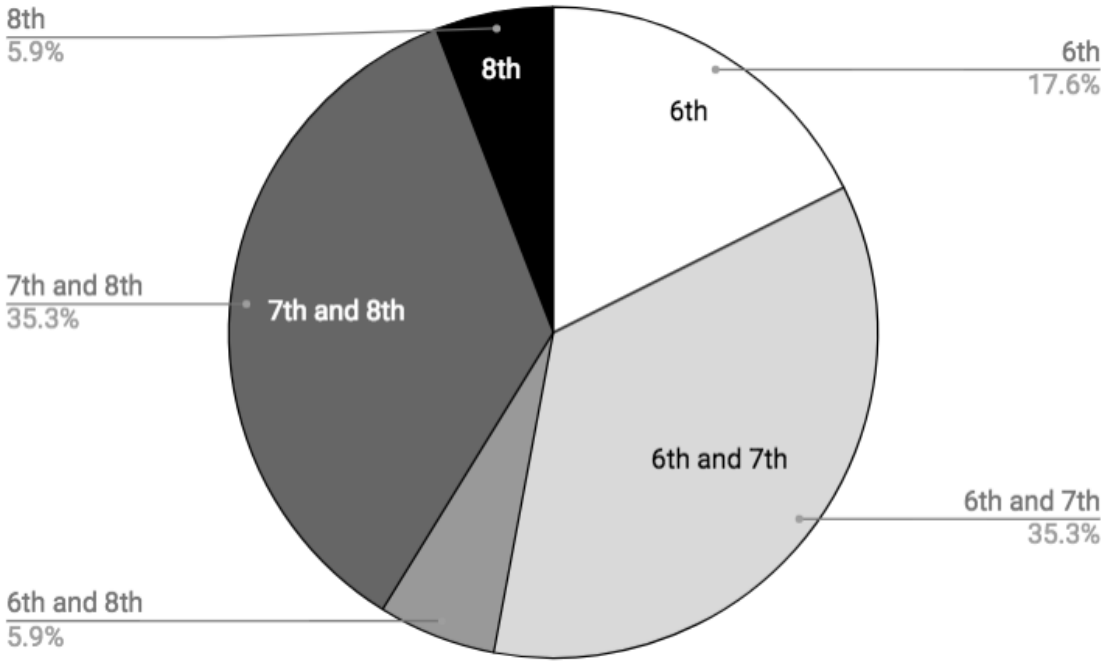

Figure 1: Grade levels currently taught by participants

When asked to indicate their level of educational attainment, eight teachers stated their highest education level to be a master's degree (47%) and nine teachers stated they held a bachelor's degree (53%). None of the teachers polled reported having a Ph.D. Fourteen participating teachers answered the item about Number of Years they have been teaching, counting the current year of teaching as one year. Responses showed a range of experience from three to thirty years teaching. Two teachers fell in the three to five-year range (12%), three teachers fell in the six to ten-year range (18%), three teachers fell into the eleven to fourteen-year range (18%), and the remaining six members of the group who responded to this item declared their teaching experience as fifteen years or more

(35%). Three teachers did not answer this question (18%). Figure 2 provides a representation of the respondent's number of years teaching.

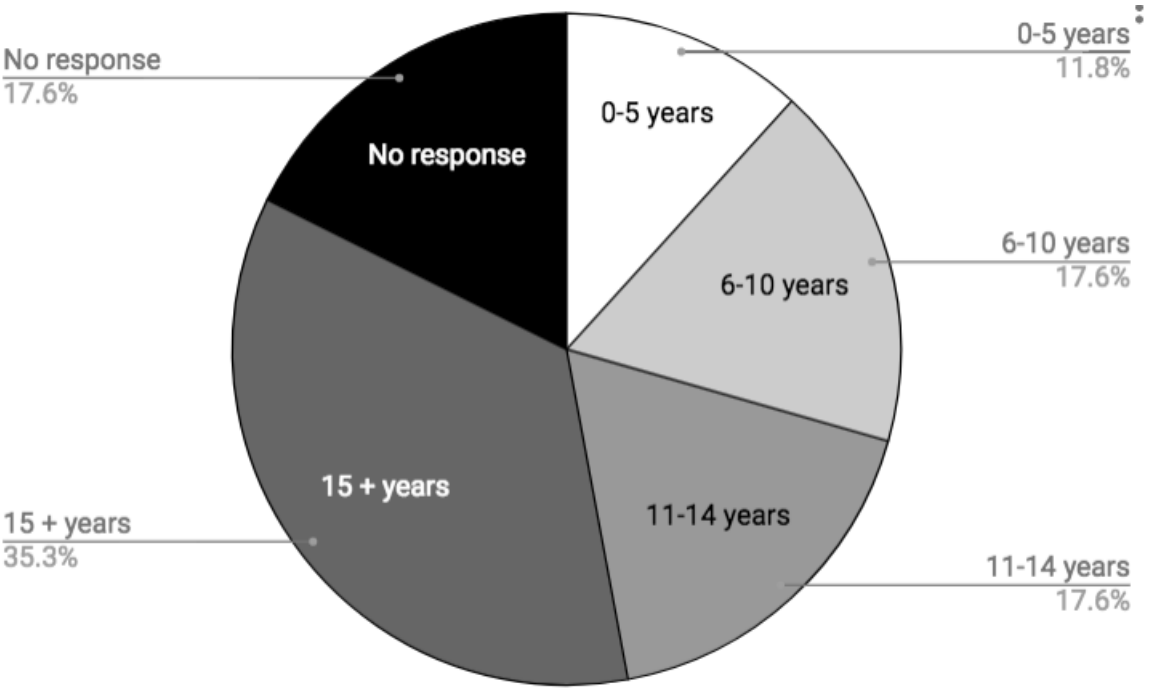

Figure 2: Participants years of prior teaching experience

Technology Use and Classroom Strategies

This section will first review twenty Likert style items detailing the frequency with which teachers use technology and classroom strategies in UDL. Then, I will discuss themes found in the qualitative responses item in this section. Participants were asked to indicate their use of thirteen types of classroom technologies and seven types of classroom strategies used to assist students with disabilities. For all twenty UDL tools, respondents selected from a Likert Scale to indicate their frequency of use of tools with

students with disabilities: *Daily, Weekly, Monthly* and *Do Not Use*. Due to the volume of items, the first thirteen technology items were placed at the beginning of the survey. To break up the lengthy frequency Likert Scales, several multiple choice and semantic differential items were placed before the second Likert Scales group of seven UDL tools All UDL technologies and strategies were selected based on UDL guidelines and learning tools frequently used in UDL lessons or recommended as UDL classroom supports in the current literature.

The types of technologies and strategies on the survey are associated with UDL methods that fall into four groups: reading tools, writing tools, web/video (audio support) tools, and visual tools. Technologies from different categories were mixed randomly throughout the Technology Use section of the survey. While some categories may overlap, and may fit into more than one category, items were placed in categories they were most often referred to in current literature. Classroom strategies from different categories were also mixed at random throughout the survey. There were three items in the reading category, six items in the writing category, three items in the web/video (audio) category and four items in the visual category. Sets of items identified as being related and then validated as measuring a common construct using Pearson correlations were combined into variables for statistical analysis. Given the small number of respondents, the researcher chose to use correlation tables rather than factor analysis or other statistical tools to assess the structure of the responses.

Reading Tools

The UDL Tools for reading included in the survey were on-line textbooks, e-books and text-to-speech software for listening to text. Likert Scales measured frequency of use: Daily (3), Weekly (2), Monthly (1) and Do Not Use (0). Mean and standard deviation of UDL reading strategies are listed in Table 1.

Table 1. Frequency of use of UDL Reading Tools: Mean and Standard Deviation

UDL Reading Strategy	Mean	Standard Deviation
On-line textbooks	0.64	1.06
E-books	0.71	0.99
Text to speech software for listening to text	0.59	0.8

The use of these three reading tools showed the lowest means of any UDL tools or strategies category, with an overall mean of 0.65 for all reading tools. Out of a scale of zero through four, all means were less than 1.0, indicating they are used less than once per month. The low level of UDL reading strategies used when compared to other UDL strategies indicates reading may be an area for improvement for use with special education students. After running a Pearson Correlation analysis, there was no correlation shown between text to speech use and on-line textbook use ($r= 0.11$, $p= 0.66$). Use of e-books showed a correlation with use of on-line textbooks ($r= 0.43$, $p= 0.08$) and use of text to speech software ($r= 0.47$, $p= 0.05$). Because two of the reading variables did not

correlate, a comprehensive variable for comparison of reading tools with other comprehensive variables could not be created.

Writing tools

UDL writing items surveyed included predictive writing programs, sentence starters, Google documents, speech-to-text, spellchecker and use of writing templates. Likert Scale format measuring frequency of use was the same for all frequency items: Daily (3), Weekly (2), Monthly (1) and Do Not Use (0). Mean and standard deviation of UDL writing strategies are listed in Table 2.

Table 2. Frequency of use of UDL Writing Tools: Mean and Standard Deviation

UDL Writing Strategy	Mean	Standard Deviation
Predictive Writing	0.47	0.94
Sentence starters	1.53	1.01
Google docs, sheets or forms	2.06	1.03
Speech-to-text for writing	0.12	0.49
Spell checker (or calculator)	1.59	1.32
Writing templates	1.41	1.18

Writing strategies were the second lowest used UDL tool or strategy, with an overall mean of 1.2 for all writing tools, still much higher than the reading mean. Due to significantly low overall reported teacher use of speech-to-text, with a mean of 0.12 showing it close to Do Not Use (0), it was removed from the comprehensive writing

variable. Predictive writing was included in the mega variable due to some correlative effect with frequency of sentence starters ($p = 0.51$, $r = 0.036$), although the mean is also low at 0.47. The writing strategy used most by respondents was Google docs, sheets or forms, indicated by a mean of 2.06. This shows Google docs are used Weekly (2) on average by participating teachers. The Pearson r- correlation and p-value between items included in the writing mega variable are reported in Table 3.

Table 3. Correlation between Writing Tools included in Writing Mega Variable

	Predictive Writing	Sentence starters	Google Docs	Writing templates
Sentence Starters	r = 0.511 p = 0.036			
Google Docs	r = 0.356 p = 0.161	r = 0.390 p = 0.122		
Writing Templates	r = 0.265 p = 0.304	r = 0.702 p = 0.002	r = 0.495 p = 0.043	
Spell check	r = -0.08 p = 0.74	r = 0.45 p = 0.06	r = 0.29 p = 0.25	r = 0.4 p = 0.11

After analyzing item correlations, a comprehensive variable was created combining predictive writing, sentence starters, google docs and writing templates. The overall writing variable was used to make comparisons to other demographic data or overall use of UDL tools and strategies. The researcher notes there were no correlations

found between the writing variable and other comprehensive variables, suggesting use of writing UDL strategies does not correlate significantly with use of UDL overall.

Web/Video (Audio) Tools

Web/Video (Audio) tools surveyed included web activities, specific websites to present instruction and video media. Respondents reported use of web/video (audio) tools in Likert Scale format measuring frequency of use: Daily (3), Weekly (2), Monthly (1) and Do Not Use (0). Mean and standard deviation of UDL writing strategies are listed in Table 4. Moderately high levels of use of web/video (audio) strategies were reported when compared to other UDL tools surveyed. Specific websites and video media are particularly high, with means over 2.0, indicating they are used weekly or more.

Table 4. Frequency of use of UDL Audio Tools: Mean and Standard Deviation

UDL Wed/Video (Audio) Strategy	Mean	Standard Deviation
Web Quest/Web Activities	1.29	1.05
Specific websites to present instruction	2.18	1.01
Video Media (YouTube, video clips or animation)	2.06	0.75

Web/video (audio) showed to be the UDL tools group with the highest overall use, with a mean of 1.84 for all tools. There was no significant correlation shown between UDL web/video (audio) tools, so a comprehensive variable could not be created to use for data analysis of web/video tools with other UDL categories (Table 5).

Table 5. Correlations of Wed/Video (Audio) Tools

	Web activities/ Web quest	Visual/video media (YouTube, video clips)
Visual/video media (YouTube, video clips)	r = 0.14 p= 0.6	
Specific websites to present instruction	r= 0.3 p= 0.24	r= 0.4 p= 0.11

Visual Tools

Visual tools surveyed included charts, graphs and illustrations, PowerPoints/slides, document camera or projector, planner, and graphic organizers. Respondents reported use of visual tools in the common Likert Scale format measuring frequency. Mean and standard deviation of UDL visual strategies are listed in Table 6.

Table 6. Frequency of use of UDL Visual Tools: Mean and Standard Deviation

UDL Visual Strategy	Mean	Standard Deviation
Charts, graphs, illustrations	1.94	1.09
PowerPoints or Google Slides	1.71	0.77
Document Camera/Projector	1.88	1.11
Planners to track assignments	2.11	1.11

UDL Visual Strategy	Mean	Standard Deviation
Graphic Organizers/ Outlines/ Concept Maps	1.47	1.01

Visual tools were the second highest used of all UDL tools, with a mean of 1.82 for all visual tools. The Pearson r- correlation and p-value between items included in the visual tools variable are reported in Table 7. Through Pearson correlation analysis, charts/graphs/illustration, graphic organizers, PowerPoint, and document camera appear to have a positive association indicating significant correlations that justified combining them into an overall visual tools variable for comparison with other UDL survey items as shown in Table 7.

Table 7. Correlation between Visual Tools included in Visual Tools Mega Variable

	Charts, graphs, illustrations	Power point	Document Camera	Graphic Organizers
Power point	r = 0.797 p = 0.000			
Document Camera	r = 0.666 p = 0.004	r = 0.686 p = 0.002		
Planners	r = 0.575 p = 0.016	r = 0.407 p = 0.105	r = 0.417 p = 0.096	
Graphic organizers	r = 0.597 p = 0.011	r = 0.511 p = 0.036	r = 0.276 p = 0. 284	r = 0.227 p = 0.382

Miscellaneous UDL Tools

Four miscellaneous UDL strategies were included that did not fit into one group because they could be used to support learning in all UDL domains of reading, writing, web/video (audio) and visual. Items include collaboration with general education teachers, collaboration with special education teachers, providing multiple types of feedback to students (conferencing, track changes), lessons using three or more modalities, and flexible work groups. Respondents reported use of Miscellaneous UDL Tools in Likert Scale format measuring frequency as in the previous measurements. Mean and standard deviation of Miscellaneous UDL strategies are listed in Table 8.

Collaboration with special education teachers was shown to have a mean of 0.76, showing that teachers report they collaborate with special education teachers infrequently, less than once per month (1=Monthly). Collaboration with general education teachers was reported much higher with a mean of 2, showing teachers report they collaborate with general education teachers weekly on average (2=Weekly). This discrepancy indicates collaboration with special education teachers could be an area to increase. Flexible work groups and multiple modality materials are reported to have moderately high use by teachers, with both means two or higher.

Table 8. Frequency of use of Miscellaneous UDL Tools: Mean and Standard Deviation

Miscellaneous UDL Strategy	Mean	Standard Deviation
Collaboration with special education teachers	0.76	1.16
Collaboration with general education teachers	2.00	1.06
Frequency flexible work groups (pairs, small group, individual)	2.35	0.61
Frequency materials with three or more modalities (visual, auditory, kinesthetic)	2.00	0.96
Frequency multiple types of student feedback (track changes, conferencing)	1.65	0.79

While collaboration is not expressly a UDL strategy, it was placed in the survey to get a measure of whether collaboration was predictive of any other UDL strategies. A mean was not created for all Miscellaneous UDL tools because they cover many domains of learning, though it should be noted that collaboration with general education teachers, use of materials with three or more modalities, and flexible work groups appear to be strategies used regularly by teachers, with individual means of over two. Table 9 shows a strong positive correlation exists between collaboration with special education teachers and multiple types of feedback (e.g. track changes, conferencing). A moderate positive correlation also exists between collaboration with special education teachers and use of

flexible work groups, such as small group, pairs or individual. These correlations probably exist because special education teacher report a higher frequency of collaboration with other special education teachers (Mean = 3, Daily) and may use flexible work groups and multi modal teaching more often in their classrooms. This may also indicate that collaboration with special educators has the effect of increasing use of UDL strategies of using flexible work groups and using multiple types of feedback. The final correlation in this set may show that use of the UDL strategy of flexible work groups makes a teacher more likely to provide their students with multiple types of feedback, both UDL strategies that fall under the UDL guideline of multiple means of engagement.

Table 9. Correlations of Miscellaneous Frequency Survey Items

	Collaboration Special Education Teachers	Collaboration General Education Teachers	Flexible Work Groups (e.g. pairs, small group, individual)	Materials using 3 or more modalities (e.g. visual, auditory, kinesthetic)
Collaboration General Education Teachers	r= 0.36 p= 0.16			
Flexible Work Groups (e.g. pairs, small	r= 0.51 p= 0.04	r= -0.1 p= 0.7		

	Collaboration Special Education Teachers	Collaboration General Education Teachers	Flexible Work Groups (e.g. pairs, small group, individual)	Materials using 3 or more modalities (e.g. visual, auditory, kinesthetic)
group, individual)				
Materials using 3 or more modalities (e.g. visual, auditory, kinesthetic)	r= 0.35 p= 0.17	r= -0.06 p= 0.81	r= 0.33 p= 0.2	
Multiple Types of Feedback (e.g. track changes, conferencing)	r= 0.63 p= 0.006	r= 0.75 p= 0.77	r= 0.54 p= 0.025	r= 0.26 p= 0.32

Comprehensive variable: UDL Tools and Strategies

Two UDL variables were created from the twenty-three UDL strategy and tool use items, which will be referred to as the *UDL Overall-Use Variable* and the *Total Number of Strategies Used* variable. The UDL Overall-Use variable was created by calculating the overall mean of the twenty quantitative UDL items for each participating teacher, including reading, writing, visual, web/video/audio and miscellaneous tools, while excluding collaboration items. The Total Number of Strategies Used variable was calculated to determine the number of different strategies used by respondents; teachers

that did not necessarily report using high frequencies of UDL tools but used a wide variety of different tools would have a higher total number of strategies used variable. Both of these UDL variables allow for comparison with demographic data, UDL professional development, and social-emotional development items to make statistical comparisons. These comparisons will be revisited later in the Results Chapter.

Qualitative Item: UDL Tools and Strategies

Teachers completed a short-answer question related to the quantitative item about how often they use materials with three or more modalities (visual, auditory, kinesthetic) in teaching students with disabilities. Teachers were asked to report the top three multimodal teaching strategies they use to get a more detailed representation of teaching strategies. Responses were hand-coded and analyzed by themes or patterns. Fifteen out of seventeen respondents answered the qualitative item, generating fifty-five separate responses. Many teachers provided more than three answers to the prompt, and all answers were accepted and analyzed. The researcher coded the data based on the following themes that emerged from responses: reading, writing, web/video/audio, visual, kinesthetic, collaboration/flexible work groups, lecture/direct instruction, acting/role playing and games-based learning. The most common themes teachers indicated as preferred multi-modal strategies were web/video/audio tools with sixteen examples mentioned in responses, and visual tools with fifteen examples mentioned. Nine teachers specifically mentioned that they used video clips or YouTube (60%). Five teachers mentioned slides or PowerPoint presentations to be top multimodal strategies (33%). The least common themes to emerge were reading, with one example cited, and games-based

learning, also with one example. The low level of responses in these areas indicate that reading strategies and games-based learning are areas of programming that could possibly be increased school-wide. The low response related to reading-related strategies also aligns with the low means found in quantitative items related to their use earlier in the survey, indicating low teacher use of reading strategies overall.

Student Choice and Coping Skills

Although this study is primarily concerned with academic outcomes for middle school students, current UDL guidelines on multiple means of engagement address social-emotional learning and the academic impacts of student affect in the learning environment. UDL guides teachers to advance student choice and autonomy in relation to levels of challenge, perceived rewards, assessments/feedback and goal setting; further, a high value is placed on developing student self-regulation techniques, including personal coping skills and self-assessment practices (CAST, 2011). The researcher asked the question whether teaching self-regulation skills had links to other UDL academic teaching methods utilized by teachers in the study. This section will first review five survey items related to student choice followed by two survey items addressing student coping skills and strategies.

Student choice

Four survey items related to student choice and teacher feedback. UDL guidelines encourage teachers to build multiple levels of challenge into their lessons to engage a variability of learners with an appropriate level and allow for student choice. The first

survey item presented a scale with the prompt “For most assignments…” and bipolar choices “I provide one level of challenge” and “I provide multiple levels of challenge” with a four-point rating scale. Results are shown in Figure 3 below with (1) representing providing multiple levels of challenge and (4) representing providing one level of challenge in assignments. Amongst respondents, 71% of teachers scored themselves a (1) or (2), showing most teachers tended toward using the UDL strategy of providing assignments at multiple levels of challenge. In data analysis, responses were flipped so that a 4 would indicate that the respondent used multiple levels of challenges to align with other survey items, wherein a higher number represented higher use of UDL

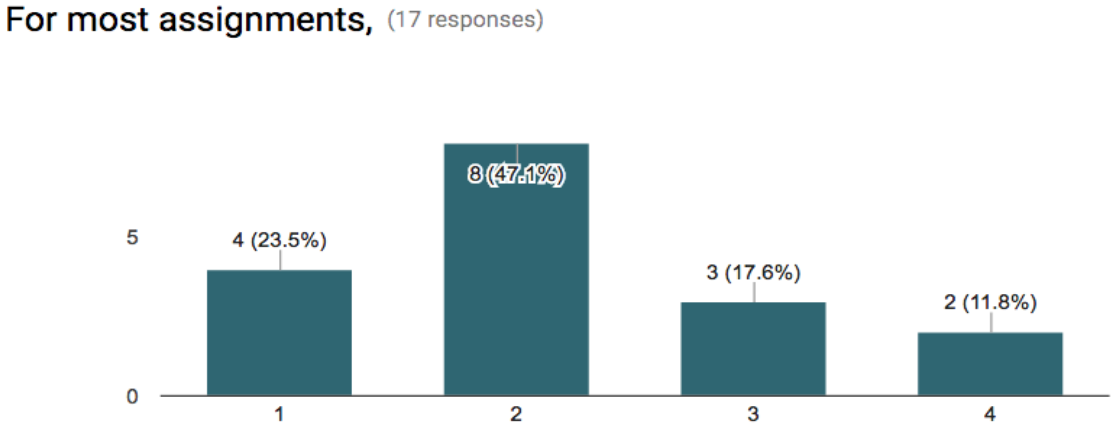

Figure 3: Teacher reported levels of challenge provided in assignments, with (1) multiple levels of challenge and (4) one level of challenge

The second item presented a semantic differential scale with the prompt “When students meet their educational goals or finish an assignment…” and bipolar choices “A reward or reinforcement is preplanned” and “students select a reward/reinforcement” with a four-point rating scale between the prompts. Fifteen teachers responded to this

item. Results are shown in Figure 4, with (1) representing that a reward or reinforcement is preplanned and (4) representing students select a reward or reinforcement. 80% of respondents scored themselves a (1) or (2), showing most teachers tend toward preplanning the reward or reinforcement when students meet their goals or finish an assignment over having students choose. This shows most teachers did not select UDL strategy highlighting student autonomy of choice, a means of engagement.

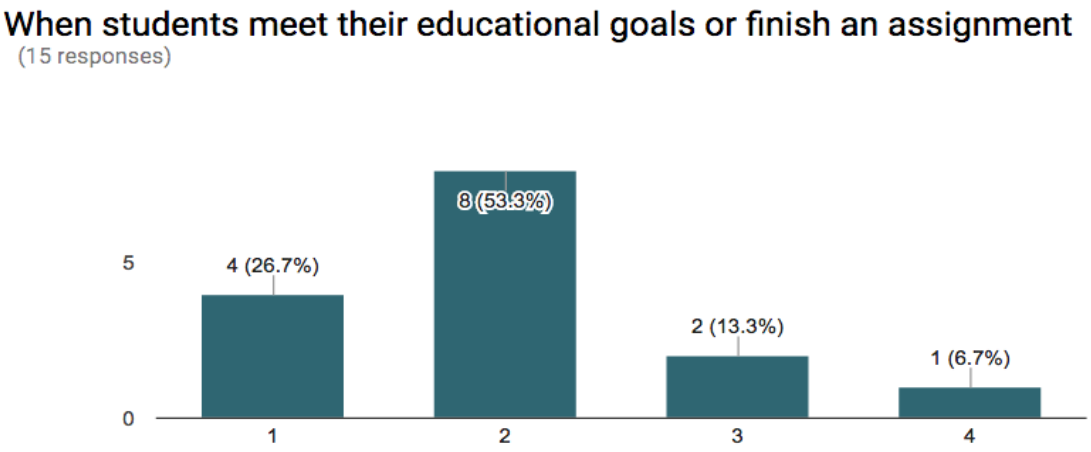

Figure 4: Teacher reported reward or reinforcement, with (1) reward is preplanned and (4) reward is chosen by students

On a third item shown in Figure 5, survey results show that most teachers tend to pre-plan accommodations and modifications, with 65% of teachers selecting a (1) or (2) indicating they develop accommodations before instruction begins.

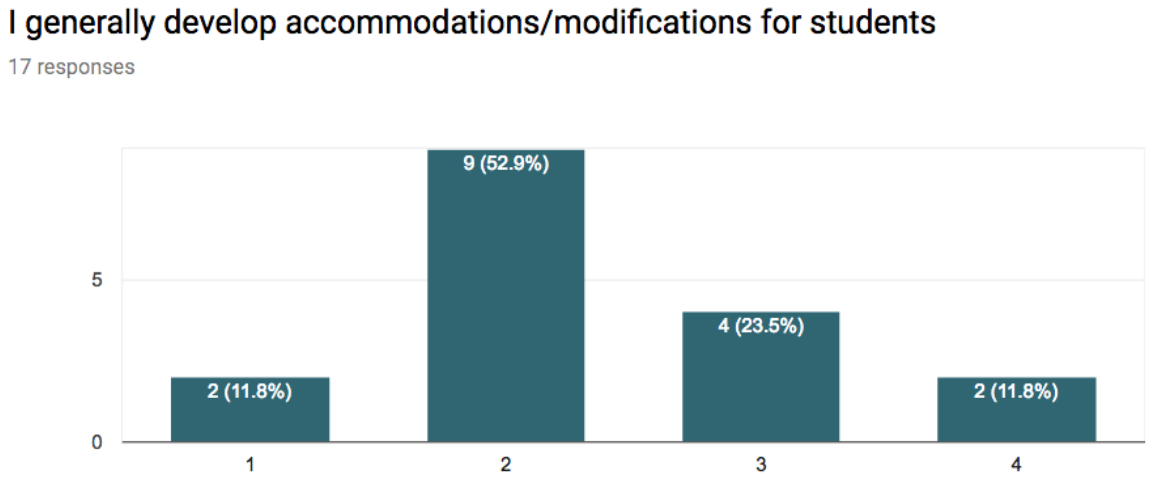

Figure 5: Teacher reported use of when accommodations are developed with (1) developing accommodations before instruction begins and a (4) planning accommodations during instruction.

On a fourth item, to gauge how much student choice is incorporated into tools used in the classroom (e.g. write by hand, use word processor, use google slides), participants were given a four-point semantic differential item and asked to fill it out based on whether tools were selected by students (1) or pre-planned into the lesson (4). For analysis, the data was flipped to represent tools selected by the teacher as a low use of UDL (1) and tools selected by the student as a high use of UDL (4). Results showed most teachers pre-plan the tools used in their lessons rather than allowing student selection, with 65% of teachers reporting a (1) or (2).

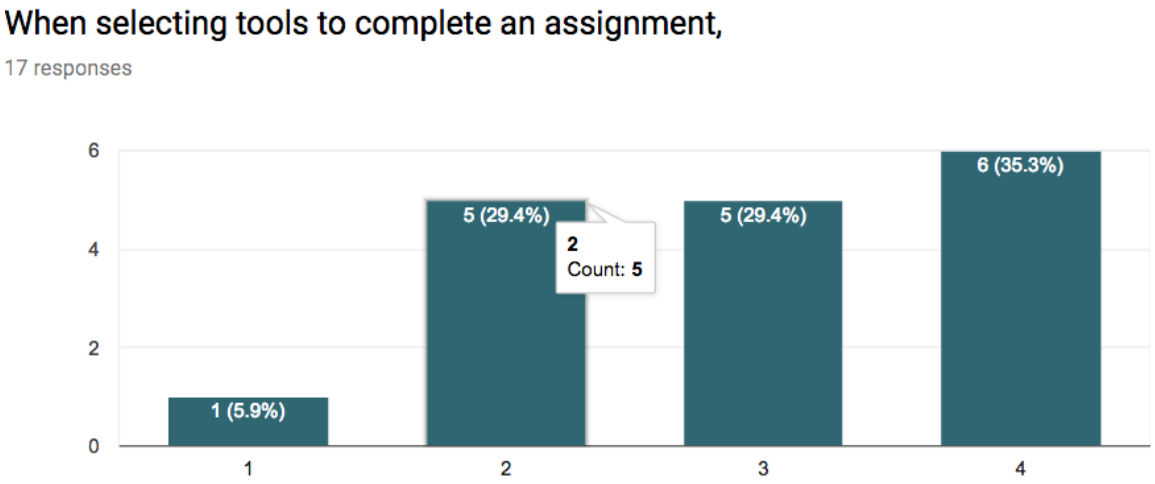

Figure 6: Teacher reported method of tool selection to complete an assignment with (1) student choose the tool and (4) tools are preplanned into the lesson.

Lastly, one final item was placed in the survey to gauge how much student choice is incorporated into teacher feedback methods used in the classroom. Participants were given a four-point scale and asked to fill out whether feedback from students was selected by the student (1) or pre-selected by the teacher (4). The data was flipped to represent feedback selected by the teacher as a low use of UDL (1) and feedback selected by the student as a high use of UDL (4). Results showed most teachers preferred feedback to be pre-selected rather than student selected, with 88% of teachers selecting a (1) or (2).

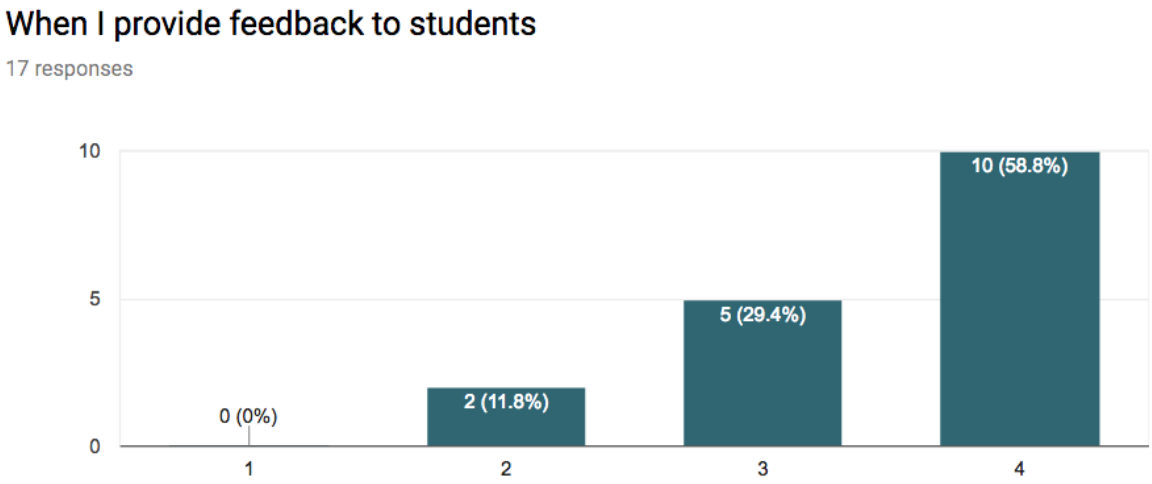

Figure 7: Teacher reported method of how student feedback is selected with (1) students select method of feedback and (4) method is preselected

Using Pearson Correlation analysis of all these survey items, one relationship of significance was found when using 0.1 as the alpha level threshold. Student choice of feedback appeared to be positively correlated with providing multiple levels of challenge ($r = 0.42$, $p = 0.09$), showing teachers who provide fewer levels of challenges in their assignments were more likely also to choose the feedback method for assignments rather than having students choose.

Coping skills and strategies

Respondents were presented with two survey items that asked about social-emotional learning as related to UDL. The first item was a Likert Scale asking teachers to rate how often they incorporated personal coping skills and strategies into lessons using the scale Do Not Use (0), Monthly (1), Weekly (2), and Daily (3). Of the respondents, 29% of teachers reported they incorporated coping skills into their lessons daily, 24% of teachers reported they used coping skills weekly, 18% reported they used coping skills

and strategies monthly. Twenty-nine percent of teachers reported they did not incorporate personal coping skills and strategies into their lessons at all (m= 1.53, sd = 1.23); on average teachers report they employed these lessons bi-weekly. A Pearson's correlation analysis was computed to assess the relationship between teaching self-regulation strategies and both UDL overall-use and the total number of strategies used. There was a moderate correlation between frequency of self-regulation strategies taught and UDL overall use ($r = 0.432$, $p = 0.083$) and between frequency of self-regulation strategies used and total number of UDL strategies used ($r = 0.509$, $p = 0.037$). This correlation indicated that if a teacher is incorporating coping skills and strategies into their lessons, they are more likely to use UDL strategies and use a wider range of UDL strategies.

Teachers were next asked to respond to one open-ended short-answer question to gather more information about the specific methods used to teach coping skills. Fourteen teachers responded to the prompt: "Please list one method you use for teaching personal coping skills and strategies". One teacher complicated this analysis when they reported they did not incorporate coping skills into their lessons, yet they wrote about at least one strategy they used. Responses were coded for themes and patterns. Themes included: taking breaks, reflecting on past behavior, deep breathing, preferential seating, supportive grouping, one on one teaching, mindfulness or meditation, access to a quiet place, and academic accommodations. Fourteen teachers responded with a total of twenty-two answers. The most common theme found in five out of fourteen responses (38%) was references to breaks. One teacher wrote: "Taking a quick water break to gather one's thoughts/emotions- settle oneself." Another teacher wrote "I allow students to take a

break using sensory tools, such as play dough, trampoline, dance/movement breaks. I also schedule these into the period so that students must take a break for approximately 5 minutes every 20-30 minutes." Another pattern in the survey responses included teachers reporting what appeared to be academic accommodations, listed in four occurrences (31%). Some responses appeared like lists of special education accommodations found in IEPs, for example, one teacher wrote "preferential seating, extended time, quiet places, supportive grouping, one to one reinforcement of concepts." Another theme referenced by three teachers (23% of respondents) was one-on-one teaching time. In the quote, above, the teacher stated, "one-on-one reinforcement of concepts". Another teacher wrote "I encourage students to work with me during student sessions." Deep breathing and preferential seating were each mentioned in 14% of responses (2/14) and building resiliency, reflection, quiet places and daily meditation were each mentioned in 7% of responses (1/14).

An analysis of the responses showed many of the answers provided were not teaching methods but appeared to be coping skills and strategies used with individual students. It is possible teachers misinterpreted the question to be asking about applications of IEP accommodations rather than lessons they were teaching on coping skills, however, in the previous pilot study done with elementary teachers, responses to the same question tended to be concrete curricular tools or teaching strategies. This could indicate that middle school teachers in this district may be less familiar or use fewer direct teaching tools at the whole class level for teaching personal coping skills and strategies. Overall, teachers who are using individual or whole class methods to teach and

reinforce coping skills and strategies, such as deep breathing, are more likely to use UDL strategies in their classroom and use a wider range of strategies. As the analysis below shows, there was no correlation found between UDL Training and coping strategies in the classroom. This may indicate self-regulation and coping strategies are used by more teachers schoolwide than UDL.

UDL Familiarity

To assess previous familiarity and training in UDL, teacher participants were provided the statement, "I am familiar with Universal Design for Learning" and the choices Agree (3), Somewhat agree (2), Somewhat disagree (1) and Disagree (0). Four teachers replied Agree (26%), six teachers replied Somewhat agree (35%), three teachers selected Somewhat disagree (18%), and four teachers selected Disagree (26%). When asked whether they had received previous training in Universal Design for Learning, six teachers replied "yes" (2) (35%) and eleven teachers replied "no" (1) (65%). Five out of six teachers who answered "yes" to having received previous UDL training responded in short-answer form to the question, "If stated yes above, how many hours of training have you received?" Responses varied from one respondent stating they had received 15 minutes, to another sharing they were "currently doing a master's program…many hours". Another respondent shared they had taken a semester for graduate school and an additional 6 hours of training in a previous district. Additionally, one participant stated they had received one hour of training and two others stated they had received three hours of training. Quantitative responses on the yes/no item and qualitative responses

from six participants were coded and categorized in groups below based on number of hours reported in previous UDL professional development: 0 hours (eleven participants, 64%), 1 hour or less (one participant, 6%), 2-3 hours (two participants, 12%), 6 hours or more (two participants, 12%) and one participant who reported they received UDL professional development but did not answer the item responding to how many hours of training they received (6%). Figure 3 provides a representation of the respondent's reported UDL professional development hours.

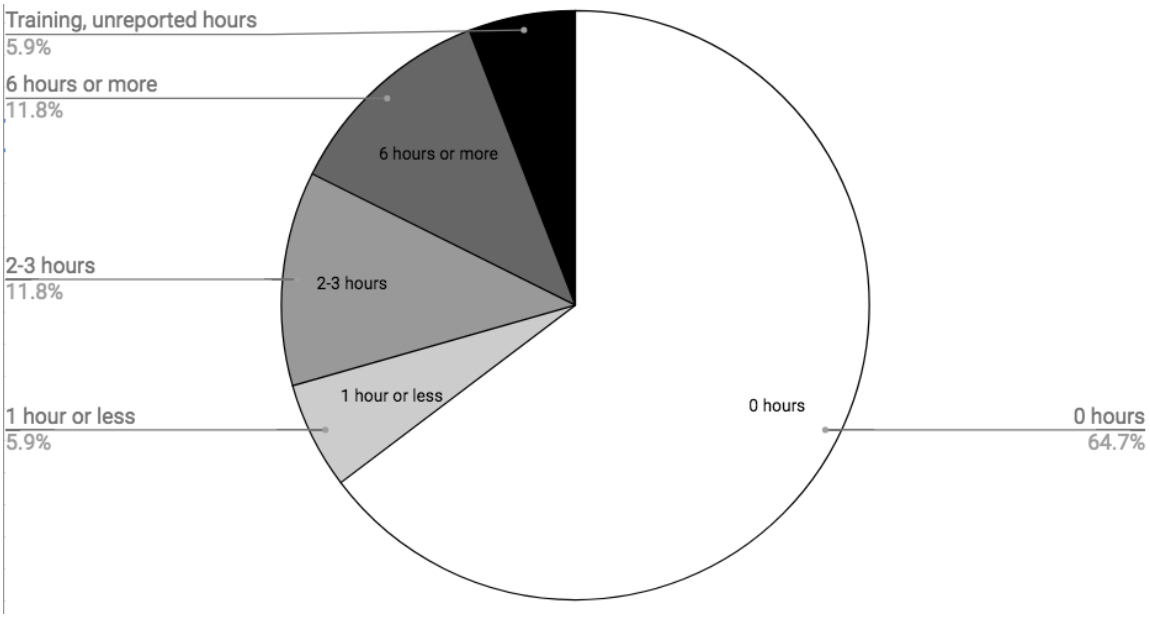

Figure 8: Previous UDL Training in Universal Design for Learning of Participants

A Pearson's correlation test was computed to assess the relationship between overall use of UDL and whether a teacher had received professional development in UDL. There was a strong correlation between UDL overall use and UDL professional development ($r = 0.965$, $p = 0.000$). There was also a moderate correlation between total

number of UDL strategies used and UDL professional development ($r = 0.416$, $p = 0.097$). Further, there was a significant correlation between the visual tools comprehensive variable and teachers receiving UDL professional development. Teachers who answered "yes" to the question about whether they have ever received UDL professional development were more likely to report higher use of visual tools in their classrooms to support special education middle school students ($r = 0.446$, $p = 0.073$). Also, there was a strong correlation between using visual UDL tools and strategies and UDL overall use, showing teachers who use visual strategies are more likely to use UDL strategies overall ($r = 0.791$, $p = 0.000$).

DISCUSSION

Introduction

The central questions this survey of middle school public school teachers sought to investigate were: What are the types and frequency of use of Universal Design Learning tools and strategies used in classrooms with special education students? Does use of some UDL tools correlate with use of other tools? What effect does previous UDL training have on the use of UDL methods in the classroom? This section will discuss data collected, links to current research and implications, arranged into three categories: technology use and classroom practices, student feedback and coping skills, and effects of UDL training.

Technology use and classroom practices

Reading: Multiple means of representation

Reading strategies such as digital textbooks, e-books and text-to-speech software align with the UDL principle of multiple means of representation, allowing students to engage with auditory and visual feedback as they interact with text. Studies show 80% of students with learning disabilities struggle in reading comprehension (Narkon, Wells, 2013), so the need for additional reading strategies is clearly present in our classrooms. Digital reading supports have been shown to be effective in supporting students with moderate-severe disabilities (Coyne, et al. 2012) and new findings suggest that audiobooks and reading tools created with UDL principles have significant positive

effects on the reading comprehension scores of middle school students with disabilities, particularly with students with learning disabilities (Hall, Cohen, Vue & Ganley, P., 2015).

This survey of middle school teachers reveal UDL supports in reading to be the least used by respondents with students with disabilities. Teachers reported notably low use of the reading strategies on-line textbooks, e-books, and text to speech, using these reading tools less than once per month. In qualitative responses in which teachers were prompted to list their three top multimodal teaching strategies, only one response out of fifty-three, or less than two percent of responses, mentioned reading, specifically "textbooks." This is a surprising finding given the accessibility of many digital and audiobook programs by today's online learners. It seems clear that middle school teachers from this population sample would benefit from heightened awareness around the benefits and accessibility of digital reading tools.

Writing: Multiple means of expression

In adherence with the UDL guideline to provide multiple means of expression and communication, writing tools appear to be used more frequently than reading tools by the teachers who completed the survey. UDL tools of sentence starters, google docs, spell check, and writing templates were reportedly used between monthly and weekly by teachers overall. The use of writing templates correlated with several other writing strategies, showing teachers who use writing templates were more likely to use sentence starters and/or google docs. Predictive writing and speech-to-text, considered assistive technologies primarily used with students with disabilities, were reportedly used less than

once per monthly by teachers overall. The use of writing tools overall did not correlate with the use of other UDL strategies, suggesting that writing tools may be stand-alone strategies that do not link with use of other UDL tools. In qualitative responses in which teachers were prompted to list their three top multimodal teaching strategies, seven out of fifty-five, thirteen percent of responses, included reference to written representations of letters or numbers, including “written directions”, “handouts”, “take notes”, “diagram problems”, “use calculator”, and “Google docs”.

Across many classrooms, google docs, sentence starters, spell check and writing templates are UDL supports regularly used by all students and are relatively easy to implement in an inclusive classroom setting. Speech-to-text and predictive writing programs are often perceived to require more specialty knowledge in special education accommodations, which could account for lower use by teachers. Students benefit from the use of organizational software such as writing templates and spell check to mitigate their challenges with low-level processes of writing; further, students with a diversity of skills also benefit from access to speech-to-text software to bolster their ability to convey complex thoughts, shown to boost clarity of ideas and legibility (Forgrave, 2002). Survey results indicate teachers in this study may require more training and support in using assistive technology UDL tools, particularly in the improved ease of access of speech-to-text software through google dictation and editing programs (see Moynihan, 2016).

Video/Web (Audio) and Visual: Multiple means of representation

The variability of learners is reflected in the variety of representations teachers provide in a UDL classroom, such as multiple options for accessing content, including

auditory, visual and custom alternatives for information (CAST, 2011). Websites and video media support learning in the auditory and visual areas, and in this study to develop clear-cut categories, were considered audio stimuli because they activate learning in this domain. When surveyed about web and video tools, teachers in the survey reported using web activities, websites, and video media such as YouTube on a weekly to monthly basis. There was not a correlation between the uses of any web/video strategies, suggesting use of one type of video and visual media use does not predict the use of another. Teachers reported weekly use of specific websites to present instruction and video media such as YouTube or other video clips. In the qualitative item asking teachers to report their three most preferred type of multimodal teaching strategies, more teachers mentioned web/video/audio strategies than any other category, with sixteen out of fifty-three strategies mentioned, or 30% of responses. Teachers wrote down several strategies in which they used video or audio learning techniques such as "video demonstration, written directions with hyperlinks to websites and videos", "video clips/assigned work on the big screen, listening lab, role playing and acting" and "I like Education.com for computer based lessons. The site uses songs, stories, multiple choice, click and match, and other interactive games for learning LA and Math. I also use YouTube clips."

Most research into use of video with students with disabilities centers around video modeling and video games in the classroom. Video modeling is a research-based intervention shown to aide students with autism and students with learning disabilities in improved interaction with higher level content and increased cooperative behaviors (O'Brien & Wood, 2011). While research has not shown significant effects on learning

outcomes using video games, student engagement levels have been shown to increase with the use of video games designed with UDL principles (Marino, et al. 2014b). It is unclear whether the positive results in academic and behavioral outcomes from video modeling or increased engagement from video games generalize to use of YouTube and video clips in the classroom. Yet, it is apparent from the survey results that middle school teachers in the surveyed population utilize video media heavily in the classroom.

A close second in popularity of use, visual tools were shown to be widely used in the survey. While video and web tools engage learners in auditory and visual modalities, for the purposes of this study, visual tools will be considered tools that only use visual stimuli. UDL visual tools include charts, graphs and illustrations, PowerPoints/slides, document camera or projector, planner, and graphic organizers. The use of charts, graphs and illustrations correlates positively with all other visual tools, showing that use of charts and graphs is linked to the use of other UDL visual tools. Using PowerPoint or Google slides predicted the use of the document camera and graphic organizers in the classroom. Planners and document cameras showed a correlative link, possibly because teachers who promote the use of planners may use the document camera to model the correct use of planners in the classroom. Planners were reportedly the most used visual tool, with use between daily and weekly. This was a surprising outcome, because use of planners was mentioned only one time in the qualitative responses teachers provided. While purely anecdotal, I have also not observed planners used consistently with special education students at this school. Fifteen of fifty-five teachers, twenty-seven percent of responses, reported the use of visual tools in the qualitative item on the survey, including

six teachers stating they use “Google slides” or “PowerPoint”. Additionally, teachers reported the use of “teaching models”, “images/visuals”, “assigned work on the big screen,” “graphic organizers”, and “visual example (live).” While this researcher was unable to locate research specifically linking visual learning and universal design for learning strategies, using salient visual supports is a widely-known strategy used with English Language Learners and all struggling students. In sum, teachers surveyed report providing diverse options for perception and comprehension through use of audio and visual representations of information regularly in their classrooms.

Miscellaneous items

The low rate of collaboration with special education teachers shown by the survey was a surprising finding. As a working special education teacher at this school, my perception was that special education collaborate with general education teachers happened between daily and weekly. The survey reported that collaboration with special education teachers occurs less than once a month, while collaboration with general education teachers happens more often than once a week. It is interesting to note that when data is disaggregated by teacher type, special educators report they collaborate with each other every day (m = 3.0) and collaborate with general education teachers almost every day (m = 2.5), however, general education teachers report collaborating with each other weekly (m = 1.9) and with special education teachers less than monthly (m = 0.4). It is possible that general education teachers report low levels of collaboration with special education teachers because they feel under-supported with special education students or programming generally, despite engaging in actual minutes of collaboration

time. It also could be the wording of the question as “How often do you collaborate with special education teachers/general education teachers when planning lessons” produced particularly low results. Teachers may have different definitions of “collaboration”, with some perceiving frequent check-ins about lesson plans while others interpret collaboration to mean creating lesson plans together. The lack of perceived special education collaboration school wide could also be responsible for why some UDL strategies, such as reading and writing tools, are underused. Without regular support from trained special educators in implementation of UDL tools with students with disabilities, many UDL strategies are used only once a month or less by teachers. This is an area where improvements in collaboration between special education and general education teachers may help increase overall UDL strategies in the classroom.

Student Feedback and Coping Skills

Multiple means of engagement, the third key principal of UDL as proposed by Rose, Meyer and Gordon (2014), relates to learner affect, including self-regulation, motivation and interest rather than just knowledge acquisition. The natural variability of student engagement can be addressed by building multiple levels of challenge into assignments as well flexible methods of teacher feedback, student choice in rewards and reinforcements, and direct teaching of coping and self-regulation strategies. The survey revealed a correlative connection between the frequency with which teachers incorporate tools to help facilitate personal coping skills and strategies into lessons with their overall UDL use and their use of a wider range of UDL strategies. One unique factor to this

survey is the finding that there is a link between teaching social-emotional skills and frequency of universal design for learning tools and strategies. This effect does not appear to be connected to previous UDL training, showing that the teaching of coping skills in the classroom may be more widespread than other UDL techniques and strategies. The overlap between social-emotional learning and universal design is a pertinent area for future research.

Effects of Universal Design for Learning Training

Overall Findings

One of the key findings in this survey is the strong correlation found between previous UDL training and higher frequency of overall use of UDL tools and strategies in the classroom. There was also a moderate correlation found between previous UDL training and total number of UDL tools and strategies used. These findings are significant because they indicate that UDL training influences not only the use of UDL in the classroom overall, such as using several UDL strategies regularly, but previous training relates to teacher uses of a wide range of UDL strategies, particularly in visual tools. The use of visual tools also correlated with the use of UDL strategies overall, showing that teachers who use visual tools are more likely to use other types of UDL strategies. In this study, visual UDL tools appear to be a strong modality used more frequently than other tools and connected with use of other UDL tools. The connection between previous UDL training and using UDL strategies more frequently in the classroom is not a surprising finding and has been mirrored in other studies. One major difference of the current study

is that it relied on feedback from currently practicing teachers reporting on what they use in the classroom daily, weekly or monthly rather than analyzing lesson plans alone, as previous studies have done.

Links to previous studies

Several studies investigating the effects of teacher training on the use of UDL have been conducted and found increases in use of UDL principles in teacher lesson plans (see also Literature Review Chapter). McGuire-Schwartz and Arndt (2007) studied teacher training in UDL and its effects on lesson plan design. Teacher's surveyed responded that UDL improved lesson plan design and often met the needs of students with disabilities. Spooner at al. (2007) also researched the effects of UDL training in lesson plans of pre-service teachers, finding significant increases in inclusion of students with disabilities after UDL training in lesson plans, including use of clear lesson modifications the three UDL principles of multiple means of action, expression and engagement. Studies by Spooner et al. (2007) and Courey at al. (2013) also investigated special education pre-service teachers, finding similar results in improvements in lesson plan design. McGhie-Richmond and Sung (2012) also conducted a study of pre-service and current service teachers on revisions of their lesson plans, showing similarly that teachers included more UDL principles in lesson plans after training. These studies appear to show the effectiveness of the specific UDL trainings the research groups were subject to. Clear limits to these studies are the lack of implementation of UDL in the classroom by current teachers. In contrast, the current study investigated UDL methods teachers were using currently in the classroom. It also investigated UDL training broadly,

looking at linkages between a variety of different UDL trainings teachers had attended, from 15 minutes long to an entire semester. Future studies could dig more deeply to find if effects exist between the length or type of UDL training and the use of UDL strategies in the classroom.

Looking to the future

The study that is the subject of this thesis is unique in its central consideration of frequency of UDL technology and strategies used in public school classrooms. Rather than being mostly pre-service teachers, 88% of the teachers in the population for this study have been teaching longer than five years. One limit of this study and others looking at UDL training is that teacher statements were not corroborated by formal classroom observations. There is a possibility that teachers overstate the use of UDL strategies in the classroom on surveys and lesson plans, as indicated in the current study by the results that planners are the most frequently used visual tool, a claim that has not been corroborated by my day-to-day observation of students with disabilities in class. Further studies would benefit from completing observations in the classroom to verify the frequency and type of UDL strategies used. This study also did not differentiate use of UDL strategies with specific disability types. The middle school that was the object of study has a full-inclusion special education program that involves students with all disability types in classroom lessons.

The literature provides several studies considering UDL and students with learning disabilities as well as students with moderate to severe disabilities (Browder at al., 2009; Coyne, et al., 2012; Marino et al., 2014). The literature shows a shortage of

research on the effects of using UDL with students with autism, a surprising finding given the significant effectiveness technology-based intervention has been shown to have with people with autism (Grynszpan, Weiss, Perez-Diaz & Gal, 2014). Further studies would be useful investigating the experiences of students with emotional disabilities using UDL technology, as well as more studies connecting UDL strategies and students with autism. To draw conclusions about how UDL classrooms develop social-emotional learning skills for students with disabilities, more research is also needed in UDL strategies and social-emotional learning. Research on the effects of UDL strategies on general education students as well as special education students is merited. Finally, a review of UDL academic outcomes literature yielded no studies specifically in mathematics, an area where more research is clearly warranted.

CONCLUSION

Universal Design for Learning presents a model of instructional design that considers the variability of learners in a classroom when designing classroom lessons and materials. This framework seeks to target traditional ideas of instructional design geared toward the "average" student, claiming that teaching designed for homogenous groups contains implicit barriers to learning in both academic and social-emotional spheres. Instead of referring students who do not fit the mold to a separate classroom, UDL at its core values inclusion and proposes that instruction designed for the variety of learners in the classroom is a strength for all learners. The Individuals with Disabilities Education Act's (IDEA) requirement that students be educated in the least restrictive environment means educators are obligated to continue pursuing effective instructional tools that allow access to the widest breadth of learners possible. UDL has gained national attention as both a paradigm and a set of guidelines to lower barriers to learning for the diversity of learners in our classrooms today.

Broadly, Universal Design for Learning embodies guide points for good teaching supported by an underlying philosophy that values diversity of learners and inclusion classrooms. More narrowly, UDL is a checklist of specific checkpoints and implementation examples to guide teachers in applying the UDL framework. The research shows that UDL needs to be operationally defined and its guidelines flushed out for educators and researchers to successfully implement the program and determine benefits and areas to improve. Documents such as the UDL Guidelines by the Center for

Applied Special Technology (CAST, 2011) offer concrete tools for implementation that can help teachers and researchers articulate specific methods to apply UDL. As educators in the field become practiced at defining and utilizing UDL, and the research base continues to grow, more concrete conclusions about the effectiveness of these practices on learning will be generated.

In the current era, print is no longer limited to unchanging words on a page and the increase of technology in classrooms nationwide offers useful tools to teachers and schools who implement UDL. Technology, when used in a targeted way to achieve learning goals, can enhance learning or increase accessibility. Many classrooms are now implicitly or explicitly implementing UDL strategies through increases in access to audiobooks, speech-to-text, and even on-line learning platforms that tailor specific lessons to individual student's academic levels. UDL can further guide and cultivate a pedagogy of inclusiveness and universal access through use of its tools and guidelines of multiple means of engagement, representation, and action/expression combined with thoughtful use of technologies in the classroom.

This thesis studied one California public middle school's use of UDL technologies and strategies in the classroom as reported by teachers. The survey found that visual and web/video (audio) tools were the most widely used in the classroom, followed by writing UDL tools and strategies. The least used were reading UDL tools as reported by teachers. The study found that previous teacher training in UDL correlated with greater use of UDL strategies overall in the classroom and use of a wider range of different UDL strategies. Use of UDL strategies and tools also correlated with social-

emotional learning in the classroom, particularly incorporating personal coping skills and strategies into lessons.

Limitations

This study was conducted within an upper middle class community of northern California and its results are reflective of the thoughts and opinions of teachers from the specific middle school surveyed. This study may not be reflective of all middle schools, and being an affluent school may have influenced the use of technologies and UDL strategies in the classrooms, teacher responses, as well as other factors. While the online survey was collected from 57% of the teachers, this still represents 17 teachers total and therefore it would not be advisable to generalize the results to a larger population. Further, the demographic profile of participants was of low ethnic diversity, reflective of the overall ethnic profile of the community in northern California where the survey was distributed. Using a larger sample size from a more ethnically diverse population would be advisable for future research. Future research would benefit from including in-class observations and interviews with teachers to further investigate why teachers answered the way they did, as well as their thoughts and perceptions about the effectiveness of UDL in the classroom. Further studies would be strengthened by including student opinions about UDL as well as student data showing the effects of using UDL strategies on academic or social-emotional growth.

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APPENDICES

Universal Design for Learning Survey

Informed Consent

You are being asked to participate in a research study investigating how general education and special education teachers use Universal Design for Learning strategies in their classrooms. This research study is being conducted as part of thesis work for a Masters of Arts in education from Humboldt State University. You are being asked to take part because you are a certificated teacher in a Marin County school.

If you agree to participate in the survey, you will answer questions about your teaching practices, technology you use in the classroom, and your experiences teaching general education and special education students. I anticipate this survey will take 20-30 minutes to complete. All identifying data will remain confidential.

Taking part in this study is completely voluntary. You may skip or pass on any questions that you do not want to answer. Choosing not to participate will not affect your current or future relationship to the school, Humboldt State University or me, the graduate student researcher. If you decide to take part and change your mind, you may withdraw at any time. The survey presents minimal risk. Participating in this study will help Marin

County teachers further their understanding of their work and analyze how they use particular educational strategies in their classrooms with general education and special education students.

All data collected and records will be kept private. No identifying information will be included in public documents. I am not recording your computer IP address, hence there will be no way to link your identity to your individual responses. Information gathered from this survey may be presented in public data or reports. Data without identifying features may be maintained for future research and/or shared with other researchers in the future. Direct quotes may be used from your answers with your permission and they will not be associated with your name in any way.

If you have any questions about this research I will be happy to answer them at swg2@humboldt.edu or 415-572-8544. You can also contact my Advisor Eric Van Duzer at evv1@humboldt.edu or (707) 826-3726. If you have any concerns with this study or questions about your rights as a participant, contact the Institutional Review Board for the Protection of Human Subjects at irb@humboldt.edu or (707) 826-5165.

I have read and understand the information provided, and agree to participate in the following survey

☐ Yes, I consent to participate

☐ No, I do not consent to participate

I consent for use of direct quotes from my answers. Quotes will not be associated with my name in any way.

- Yes, I consent for use of my direct quotes
- No, I do not consent for use of my direct quotes

Classroom Practices

For most assignments,

	1	2	3	4	
I provide multiple levels of challenge					I provide one common level of challenge

The audience for most student assignments or activities in my classroom is

- Our classroom community
- Our classroom and neighboring classrooms at the same grade level
- Our classroom and neighboring classrooms at multiple grade levels
- The town or school district
- The community of world wide web users

How often do you collaborate with special education teachers when planning lessons?

- Daily
- Weekly
- Monthly

Do Not

How often do you collaborate with general education teachers when planning lessons?

Daily

Weekly

Monthly

Do Not

When students meet their educational goals or finish an assignment

	1	2	3	4	
A reward or reinforcement is preplanned					Students select a reward or reinforcement

I generally develop accommodations/modifications for students

	1	2	3	4	
Before instruction begins					During instruction

When selecting tools to complete an assignment,

e.g. write by hand, use word processor, use google slides

	1	2	3	4	
Students chose the tools to use					The tools are preplanned in the lesson

Technology Use

Please indicate the frequency of use of technology in the classroom with students with disabilities.

	Daily	Weekly	Monthly	Do not use
Web activities (e.g. "Web Quest")	○	○	○	○
Predictive writing programs (e.g. Co-Writer, WordQ)	○	○	○	○
Sentence starters	○	○	○	○
Google doc's, sheets or forms	○	○	○	○
Online textbooks	○	○	○	○
Charts, graphs and illustrations	○	○	○	○
Speech-to-text for writing	○	○	○	○
Specific websites to present instruction	○	○	○	○
E-books	○	○	○	○
Text-to-speech software for listening to text	○	○	○	○
Powerpoint or google slides	○	○	○	○
Document camera or projector	○	○	○	○

Student Feedback or Coping Skills

When I provide feedback to students

	1	2	3	4	
Students select the method of feedback	○	○	○	○	Method of feedback is preselected

I incorporate tools to help facilitate personal coping skills and strategies into lessons

Select all that apply

- ○ Daily
- ○ Weekly
- ○ Monthly
- ○ Do Not Use

Please list one method you use for teaching personal coping skills and strategies

Your answer

Classroom Strategies, continued

How frequently do your students with special needs use the following:

	Daily	Weekly	Monthly	Do not use
Planners to track assignments	○	○	○	○
Graphic organizers, outlines or concept maps	○	○	○	○
Spell checker or calculator	○	○	○	○
Writing templates or sentence starters	○	○	○	○
Flexible work groups (e.g. pairs, small group, individual)	○	○	○	○
Materials using 3 or more modalities (e.g. visual, auditory, kinesthetic)	○	○	○	○
Multiple types of feedback (e.g. track changes, conferencing)	○	○	○	○

Please list the top three multimodal teaching strategies you use

(e.g. PowerPoint presentations, manipulatives, lecture and video clip)

Your answer

UDL Familiarity

Please rate your agreement level with the following statement: I am familiar with the term “Universal Design for Learning.”

- Agree
- Somewhat Agree
- Somewhat Disagree
- Disagree

Please state in your own words what you think Universal Design for Learning means

Your answer

Have you ever received professional development in Universal Design for Learning?

- Yes
- No

If you stated yes above, how many hours of training have you received?

Your answer

Demographics

Select your grade level of current teaching assignment

- [ ] Pre-K
- [ ] 1
- [ ] 2
- [ ] 3

- [ ] 4
- [ ] 5
- [ ] 6
- [ ] 7
- [ ] 8
- [ ] Other: Your answer

How many years have you been teaching (count this year as one)?

Your answer

I am currently a(n)

- ○ General education teacher
- ○ Special education teacher
- ○ Specialist teacher (Art, ELL Support, PE, etc.)

What is your gender

- ○ Female
- ○ Male
- ○ Other
- ○ Other: Your answer

What is your highest degree earned?

- ○ P.h.d/Ed.D

MA/MS

BA/BS

What is your opinion about being interviewed about classroom technology or allowing me to do a classroom observation?

I am open to be interviewed

I am open to you doing a classroom observation

No thanks

Other: Your answer

If you are interested in being interviewed or observed, please add your name

Your answer